WIDIA™

# TORNEADO

**WIDIA™ significa calidad total**

El grupo de productos WIDIA lleva más de 80 años innovando y su objetivo principal es diseñar y fabricar productos de corte de metal mediante los cuales los procesos de mecanizado de nuestros clientes resulten más eficaces y efectivos.

Con miles de productos en nuestro catálogo, el grupo de productos WIDIA ofrece ventajas competitivas que mejorarán su productividad y aumentarán su rentabilidad.

Para obtener más información, póngase en contacto con su distribuidor local autorizado de WIDIA o visite **www.widia.com**.

# TORNEADO

WIDIA™

# Torneado


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# WIDIA™ significa calidad total

**Al adquirir productos de la familia de marcas WIDIA, no sólo está comprando velocidad, potencia y precisión, sino también calidad total.**

El grupo de productos WIDIA ofrece el catálogo más completo de productos de gran precisión y de servicios de soluciones personalizadas que hay actualmente en el mercado. Con más de 14.000 productos para el fresado, torneado y taladrado en nuestra cartera y una red cualificada de socios de distribución autorizados, encontrará todo lo que necesita en un mismo sitio.

## Más de 80 años de calidad

**1925**
Solicitud para registrar "WIDIA" como marca comercial

**1926**
Comienza la producción de metal duro de tungsteno

**1930**
WIDIA gana el Gran Premio en la exposición universal EXPO en Lieja

**1962**
Se concede la primera patente para las plaquitas de metal duro

**1968**
Lanzamiento de la primera calidad de recubrimiento global

**1987**
Lanzamiento del sistema de herramientas Widaflex™ para tornear, taladrar y fresar

**2000**
Certificación de las normas QS 9000 TES y VDA 6.4 para las operaciones WIDIA en Essen y Lichtenau

**2006**
WIDIA celebra sus 80 años de historia

**2009**
Lanzamiento de las calidades de las series TN5105 y TN7100 para torneado

# Experiencia técnica con la que puede contar

Las herramientas de corte de la marca WIDIA™ se encuentran disponibles de forma exclusiva a través de una red especializada de socios distribuidores autorizados con los que puede contar para obtener mucho más que productos.

**Ellos le enseñarán a:**

- Conseguir mejoras cuantificables en la productividad.
- Reducir significativamente el tiempo de ciclo.
- Mejorar el uso de la máquina herramienta.
- Sacar el mayor provecho de soluciones probadas de la cadena de suministro.
- Acceder al inventario local y a la mejor asistencia técnica.
- Solicitar demostraciones in situ de la tecnología de herramientas más avanzada.

# La familia de marcas más fuerte del sector

La familia de marcas WIDIA cuenta con una red mundial de los mejores distribuidores autorizados del sector, seleccionados por sus conocimientos especializados en las áreas siguientes:

## Herramientas de torneado, taladrado, fresado intercambiable y sistemas de herramientas

WIDIA | WIDIA MANCHESTER | WIDIA CLAPPDICO | WIDIA CIRCLE

## Fresas de mango de metal duro integral y taladrado y escariado de metal duro integral

WIDIA HANITA | WIDIA RÜBIG

## Operaciones de roscado

WIDIA GTD

# Fácil de pedir

Encontrar los productos WIDIA™ adecuados para sus aplicaciones de mecanizado nunca ha sido tan fácil. Nuestros ingenieros y distribuidores autorizados son expertos en mecanizado de alto rendimiento. Trabajarán con usted para determinar el producto correcto para su aplicación, seguido del pedido, envío y entrega correspondientes del producto con el servicio de atención al cliente que se puede esperar de una marca líder en todo el mundo.

# Servicios de la cadena de suministro

Si su fábrica emplea procesos de tratamiento por lotes o una producción en masa, o si sus máquinas de corte de metal están organizadas en líneas, células o unidades independientes, nuestro programa de servicios de cadena de suministro eliminará gastos generales innecesarios, asegurará la disponibilidad de herramientas, reducirá los tiempos de configuración y minimizará los costes en un 30–90%.

De hecho, a menudo nuestras soluciones se amortizan rápidamente porque ofrecen un ahorro que supera el gasto anual en herramientas de corte y suministros.

# Fabricación mundial

**Los productos WIDIA se desarrollan y fabrican en nuestros centros de excelencia en fabricación ubicados en**

- Essen, Alemania
- Lichtenau, Alemania
- Nabburg, Alemania
- Johnson City, Tennessee, EE.UU.
- New Market, Virginia, EE.UU.
- Orwell, Ohio, EE.UU.
- Solon, Ohio, EE.UU.
- Bangalore, India
- Shlomi, Israel

# Programas de formación amplios

Como cliente de WIDIA™ podrá acceder a nuestro exclusivo programa de formación on line donde encontrará docenas de cursos sobre nuestros productos y servicios más recientes.

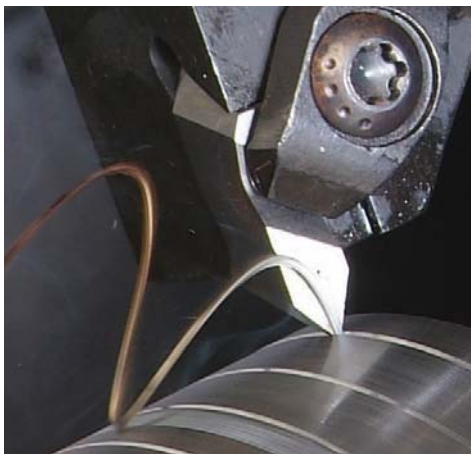
# En la web

Visite nuestra página web para obtener información actualizada sobre novedades, descargar copias electrónicas de documentación de productos y visualizar la lista de eventos del sector en los que participamos. Visite www.widia.com y utilice el buscador de distribuidores para encontrar el distribuidor autorizado más cercano.

# Cuando piense en velocidad, potencia y precisión, piense en calidad total: piense en WIDIA.

Para saber cuál es su distribuidor autorizado de WIDIA más cercano, utilice el buscador de distribuidores en **www.widia.com**.

# Soluciones personalizadas en torneado, mandrinado, ranurado, tronzado y roscado



Nos dedicamos a diseñar y desarrollar soluciones especiales de torneado, fresado y taladrado para operaciones exigentes y la fabricación centralizada. Nuestros ingenieros de fábrica, expertos en producción e ingenieros de aplicaciones de campo están disponibles para trabajar con usted en el diseño de soluciones que proporcionen la máxima productividad y el mayor rendimiento.

Unas ventajas únicas, como los recubrimientos de alta calidad de PVD internos (TiN, TiCN, TiAlN, AlTiN y recubrimiento Z), una amplia gama de materias primas (HSS, HSS-E, polvo HSS; metal duro sólido, metal duro soldado) y una amplia gama de diámetros (de 0,25 mm a 75 mm) convierten a WIDIA™ en la marca preferida para herramientas de alta calidad y específicas para cada aplicación.

Estamos especializados en el diseño y la fabricación de diseños especiales en los siguientes tipos de herramientas:

- Geometrías complejas
- Portaherramientas y barras de mandrinar
- Herramientas de moldear
- Estándares modificados
- Materiales superabrasivos (PCD y CBN)
- Herramientas y plaquitas para:
  - Desbaste de barra
  - Torneado de aplicaciones pesadas
  - Mecanizado de rueda de ferrocarril

# Responsabilidad medioambiental

Mantenemos un compromiso firme ofreciendo productos respetuosos con el medio ambiente que aporten, al mismo tiempo, un alto nivel de rendimiento y el máximo nivel de calidad probada. Gracias a décadas de experiencia en herramientas y fabricación junto con la sinergia de una ingeniería de primera calidad, podemos ofrecer las oportunidades más eficaces de fabricación sostenible del sector.

# Ingeniería sostenible

## Lideramos el camino en innovación, ingeniería y asistencia en herramientas estándar y a medida. Metodología y asociación probadas.

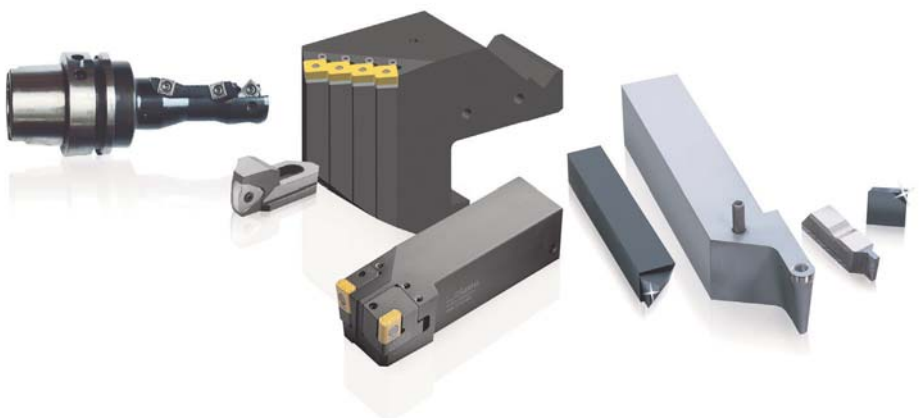
La ingeniería exitosa de un proyecto requiere planificación, trabajo en equipo y una ejecución disciplinada. Gracias a nuestra amplia experiencia en el desarrollo y la implementación de nuevas estrategias de ingeniería de proyecto, hemos sido pioneros en una metodología probada para ayudarle a fabricar nuevos productos y llevarlos al mercado rápidamente. Se realiza un esquema de aquellos servicios que se pueden facilitar y se acuerdan de forma conjunta antes de que comience el proyecto. Evaluamos el progreso y los resultados con usted en todo el proyecto mediante nuestros sistemas de gestión por etapas.

Gracias a un proceso completo de primera calidad, podrá beneficiarse de un tiempo de introducción al mercado más rápido, de una reducción en los costes generales y de una disminución de los riesgos a la hora de implementar nuevas tecnologías.

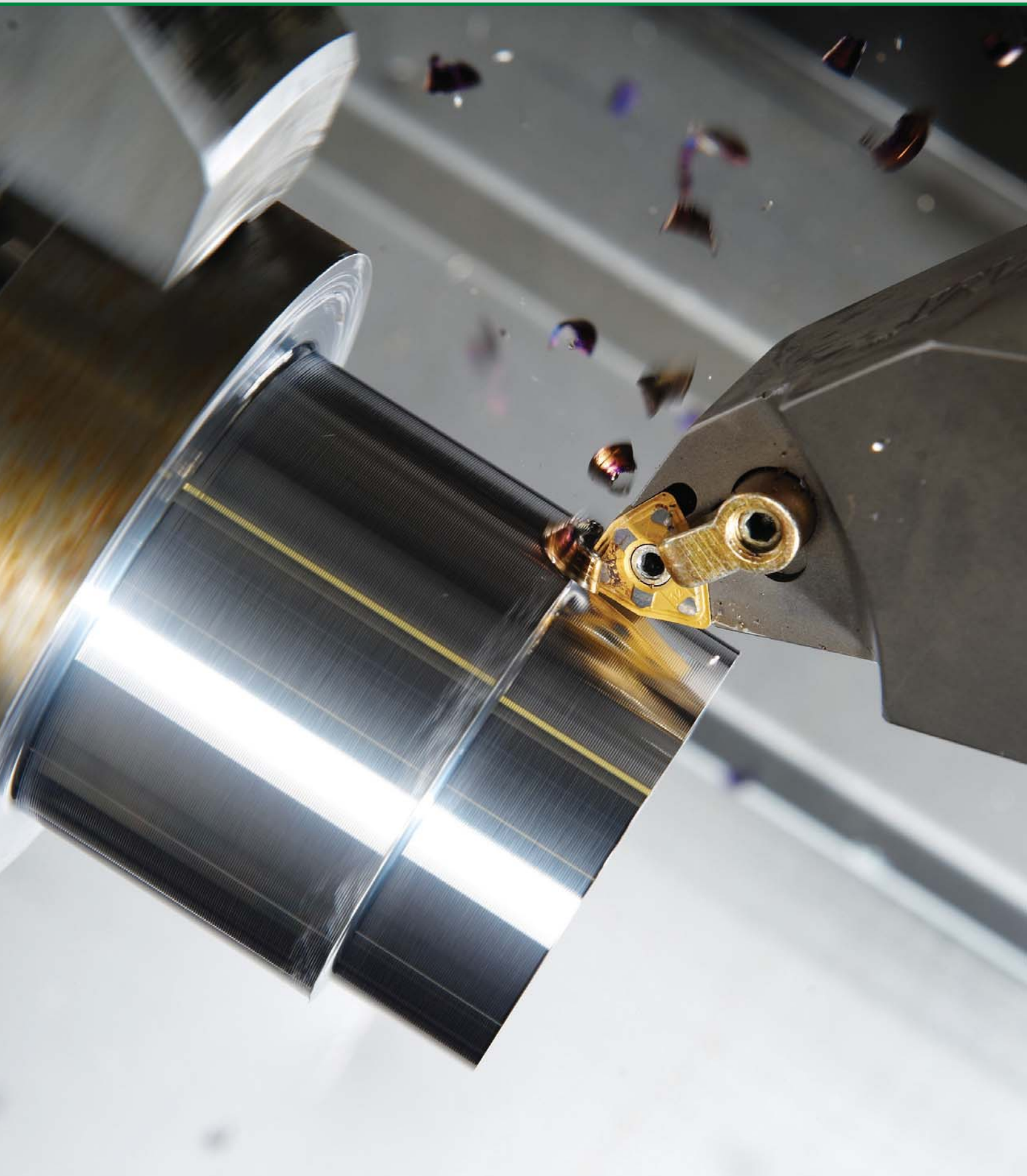
# Proveedor ideal

Trabajamos con todos los mercados industriales más importantes del mundo y somos el proveedor ideal de los sectores más exigentes, incluidos el aeroespacial, de moldes y matrices, de automoción, de equipos pesados, médico y de ingeniería general. A lo largo de más de 80 años de experiencia, hemos logrado una reputación de proveedores fiables. Nuestros productos y servicios innovadores y únicos están diseñados especialmente para proporcionar una eficiencia y un rendimiento excepcionales. Hemos permitido a los clientes ser más competitivos y rentables en sus sectores respectivos, produciendo piezas en menos tiempo, con menos cambios de herramienta y una mayor vida útil de las herramientas.

Nuestro objetivo es proporcionarle unas herramientas y unos servicios que ofrezcan la máxima satisfacción al cliente; nos complace incluir algunas de nuestras más recientes innovaciones en este catálogo. Para obtener más información sobre cómo pueden mejorar su rentabilidad estos productos, póngase en contacto hoy mismo con un distribuidor local autorizado de WIDIA™.



WIDIA



# Herramientas para torneado exterior, mandrinado interior y cartuchos

**Portaherramientas de torneado exterior: sistema de numeración de catálogo** . . . . . **A4–A5**
**Portaherramientas de torneado exterior: información general** . . . . . **A6–A7**
**Portaherramientas de torneado exterior** . . . . . **A8–A35**
**Portaherramientas de torneado interior: sistema de numeración de catálogo** . . . . . **A38–A39**
**Portaherramientas de mandrinado interior: información general** . . . . . **A40–A41**
**Portaherramientas de mandrinado interior** . . . . . **A42–A56**
**Portaherramientas en miniatura** . . . . . **A57–A59**
**Cartuchos: sistema de numeración de catálogo** . . . . . **A62–A63**
**Cartuchos: información general** . . . . . **A64–A65**
**Cartuchos** . . . . . **A66–A99**

# Herramientas de torneado exterior

Las modernas operaciones de mecanizado que se desarrollan en máquinas CNC y las plantas de producción flexibles necesitan herramientas de alto rendimiento de diseño sencillo y versatilidad de aplicación. WIDIA™ ofrece una amplia gama de portaherramientas para torneado exterior que cumple las demandas de producción más exigentes, abarcando piezas de trabajo con múltiples formas y tamaños.

Sean cuales sean las exigencias de su operación (desde cortes de acabado ligero con velocidades de corte muy elevadas hasta aplicaciones de desbaste pesado), habrá una solución WIDIA que satisfaga sus necesidades. El programa completo incluye portaherramientas con sujeción tipo pasador, tornillo o mordaza.

### Sistema de fijación M

- Fijación combinada pasador/cuña de apriete para plaquitas negativas.
- Un sistema de fijación extremadamente resistente, diseñado especialmente para cortes interrumpidos.
- Protegido por un apoyo de metal duro.

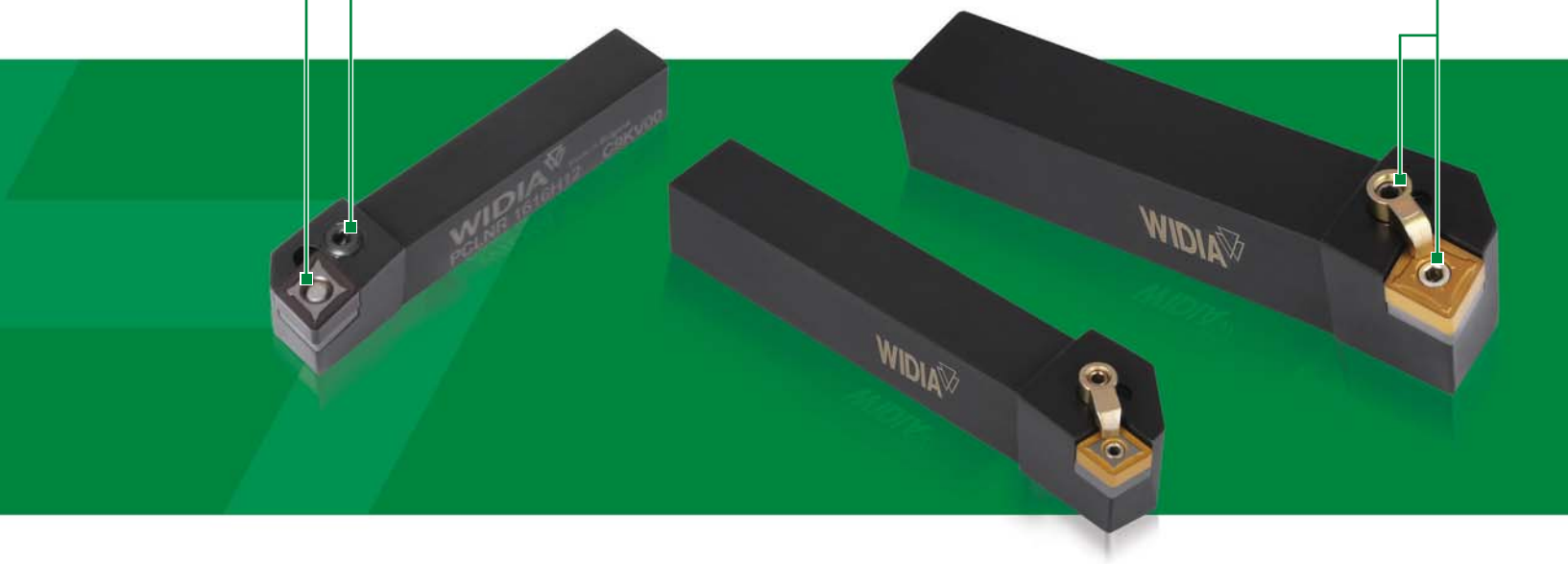
### Sistema de fijación P

- Sistema de fijación tipo palanca para plaquitas intercambiables negativas.
- Sin interferencias para el flujo de virutas.
- Rápidos cambios de plaquita.

Pasador de palanca para evitar interferencias en el flujo de virutas.

Bloqueo con amarre y pasador combinado para un rendimiento superior en aplicaciones difíciles.

Tornillo de pasador de palanca para un indexado rápido.




## Sistema de fijación S

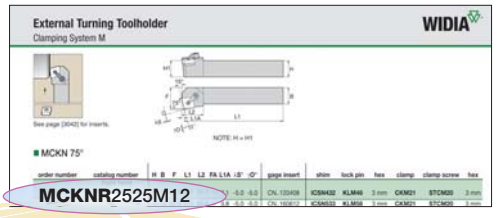
- Sistema de fijación por tornillo para plaquitas intercambiables positivas.
- Diseño compacto para una gran fiabilidad y rentabilidad.
- Apoyo de metal duro para mayor protección de la herramienta.

## Sistema de fijación C

- La fijación ajustable en altura permite el uso de rompevirutas adicionales.
- Sistema de fijación universal para plaquitas intercambiables positivas.
- Un diseño robusto que facilita su manejo.
- Apoyo de metal duro para una protección mucho mayor de la herramienta.

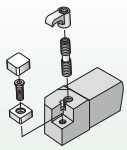
## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.



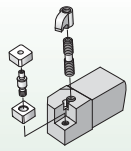

### M — Sistema de fijación de plaquitas

**C**



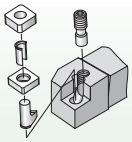
Fijación superior mediante brida para plaquitas sin orificio

**M**



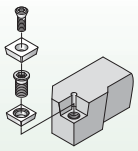
Fijación superior y de orificios para plaquitas con agujero

**P**



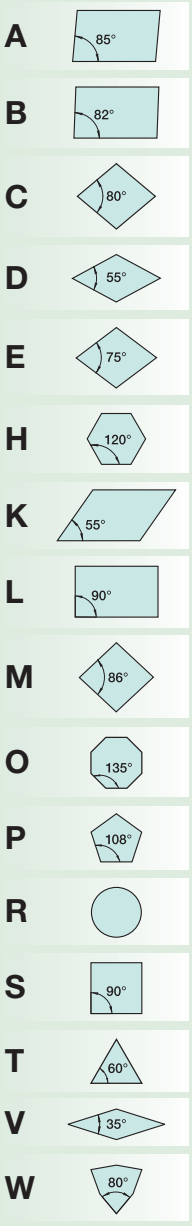
Fijación de plaquitas mediante palanca de ajuste para plaquita con orificio

**S**

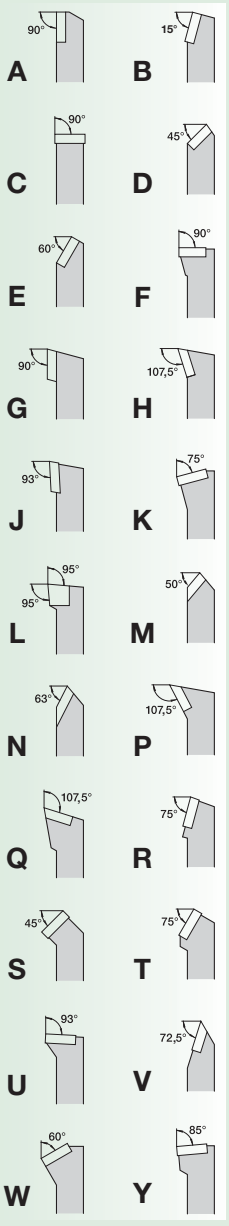


Fijación central mediante tornillo para plaquitas con orificio

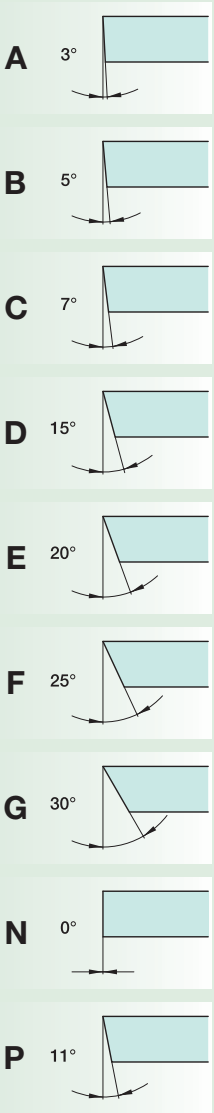
### C — Forma de la plaquita



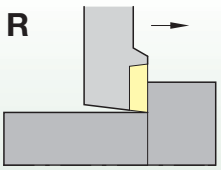

### K — Estilo de portaherramientas



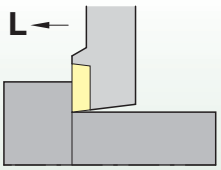

### N — Ángulo de incidencia de la plaquita



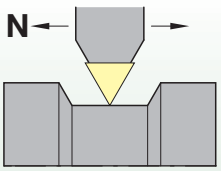

### R — Dirección de la herramienta



A derechas

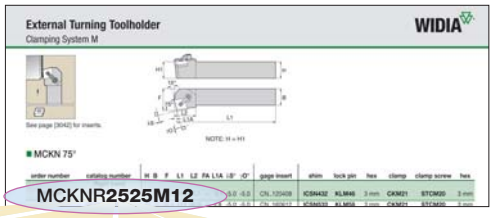


A izquierdas



Neutro

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*

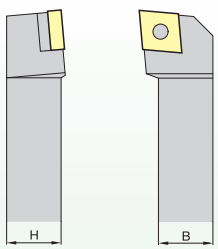



| | 25 25 | M | 12 | | | |
|---|---|---|---|---|---|---|
| Información adicional | Dimensiones del mango | Longitud de la herramienta | Tamaño de la plaquita Longitud del filo de corte L10 | Información adicional | Grosor de plaquita *(opcional)* |

**C** Alojamiento profundo para plaquita cerámica

**S** Alojamiento único en pared

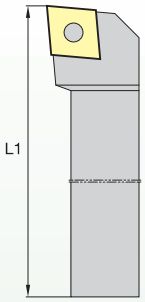
**F** Mango recto, sin compensación




Las posiciones séptima y octava serán un número de dos cifras significativo que indique la sección transversal del soporte.

- Si la dimensión para el ancho “B” o la altura “H” se representa con un número de una sola cifra, se utilizará un 0 (cero) enfrente.

Ejemplo: 8,0 mm = 08




| $l_1$ | ISO |
|---|---|
| 32 | A |
| 40 | B |
| 50 | C |
| 60 | D |
| 70 | E |
| 80 | F |
| 90 | G |
| 100 | H |
| 110 | J |
| 125 | K |
| 140 | L |
| 150 | M |
| 160 | N |
| 170 | P |
| 180 | Q |
| 200 | R |
| 250 | S |
| 300 | T |
| 350 | U |
| 400 | V |
| 450 | W |
| 500 | Y |
| Longitud especial | X |

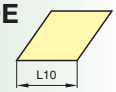
**H**


**O**

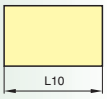

**P**

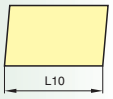

**S**


**T**


**C D E M V** 


**W**


**L** 


**A B K** 

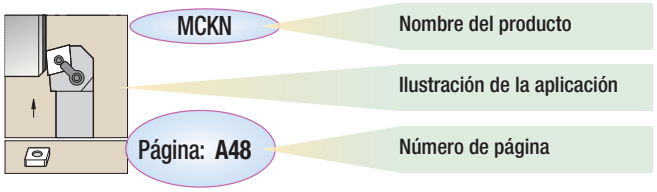

**R**


**M..**
MF, MN, MX, para plaquitas de PCBN y cerámicas

4,76 mm = 04

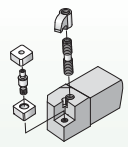
6,35 mm = 06

Cada sistema de fijación exclusivo ofrece distintos productos para satisfacer sus necesidades de portaherramientas específicas. Busque la ilustración que se ajuste a su aplicación y visite la página correspondiente para conseguir la solución correcta.

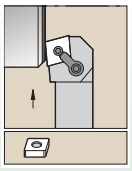


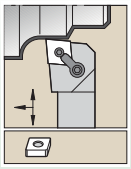

## Sistema de fijación M

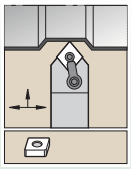
**M**

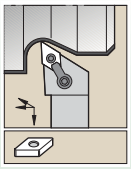


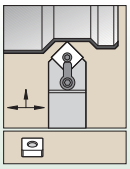
Pasador combinado/fijación de cuña para plaquitas negativas. Un sistema de fijación extremadamente resistente, diseñado especialmente para cortes interrumpidos. Un apoyo de metal duro protege a la herramienta.

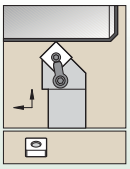

MCKN 75° Página: **A8**

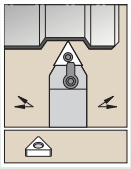

MCLN 95° Página: **A8**

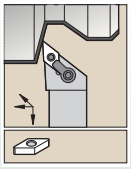

MCMN 50° Página: **A9**

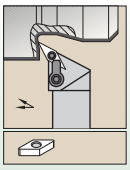

MDJN 93° Página: **A9**

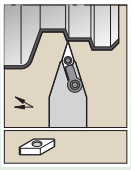

MSDN 45° Página: **A10**

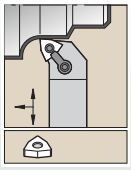

MSSN 45° Página: **A10**

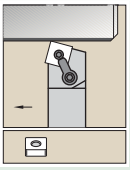

MTEN-S 60° Página: **A11**

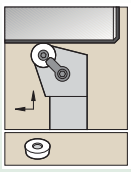

MVJN 93° Página: **A11**


MVON 117,5° Página: **A12**


MVVN 72,5° Página: **A12**

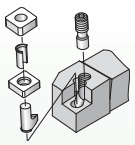

MWLN 95° Página: **A13**


MSBN 75° Página: **A13**

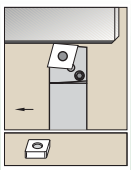

MRGN Página: **A14**

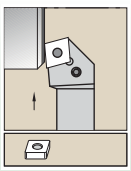
## Sistema de fijación P

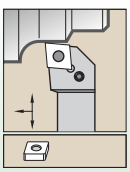
**P**

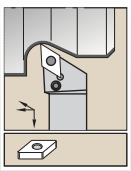


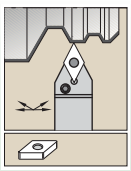
Un sistema de fijación tipo palanca para plaquitas intercambiables negativas con un orificio según el estándar DIN 4988 y plaquitas redondas positivas con un diámetro superior a los 20,0 mm. Las plaquitas con geometrías de control de virutas en una o dos caras tienen desprendimientos positivos de 6° a 18°. Las ventajas de este sistema son unos cambios rápidos de las plaquitas y la no interferencia con el flujo de virutas.

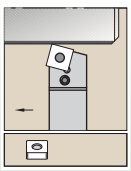

PCBN 75° Página: **A15**

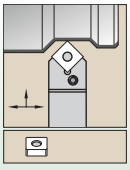

PCKN 75° Página: **A15**

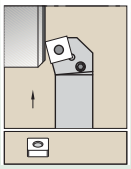

PCLN 95° Página: **A16**

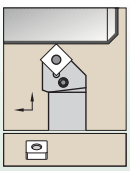

PDJN 93° Página: **A17**

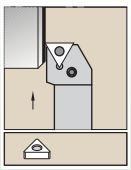

PDNN 62,5° Página: **A17**

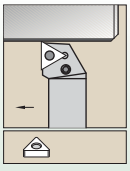

PSBN 75° Página: **A18**

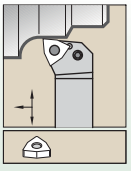

PSDN 45° Página: **A19**


PSKN 75° Página: **A19**


PSSN 45° Página: **A20**

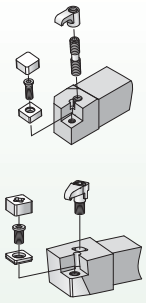

PTFN 90° Página: **A20**


PTGN 90° Página: **A21**

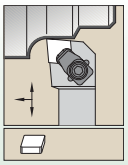

PWLN 95° Página: **A21**

## Sistema de fijación C

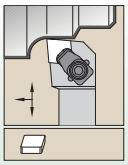
**C**



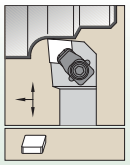
Sistema de fijación superior para plaquitas intercambiables negativas y positivas según el estándar DIN 4968. Este sistema de fijación universal es resistente y fácil de manejar. Algunas fijaciones ajustables en altura permiten el uso de rompevirutas adicionales. Un apoyo de metal duro ofrece una mayor protección a la herramienta. Portaherramientas con alturas de filo de corte ascendente de 16,0 mm y plaquitas con refrigeración interior mayores de 6,35 mm.



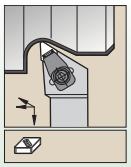
CCLN-MX
95°
Página: **A22**



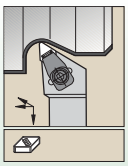
CCLN-MN
95°
Página: **A22**



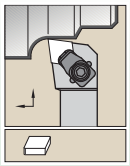
CCLN-MF
95°
Página: **A22**



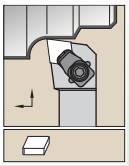
CDJN-MX
93°
Página: **A23**



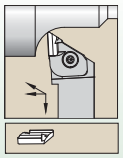
CDJN-MN
93°
Página: **A23**



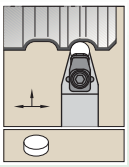
CELN-MF
97,5°
Página: **A23**



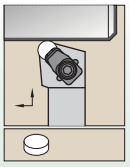
CELN-MN
97,5°
Página: **A24**



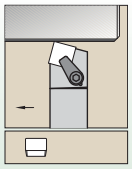
CKJN
Página: **A24**



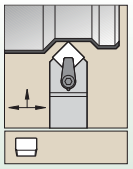
CRDN-MN
Página: **A24**



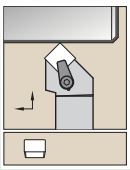
CRSN-MN
Página: **A25**



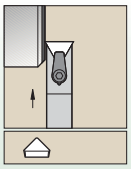
CSBP
75°
Página: **A25**



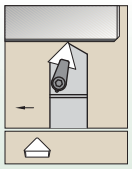
CSDP
45°
Página: **A26**



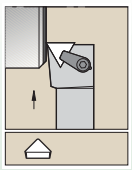
CSSP
45°
Página: **A26**



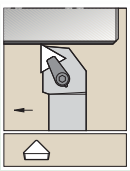
CTCPN
90°
Página: **A27**



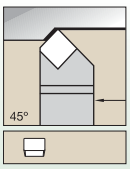
CTDP
45°
Página: **A27**



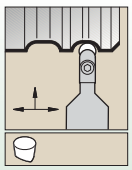
CTFP
90°
Página: **A28**



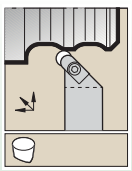
CTGP
90°
Página: **A28**




572-SCE
Página: **A29**



CRDP*
Página: **A30**

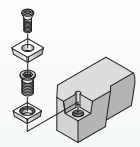


CRGP*
Página: **A30**

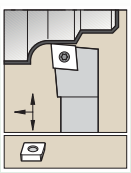
*No se muestra el sistema de fijación exacto.

## Sistema de fijación S

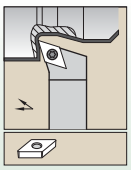
**S**



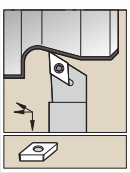
Sistema de fijación por tornillo para plaquitas intercambiables positivas con orificio avellanado según el estándar DIN 4967. Diseño compacto que emplea un mínimo de recambios para una gran fiabilidad y rentabilidad. Un apoyo de metal duro ofrece una mayor protección a la herramienta. Portaherramientas con alturas de filo de corte ascendente de 16,0 mm y plaquitas IC de 9,52 fijas mediante un casquillo roscado.



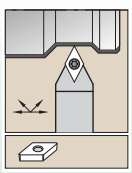
SCLC
95°
Página: **A31**



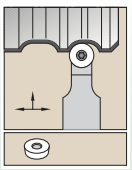
SDHC
107,5°
Página: **A31**



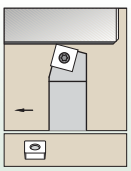
SDJC
93°
Página: **A32**



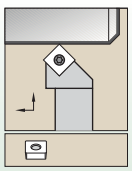
SDNC
62,5°
Página: **A32**



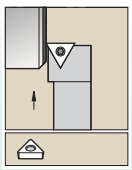
SRDC
Página: **A33**



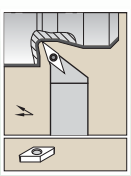
SSBC
75°
Página: **A33**



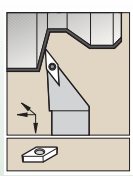
SSSC
45°
Página: **A34**



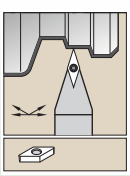
STFC
90°
Página: **A34**



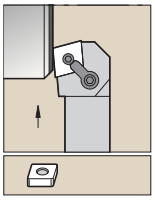
SVHB
107,5°
Página: **A35**



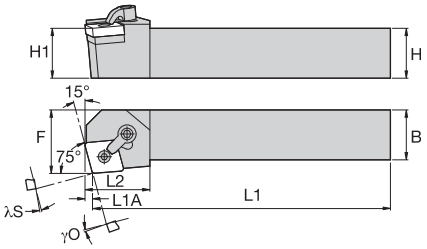
SVJB
93°
Página: **A35**



SVVB
72,5°
Página: **A35**



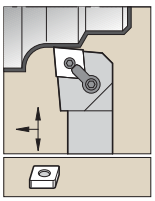
Consulte las plaquitas de las páginas B16 a B19, B46 y B72 a B73.



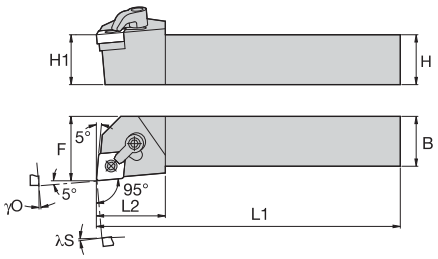

NOTA: H = H1

## ■ MCKN 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852705** | **MCKNR2525M12** | 25 | 25 | 32,3 | 151 | 35,1 | — | 3,1 | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852706** | **MCKNR3225P16** | 32 | 25 | 32,3 | 171 | 36,8 | — | 3,8 | -5.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852703** | **MCKNL2525M12** | 25 | 25 | 32,3 | 151 | 35,1 | — | 3,1 | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852704** | **MCKNL3225P16** | 32 | 25 | 32,3 | 171 | 36,8 | — | 3,8 | -5.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |



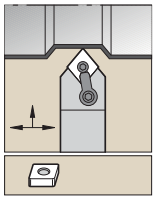
Consulte las plaquitas de las páginas B16 a B19, B46 y B72 a B73.



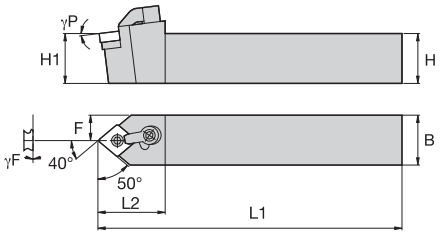

NOTA: H = H1

## ■ MCLN 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852716** | **MCLNR2020K12** | 20 | 20 | 25,3 | 126 | 32,0 | — | — | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852717** | **MCLNR2525M12** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852720** | **MCLNR3225P12** | 32 | 25 | 32,3 | 171 | 32,0 | — | — | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852718** | **MCLNR2525M16** | 25 | 25 | 32,3 | 151 | 33,0 | — | — | -5.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852721** | **MCLNR3225P16** | 25 | 25 | 32,3 | 171 | 33,0 | — | — | -5.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852719** | **MCLNR2525M19** | 25 | 25 | 32,3 | 151 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852722** | **MCLNR3225P19** | 32 | 25 | 32,3 | 171 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852723** | **MCLNR3232P19** | 32 | 32 | 40,3 | 171 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852724** | **MCLNR4040R19** | 40 | 40 | 50,3 | 201 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852707** | **MCLNL2020K12** | 20 | 20 | 25,3 | 126 | 32,0 | — | — | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852708** | **MCLNL2525M12** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852711** | **MCLNL3225P12** | 32 | 25 | 32,3 | 171 | 32,0 | — | — | -5.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852709** | **MCLNL2525M16** | 25 | 25 | 32,3 | 151 | 33,0 | — | — | -5.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852712** | **MCLNL3225P16** | 32 | 25 | 32,3 | 171 | 33,0 | — | — | -5.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852710** | **MCLNL2525M19** | 25 | 25 | 32,3 | 151 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852713** | **MCLNL3225P19** | 32 | 25 | 32,3 | 171 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852714** | **MCLNL3232P19** | 32 | 32 | 40,3 | 171 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852715** | **MCLNL4040R19** | 40 | 40 | 50,3 | 201 | 38,0 | — | — | -5.0 | -5.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |



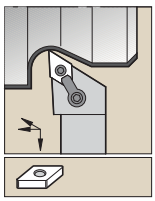
Consulte las plaquitas de las páginas B16 a B19, B46 y B72 a B73.



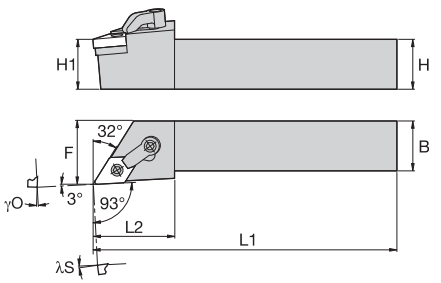

NOTA: H = H1

## MCMN 50°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3852725** | **MCMNN2020K12** | 20 | 20 | 9,8 | 126 | 32,0 | — | — | 0.0 | -7.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852726** | **MCMNN2525M12** | 25 | 25 | 12,3 | 151 | 32,0 | — | — | 0.0 | -7.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852727** | **MCMNN3225P16** | 32 | 25 | 12,3 | 171 | 38,0 | — | — | 0.0 | -7.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852728** | **MCMNN4040R19** | 40 | 40 | 19,8 | 201 | 42,0 | — | — | 0.0 | -7.0 | CN..190612 | **ICSN643** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |



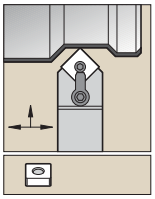
Consulte las plaquitas de las páginas B22 a B25, B52 y B76 a B78.



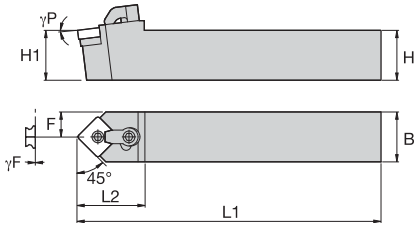

NOTA: H = H1

## MDJN 93°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852734** | **MDJNR2020K11** | 20 | 20 | 25,3 | 126 | 32,0 | — | — | -5.0 | -5.0 | DN..110408 | **IDSN332** | **KLM34L** | 2mm | **CKM7** | **STCM5** | 2.5mm |
| **3852736** | **MDJNR2525M11** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | DN..110408 | **IDSN332** | **KLM34L** | 2mm | **CKM7** | **STCM5** | 2.5mm |
| **3852735** | **MDJNR2020K15** | 20 | 20 | 25,3 | 126 | 36,0 | — | — | -5.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46L** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852737** | **MDJNR2525M15** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46L** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852738** | **MDJNR3225P15** | 32 | 25 | 32,3 | 171 | 32,0 | — | — | -5.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46L** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852729** | **MDJNL2020K11** | 20 | 20 | 25,3 | 126 | 32,0 | — | — | -5.0 | -5.0 | DN..110408 | **IDSN332** | **KLM34L** | 2mm | **CKM7** | **STCM5** | 2.5mm |
| **3852731** | **MDJNL2525M11** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | DN..110408 | **IDSN332** | **KLM34L** | 2mm | **CKM7** | **STCM5** | 2.5mm |
| **3852730** | **MDJNL2020K15** | 20 | 20 | 25,3 | 126 | 36,0 | — | — | -5.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46L** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852732** | **MDJNL2525M15** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46L** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852733** | **MDJNL3225P15** | 32 | 25 | 32,3 | 171 | 32,0 | — | — | -5.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46L** | 2.5mm | **CKM22** | **STCM20** | 3mm |



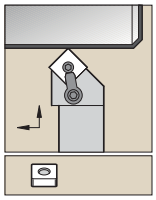
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



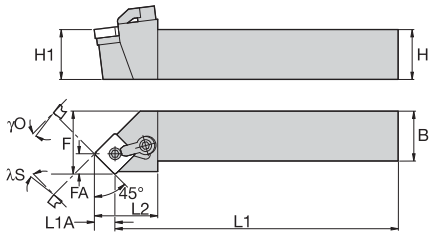

NOTA: H = H1

## MSDN 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3852739** | **MSDNN2020K12** | 20 | 20 | 9,8 | 126 | 32,0 | 0.0 | -7.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852740** | **MSDNN2525M12** | 25 | 25 | 12,3 | 151 | 32,0 | 0.0 | -7.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852742** | **MSDNN3225P12** | 32 | 25 | 12,3 | 171 | 32,0 | 0.0 | -7.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852741** | **MSDNN2525M15** | 25 | 25 | 12,3 | 151 | 35,0 | 0.0 | -7.0 | SN..150412 | **ISSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852743** | **MSDNN3232P19** | 32 | 32 | 15,8 | 171 | 42,0 | 0.0 | -7.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |



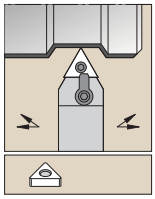
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



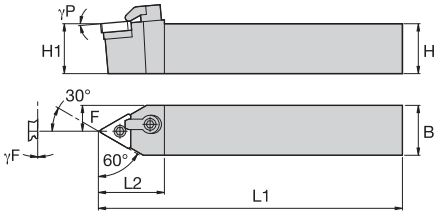

NOTA: H = H1

## MSSN 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852747** | **MSSNR2020K12** | 20 | 20 | 16,6 | 126 | 32,0 | 8,7 | 8,3 | 0.0 | -8.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852748** | **MSSNR2525M12** | 25 | 25 | 23,6 | 151 | 32,0 | 8,7 | 8,3 | 0.0 | -8.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852749** | **MSSNR3232P19** | 32 | 32 | 27,3 | 171 | 40,0 | 13,0 | 12,5 | 0.0 | -8.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852744** | **MSSNL2020K12** | 20 | 20 | 16,6 | 126 | 32,0 | 8,7 | 8,3 | 0.0 | -8.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852745** | **MSSNL2525M12** | 25 | 25 | 23,6 | 151 | 32,0 | 8,7 | 8,3 | 0.0 | -8.0 | SN..120408 | **ISSN432** | **KLM46** | 3mm | **CKM21** | **STCM20** | 2.5mm |
| **3852746** | **MSSNL3232P19** | 32 | 32 | 27,3 | 171 | 40,0 | 13,0 | 12,5 | 0.0 | -8.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |



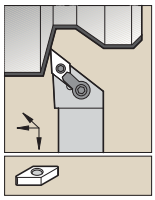
Consulte las plaquitas de las páginas B36 a B39, B58 y B83.



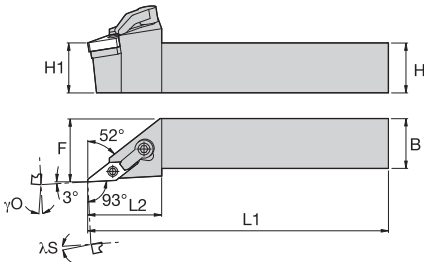

NOTA: H = H1

## MTEN-S 60°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3852750** | **MTENNS2020K16** | 20 | 20 | 10,0 | 126 | 32,0 | 0.0 | -10.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852751** | **MTENNS2525M16** | 25 | 25 | 12,0 | 151 | 32,0 | 0.0 | -10.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852752** | **MTENNS2525M22** | 25 | 25 | 12,0 | 151 | 35,0 | 0.0 | -10.0 | TN..220408 | **ITSN433** | **KLM46** | 2.5mm | **CKM9** | **STCM4** | 4mm |
| **3852753** | **MTENNS3225P22** | 32 | 25 | 12,0 | 171 | 35,0 | 0.0 | -10.0 | TN..220408 | **ITSN433** | **KLM46** | 2.5mm | **CKM9** | **STCM4** | 4mm |



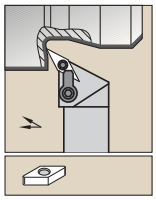
Consulte las plaquitas de las páginas B43, B59 y B86.



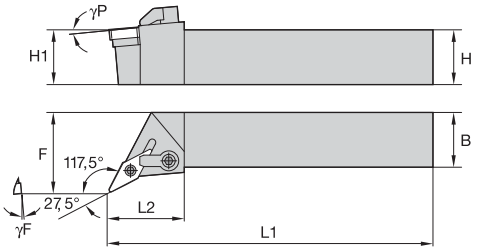

NOTA: H = H1

## MVJN 93°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852758** | **MVJNR2020K16** | 20 | 20 | 25,3 | 126 | 37,0 | — | — | -9.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852759** | **MVJNR2525M16** | 25 | 25 | 32,3 | 151 | 37,0 | — | — | -9.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852760** | **MVJNR3225P16** | 32 | 25 | 32,3 | 171 | 37,0 | — | — | -9.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852761** | **MVJNR3225P22** | 32 | 25 | 32,3 | 171 | 50,0 | — | — | -9.0 | -5.0 | VN..220408 | **IVSN432** | **KLM46** | 2.5mm | **CKM26** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852754** | **MVJNL2020K16** | 20 | 20 | 25,3 | 126 | 37,0 | — | — | -9.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852755** | **MVJNL2525M16** | 25 | 25 | 32,3 | 151 | 37,0 | — | — | -9.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852756** | **MVJNL3225P16** | 32 | 25 | 32,3 | 171 | 37,0 | — | — | -9.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852757** | **MVJNL3225P22** | 32 | 25 | 32,3 | 171 | 50,0 | — | — | -9.0 | -5.0 | VN..220408 | **IVSN432** | **KLM46** | 2.5mm | **CKM26** | **STCM4** | 4mm |



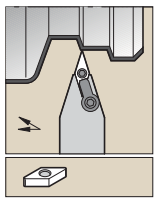
Consulte las plaquitas de las páginas B43, B59 y B86.



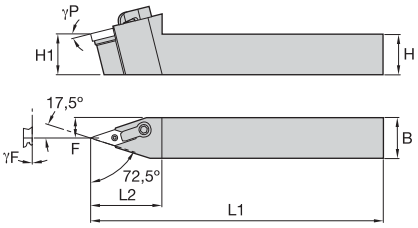

NOTA: H = H1

## MVON 117,5°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852763** | **MVONR2525M16** | 25 | 25 | 32,3 | 151 | 30,0 | — | — | -6.4 | -6.4 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM6** | **STCM5** | 2.5mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852762** | **MVONL2525M16** | 25 | 25 | 32,3 | 151 | 30,0 | — | — | -6.4 | -6.4 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM6** | **STCM5** | 2.5mm |



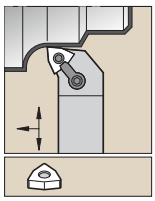
Consulte las plaquitas de las páginas B43, B59 y B86.



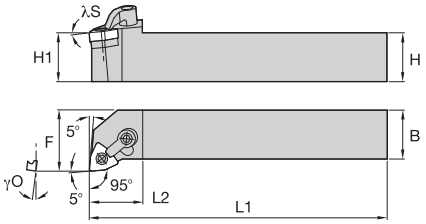

NOTA: H = H1

## MVVN 72,5°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3852764** | **MVVNN2020K16** | 20 | 20 | 10,0 | 125 | 42,0 | — | — | 0.0 | -14.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852765** | **MVVNN2525M16** | 25 | 25 | 12,5 | 150 | 42,0 | — | — | 0.0 | -14.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852766** | **MVVNN3225P16** | 32 | 25 | 12,5 | 170 | 42,0 | — | — | 0.0 | -14.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |



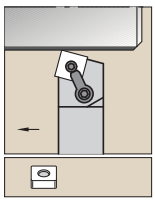
Consulte las plaquitas de las páginas B43 a B45, B59 y B87.



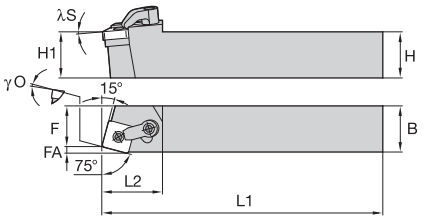

NOTA: H = H1

## MWLN 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3852769** | **MWLNR2020K06** | 20 | 20 | 25,3 | 126 | 25,0 | -5.0 | -5.0 | WN..060408 | **IWSN322** | **KLM34L** | 2.5mm | **CKM6** | **STCM5** | 2mm |
| **3852770** | **MWLNR2525M06** | 25 | 25 | 32,3 | 151 | 25,0 | -5.0 | -5.0 | WN..060408 | **IWSN322** | **KLM34L** | 2.5mm | **CKM6** | **STCM5** | 2mm |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3852767** | **MWLNL2020K06** | 20 | 20 | 25,3 | 126 | 25,0 | -5.0 | -5.0 | WN..060408 | **IWSN322** | **KLM34L** | 2.5mm | **CKM6** | **STCM5** | 2mm |
| **3852768** | **MWLNL2525M06** | 25 | 25 | 32,3 | 151 | 25,0 | -5.0 | -5.0 | WN..060408 | **IWSN322** | **KLM34L** | 2.5mm | **CKM6** | **STCM5** | 2mm |



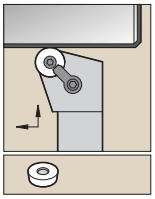
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



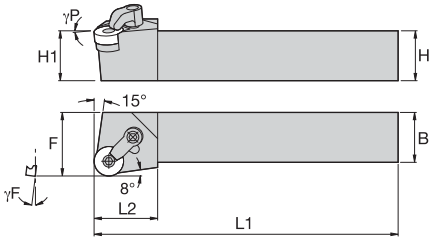

NOTA: H = H1

## MSBN 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3852771** | **MSBNR2020K12** | 20 | 20 | 17,3 | 126 | 32,0 | 3,1 | -5.0 | -5.0 | SN..120408 | **ISSN433** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852773** | **MSBNR2525M12** | 25 | 25 | 22,3 | 151 | 32,0 | 3,1 | -5.0 | -5.0 | SN..120408 | **ISSN433** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852775** | **MSBNR3225P12** | 32 | 25 | 22,3 | 171 | 32,0 | 3,1 | -5.0 | -5.0 | SN..120408 | **ISSN433** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852777** | **MSBNR3232P15** | 32 | 32 | 27,3 | 171 | 35,0 | 3,8 | -5.0 | -5.0 | SN..150612 | **ISSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852779** | **MSBNR3232P19** | 32 | 32 | 27,3 | 171 | 40,0 | 4,6 | -5.0 | -5.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852781** | **MSBNR4040R19** | 40 | 40 | 35,3 | 201 | 40,0 | 4,6 | -5.0 | -5.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3852772** | **MSBNL2020K12** | 20 | 20 | 17,3 | 126 | 32,0 | 3,1 | -5.0 | -5.0 | SN..120408 | **ISSN433** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852774** | **MSBNL2525M12** | 25 | 25 | 22,3 | 151 | 32,0 | 3,1 | -5.0 | -5.0 | SN..120408 | **ISSN433** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852776** | **MSBNL3225P12** | 32 | 25 | 22,3 | 171 | 32,0 | 3,1 | -5.0 | -5.0 | SN..120408 | **ISSN433** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| **3852778** | **MSBNL3232P15** | 32 | 32 | 27,3 | 171 | 35,0 | 3,8 | -5.0 | -5.0 | SN..150612 | **ISSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852780** | **MSBNL3232P19** | 32 | 32 | 27,3 | 171 | 40,0 | 4,6 | -5.0 | -5.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| **3852782** | **MSBNL4040R19** | 40 | 40 | 35,3 | 201 | 40,0 | 4,6 | -5.0 | -5.0 | SN..190612 | **ISSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |



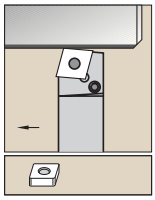
Consulte las plaquitas de la página B28.



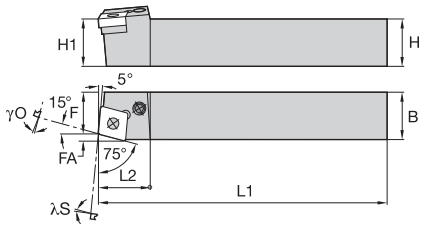

## MRGN

NOTA: H = H1

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3852784** | **MRGNR2525M12** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | RN..120400 | **IRSN43** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3852783** | **MRGNL2525M12** | 25 | 25 | 32,3 | 151 | 32,0 | — | — | -5.0 | -5.0 | RN..120400 | **IRSN43** | **KLM46** | 2.5mm | **CKM21** | **STCM20** | 3mm |



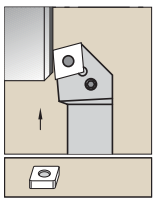
Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.



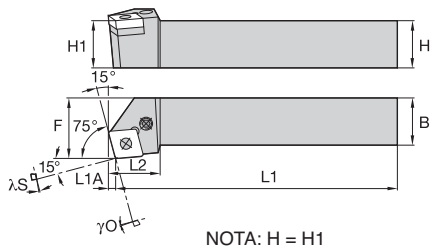

NOTA: H = H1

## PCBN 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3878361** | **PCBNR2020K12** | 20 | 20 | 17,0 | 125 | 26,0 | 3,1 | — | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878356** | **PCBNR2525M12** | 25 | 25 | 22,0 | 150 | 26,0 | 3,1 | — | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878366** | **PCBNR2525M16** | 25 | 25 | 22,0 | 150 | 26,0 | 4,2 | — | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878367** | **PCBNR3225P16** | 32 | 25 | 22,0 | 170 | 28,0 | 4,2 | — | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878363** | **PCBNR3232P16** | 32 | 32 | 27,0 | 170 | 38,0 | 4,2 | — | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878358** | **PCBNR3232P19** | 32 | 32 | 27,0 | 170 | 40,0 | 4,6 | — | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878364** | **PCBNR4040S19** | 40 | 40 | 35,0 | 250 | 38,0 | 4,6 | — | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3878360** | **PCBNL2020K12** | 20 | 20 | 17,0 | 125 | 26,0 | 3,1 | — | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878354** | **PCBNL2525M12** | 25 | 25 | 22,0 | 150 | 26,0 | 3,1 | — | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878365** | **PCBNL2525M16** | 25 | 25 | 22,0 | 150 | 26,0 | 4,2 | — | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878359** | **PCBNL3225P16** | 32 | 25 | 22,0 | 170 | 28,0 | 4,2 | — | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878355** | **PCBNL3232P16** | 32 | 32 | 27,0 | 170 | 38,0 | 4,2 | — | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878357** | **PCBNL3232P19** | 32 | 32 | 27,0 | 170 | 40,0 | 4,6 | — | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878362** | **PCBNL4040S19** | 40 | 40 | 35,0 | 250 | 38,0 | 4,6 | — | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |



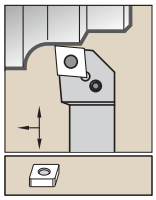
Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.



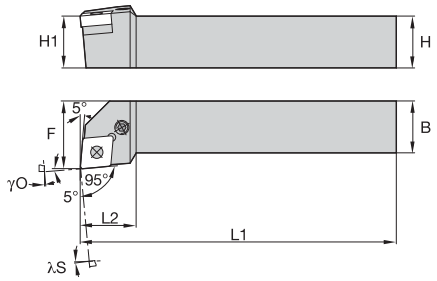

NOTA: H = H1

## PCKN 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3878372** | **PCKNR2020K12** | 20 | 20 | 25,0 | 125 | 23,0 | — | 3,1 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878370** | **PCKNR2525M12** | 25 | 25 | 32,0 | 150 | 23,0 | — | 3,1 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878374** | **PCKNR2525M16** | 25 | 25 | 32,0 | 150 | 30,0 | — | 3,8 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878375** | **PCKNR3225P16** | 32 | 25 | 32,0 | 170 | 30,0 | — | 3,8 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3899889** | **PCKNR3232P16** | 32 | 32 | 40,0 | 170 | 38,0 | — | 3,8 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878371** | **PCKNR3232P19** | 32 | 32 | 40,0 | 170 | 40,0 | — | 4,6 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879707** | **PCKNR4040S19** | 40 | 40 | 50,0 | 250 | 36,0 | — | 4,6 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3878373** | **PCKNL2020K12** | 20 | 20 | 25,0 | 125 | 23,0 | — | 3,1 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878369** | **PCKNL2525M12** | 25 | 25 | 32,0 | 150 | 23,0 | — | 3,1 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878377** | **PCKNL2525M16** | 25 | 25 | 32,0 | 150 | 30,0 | — | 3,8 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878376** | **PCKNL3225P16** | 32 | 25 | 32,0 | 170 | 30,0 | — | 3,8 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3899888** | **PCKNL3232P16** | 32 | 32 | 40,0 | 170 | 38,0 | — | 3,8 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878368** | **PCKNL3232P19** | 32 | 32 | 40,0 | 170 | 40,0 | — | 4,6 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878378** | **PCKNL4040S19** | 40 | 40 | 50,0 | 250 | 36,0 | — | 4,6 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |



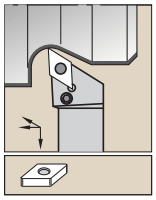
Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.



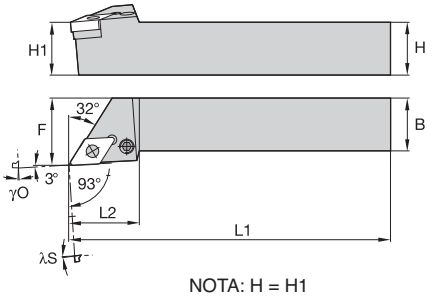

NOTA: H = H1

## ■ PCLN 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3900154** | **PCLNR1616H09** | 16 | 16 | 20,0 | 100 | 23,0 | -6.0 | -6.0 | CN..090308 | **512.111** | **513.019** | **515.018** | **511.018** | **514.018** | 15 IP |
| **3878400** | **PCLNR1616H12** | 16 | 16 | 20,0 | 100 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878422** | **PCLNR2020K12** | 20 | 20 | 25,0 | 125 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878419** | **PCLNR2525M12** | 25 | 25 | 32,0 | 150 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878402** | **PCLNR3225P12** | 32 | 25 | 32,0 | 170 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878401** | **PCLNR2525M16** | 25 | 25 | 32,0 | 150 | 28,0 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878421** | **PCLNR3225P16** | 32 | 25 | 32,0 | 170 | 38,0 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878396** | **PCLNR3232P16** | 32 | 32 | 40,0 | 170 | 36,0 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878413** | **PCLNR3225P19** | 32 | 25 | 32,0 | 170 | 38,0 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878414** | **PCLNR3232P19** | 32 | 32 | 40,0 | 170 | 36,0 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878417** | **PCLNR4040S19** | 40 | 40 | 50,0 | 250 | 36,0 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3900153** | **PCLNL1616H09** | 16 | 16 | 20,0 | 100 | 23,0 | -6.0 | -6.0 | CN..090308 | **512.111** | **513.019** | **515.018** | **511.018** | **514.018** | 15 IP |
| **3878379** | **PCLNL1616H12** | 16 | 16 | 20,0 | 100 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878418** | **PCLNL2020K12** | 20 | 20 | 25,0 | 125 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878398** | **PCLNL2525M12** | 25 | 25 | 32,0 | 150 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878397** | **PCLNL3225P12** | 32 | 25 | 32,0 | 170 | 26,0 | -6.0 | -6.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3878380** | **PCLNL2525M16** | 25 | 25 | 32,0 | 150 | 28,0 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878399** | **PCLNL3225P16** | 32 | 25 | 32,0 | 170 | 38,0 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878415** | **PCLNL3232P16** | 32 | 32 | 40,0 | 170 | 36,0 | -6.0 | -6.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3878381** | **PCLNL3225P19** | 32 | 25 | 32,0 | 170 | 38,0 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878393** | **PCLNL3232P19** | 32 | 32 | 40,0 | 170 | 36,0 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3878416** | **PCLNL4040S19** | 40 | 40 | 50,0 | 250 | 36,0 | -6.0 | -6.0 | CN..190612 | **512.123** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |



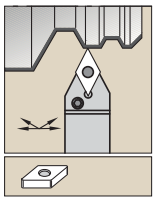
Consulte las plaquitas de las páginas B22 a B25, B52 y B76 a B78.



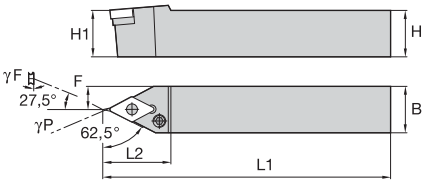

NOTA: H = H1

## PDJN 93°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3878424** | **PDJNR1616H11** | 16 | 16 | 20,0 | 100 | 22,0 | -6.0 | -6.0 | DN..110408 | **512.060** | **513.060** | **515.018** | **511.060** | **514.118** | 10 IP |
| **3878429** | **PDJNR2020K11** | 20 | 20 | 25,0 | 125 | 30,0 | -7.0 | -6.0 | DN..110408 | **512.060** | **513.060** | **515.018** | **511.060** | **514.118** | 10 IP |
| **3879151** | **PDJNR2525M11** | 25 | 25 | 32,0 | 150 | 30,0 | -7.0 | -6.0 | DN..110408 | **512.060** | **513.060** | **515.018** | **511.060** | **514.118** | 10 IP |
| **3879318** | **PDJNR2020K15** | 20 | 20 | 25,0 | 125 | 36,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3878425** | **PDJNR3225P15** | 32 | 25 | 32,0 | 170 | 38,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3879152** | **PDJNR3232P15** | 32 | 32 | 40,0 | 170 | 38,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3878426** | **PDJNR4025R15** | 40 | 25 | 32,0 | 200 | 38,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3879313** | **PDJNL1616H11** | 16 | 16 | 20,0 | 100 | 22,0 | -6.0 | -6.0 | DN..110408 | **512.060** | **513.060** | **515.018** | **511.060** | **514.118** | 10 IP |
| **3878427** | **PDJNL2020K11** | 20 | 20 | 25,0 | 125 | 30,0 | -7.0 | -6.0 | DN..110408 | **512.060** | **513.060** | **515.018** | **511.060** | **514.118** | 10 IP |
| **3878428** | **PDJNL2525M11** | 25 | 25 | 32,0 | 150 | 30,0 | -7.0 | -6.0 | DN..110408 | **512.060** | **513.060** | **515.018** | **511.060** | **514.118** | 10 IP |
| **3879317** | **PDJNL2020K15** | 20 | 20 | 25,0 | 125 | 36,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3879314** | **PDJNL2525M15** | 25 | 25 | 32,0 | 150 | 36,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3878423** | **PDJNL3225P15** | 32 | 25 | 32,0 | 170 | 38,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3879315** | **PDJNL3232P15** | 32 | 32 | 40,0 | 170 | 38,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3879316** | **PDJNL4025R15** | 40 | 25 | 32,0 | 200 | 38,0 | -7.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |



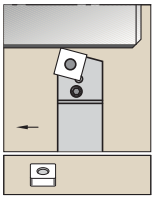
Consulte las plaquitas de las páginas B22 a B25, B52 y B76 a B78.



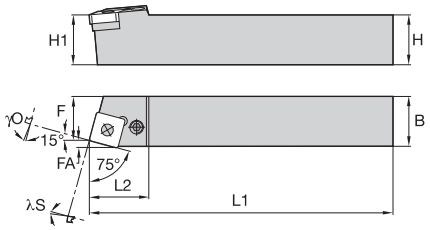

NOTA: H = H1

## PDNN 62,5°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879319** | **PDNNR2525M15** | 25 | 25 | 12,5 | 150 | 36,0 | — | — | -6.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3900156** | **PDNNR3225P15** | 32 | 25 | 12,5 | 170 | 36,0 | — | — | -6.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3879322** | **PDNNR4025M15** | 40 | 25 | 12,5 | 150 | 36,0 | — | — | -6.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879320** | **PDNNL2525M15** | 25 | 25 | 12,5 | 150 | 36,0 | — | — | -6.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3900155** | **PDNNL3225P15** | 32 | 25 | 12,5 | 170 | 36,0 | — | — | -6.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |
| **3879321** | **PDNNL4025M15** | 40 | 25 | 12,5 | 150 | 36,0 | — | — | -6.0 | -6.0 | DN..150608 | **512.153** | **513.023** | **515.018** | **511.024** | **514.128** | 15 IP |



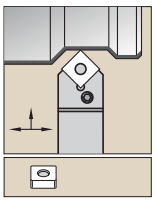
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



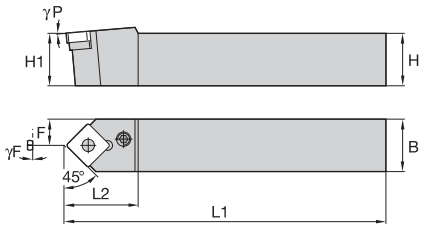

NOTA: H = H1

## PSBN 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879324** | **PSBNR2020K12** | 20 | 20 | 17,0 | 125 | 26,0 | 3,1 | — | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900158** | **PSBNR2525M12** | 25 | 25 | 22,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879333** | **PSBNR2525M15** | 25 | 25 | 22,0 | 150 | 36,0 | 3,8 | — | -6.0 | -6.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879330** | **PSBNR3232P15** | 32 | 32 | 27,0 | 170 | 33,0 | 3,8 | — | -6.0 | -6.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879327** | **PSBNR3232P19** | 32 | 32 | 27,0 | 170 | 40,0 | 4,6 | — | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879334** | **PSBNR4040S19** | 40 | 40 | 35,0 | 250 | 38,0 | 4,6 | — | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879331** | **PSBNR4040S25** | 40 | 40 | 35,0 | 250 | 47,0 | 5,9 | — | -6.0 | -6.0 | SN..250724 | **512.092** | **513.038** | **515.028** | **511.038** | **514.138** | 30 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879325** | **PSBNL2020K12** | 20 | 20 | 17,0 | 125 | 26,0 | 3,1 | — | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900157** | **PSBNL2525M12** | 25 | 25 | 22,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879329** | **PSBNL2525M15** | 25 | 25 | 22,0 | 150 | 36,0 | 3,8 | — | -6.0 | -6.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879332** | **PSBNL3232P15** | 32 | 32 | 27,0 | 170 | 33,0 | 3,8 | — | -6.0 | -6.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879328** | **PSBNL3232P19** | 32 | 32 | 27,0 | 170 | 40,0 | 4,6 | — | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879323** | **PSBNL4040S19** | 40 | 40 | 35,0 | 250 | 38,0 | 4,6 | — | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879326** | **PSBNL4040S25** | 40 | 40 | 35,0 | 250 | 47,0 | 5,9 | — | -6.0 | -6.0 | SN..250724 | **512.092** | **513.038** | **515.028** | **511.038** | **514.138** | 30 IP |
| **3900159** | **PSBNL5050T25** | 50 | 50 | 43,0 | 300 | 50,0 | — | — | -6.0 | -6.0 | SN..250724 | **512.092** | **513.038** | **515.028** | **511.038** | **514.138** | 30 IP |



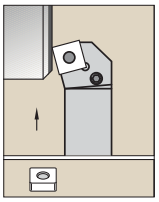
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



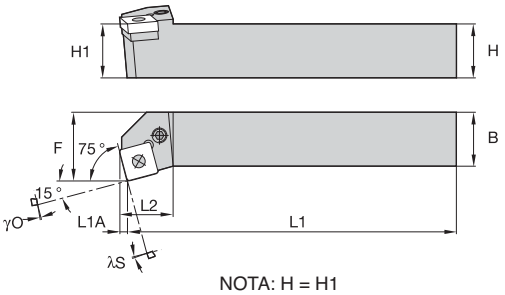

NOTA: H = H1

## PSDN 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3879336** | **PSDNN1616H09** | 16 | 16 | 8,0 | 100 | 20,0 | — | — | 0.0 | -7.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879335** | **PSDNN2020K12** | 20 | 20 | 10,0 | 125 | 26,0 | — | — | 0.0 | -7.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879337** | **PSDNN2525M12** | 25 | 25 | 12,5 | 150 | 26,0 | — | — | 0.0 | -7.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900160** | **PSDNN3225P15** | 32 | 25 | 12,5 | 170 | 33,0 | — | — | 0.0 | -7.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3900161** | **PSDNN3232P15** | 32 | 32 | 16,0 | 170 | 33,0 | — | — | 0.0 | -7.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879338** | **PSDNN4040S25** | 40 | 40 | 20,0 | 250 | 47,0 | — | — | 0.0 | -7.0 | SN..250724 | **512.092** | **513.038** | **515.028** | **511.038** | **514.138** | 30 IP |



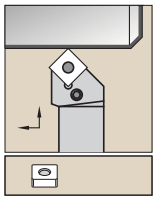
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



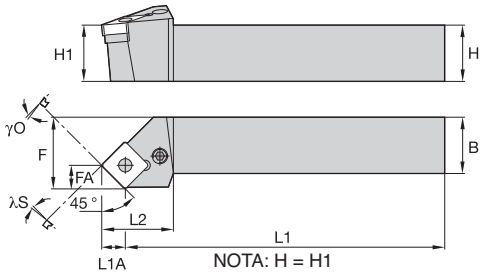

NOTA: H = H1

## PSKN 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879346** | **PSKNR1616H09** | 16 | 16 | 20,0 | 100 | 20 | — | 2,2 | -6.0 | -6.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879340** | **PSKNR2020K12** | 20 | 20 | 25,0 | 125 | 23 | — | 3,1 | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879341** | **PSKNR2525M12** | 25 | 25 | 32,0 | 150 | 23 | — | 3,1 | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879708** | **PSKNR2525M15** | 25 | 25 | 32,0 | 150 | 32 | — | 3,8 | -6.0 | -6.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879342** | **PSKNR3232P19** | 32 | 32 | 40,0 | 170 | 38 | — | 4,6 | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879710** | **PSKNR4040S19** | 40 | 40 | 50,0 | 250 | 38 | — | 4,6 | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879709** | **PSKNL1616H09** | 16 | 16 | 20,0 | 100 | 20 | — | 2,2 | -6.0 | -6.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879343** | **PSKNL2020K12** | 20 | 20 | 25,0 | 125 | 23 | — | 3,1 | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879339** | **PSKNL2525M12** | 25 | 25 | 32,0 | 150 | 23 | — | 3,1 | -6.0 | -6.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879344** | **PSKNL3232P19** | 32 | 32 | 40,0 | 170 | 38 | — | 4,6 | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879345** | **PSKNL4040S19** | 40 | 40 | 50,0 | 250 | 38 | — | 4,6 | -6.0 | -6.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |



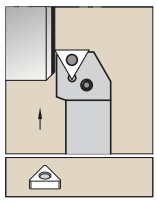
Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.



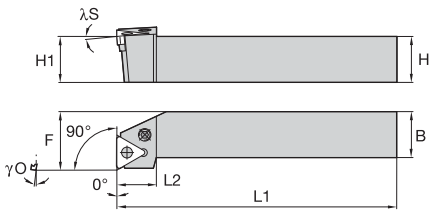

NOTA: H = H1

## PSSN 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879351** | **PSSNR1616H09** | 16 | 16 | 20,0 | 100 | 23,0 | 6,1 | 6,1 | 0.0 | -8.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879359** | **PSSNR2020K09** | 20 | 20 | 25,0 | 125 | 26,0 | 6,1 | 6,1 | 0.0 | -8.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879348** | **PSSNR2020K12** | 20 | 20 | 25,0 | 125 | 28,0 | 8,3 | 8,3 | 0.0 | -8.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879352** | **PSSNR2525M12** | 25 | 25 | 32,0 | 150 | 28,0 | 8,3 | 8,3 | 0.0 | -8.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879360** | **PSSNR3225P12** | 32 | 25 | 32,0 | 170 | 29,0 | 8,3 | 8,3 | 0.0 | -8.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879349** | **PSSNR2525M15** | 25 | 25 | 32,0 | 150 | 32,0 | 10,2 | 10,2 | 0.0 | -8.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879362** | **PSSNR3225P15** | 32 | 25 | 32,0 | 170 | 32,0 | 10,2 | 10,2 | 0.0 | -8.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879354** | **PSSNR3232P15** | 32 | 32 | 40,0 | 170 | 32,0 | 10,2 | 10,2 | 0.0 | -8.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879350** | **PSSNR3232P19** | 32 | 32 | 40,0 | 170 | 37,5 | 12,5 | 12,5 | 0.0 | -8.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879361** | **PSSNR4040S19** | 40 | 40 | 50,0 | 250 | 37,5 | 12,5 | 12,5 | 0.0 | -8.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879363** | **PSSNL1616H09** | 16 | 16 | 20,0 | 100 | 23,0 | 6,1 | 6,1 | 0.0 | -8.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879844** | **PSSNL2020K09** | 20 | 20 | 25,0 | 125 | 26,0 | 6,1 | 6,1 | 0.0 | -8.0 | SN..090308 | **512.053** | **513.019** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879347** | **PSSNL2020K12** | 20 | 20 | 25,0 | 125 | 28,0 | 8,3 | 8,3 | 0.0 | -8.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879353** | **PSSNL2525M12** | 25 | 25 | 32,0 | 150 | 28,0 | 8,3 | 8,3 | 0.0 | -8.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879358** | **PSSNL3225P12** | 32 | 25 | 32,0 | 170 | 29,0 | 8,3 | 8,3 | 0.0 | -8.0 | SN..120408 | **512.063** | **513.023** | **515.018** | **511.023** | | 15 IP |
| **3879355** | **PSSNL2525M15** | 25 | 25 | 32,0 | 150 | 32,0 | 10,2 | 10,2 | 0.0 | -8.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879843** | **PSSNL3225P15** | 32 | 25 | 32,0 | 170 | 32,0 | 10,2 | 10,2 | 0.0 | -8.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879712** | **PSSNL3232P15** | 32 | 32 | 40,0 | 170 | 32,0 | 10,2 | 10,2 | 0.0 | -8.0 | SN..150612 | **512.025** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| **3879356** | **PSSNL3232P19** | 32 | 32 | 40,0 | 170 | 37,5 | 12,5 | 12,5 | 0.0 | -8.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879357** | **PSSNL4040S19** | 40 | 40 | 50,0 | 250 | 37,5 | 12,5 | 12,5 | 0.0 | -8.0 | SN..190612 | **512.083** | **513.033** | **515.022** | **511.033** | **514.133** | 25 IP |
| **3879711** | **PSSNL4040S25** | 40 | 40 | 50,0 | 250 | 50,0 | 16,0 | 16,0 | 0.0 | -8.0 | SN..250724 | **512.092** | **513.038** | **515.028** | **511.038** | **514.138** | 30 IP |



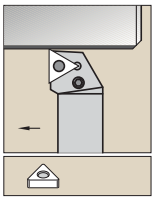
Consulte las plaquitas de las páginas B36 a B39, B58 y B83.



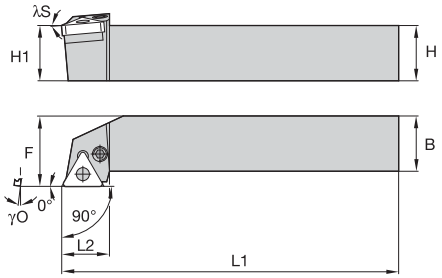

NOTA: H = H1

## PTFN 90°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879369** | **PTFNR1616H16** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879367** | **PTFNR2020K16** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879364** | **PTFNR2525M16** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879372** | **PTFNR2525M22** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879370** | **PTFNR3225P22** | 32 | 25 | 32,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879845** | **PTFNR3232P22** | 32 | 32 | 40,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879365** | **PTFNL1616H16** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879366** | **PTFNL2020K16** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879368** | **PTFNL2525M16** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879371** | **PTFNL2525M22** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |



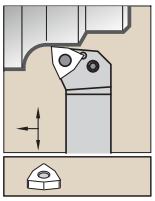
Consulte las plaquitas de las páginas B36 a B39, B58 y B83.



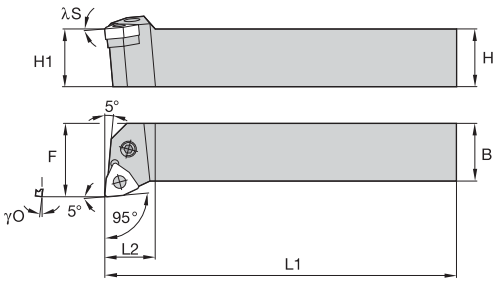

NOTA: H = H1

## ■ PTGN 90°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879385** | **PTGNR1616H16** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879389** | **PTGNR2020K16** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879390** | **PTGNR2525M16** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879387** | **PTGNR2525M22** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879846** | **PTGNR3225P22** | 32 | 25 | 32,0 | 170 | 28,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879391** | **PTGNR3232P22** | 32 | 32 | 40,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900163** | **PTGNR4040T27** | 40 | 40 | 50,0 | 300 | 31,0 | — | — | -6.0 | -6.0 | TN..270612 | **512.031** | **513.025** | **515.022** | **511.028** | **514.128** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879383** | **PTGNL1616H16** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879384** | **PTGNL2020K16** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879388** | **PTGNL2525M16** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | -6.0 | -6.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879386** | **PTGNL2525M22** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879847** | **PTGNL3225P22** | 32 | 25 | 32,0 | 170 | 28,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879392** | **PTGNL3232P22** | 32 | 32 | 40,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900162** | **PTGNL4040T27** | 40 | 40 | 50,0 | 300 | 31,0 | — | — | -6.0 | -6.0 | TN..270612 | **512.031** | **513.025** | **515.022** | **511.028** | **514.128** | 15 IP |



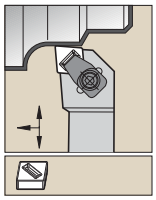
Consulte las plaquitas de las páginas B43 a B45, B59 y B87.



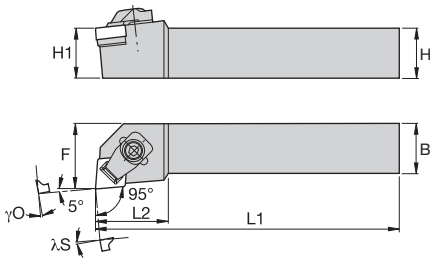

NOTA: H = H1

## ■ PWLN 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3879405** | **PWLNR1616H06** | 16 | 16 | 20,0 | 100 | 14,0 | -6.0 | -6.0 | WN..060408 | **512.134** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879407** | **PWLNR2020K06** | 20 | 20 | 25,0 | 125 | 14,0 | -6.0 | -6.0 | WN..060408 | **512.134** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3900167** | **PWLNR2525M06** | 25 | 25 | 32,0 | 150 | 20,0 | -6.0 | -6.0 | WN..060408 | **512.134** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879408** | **PWLNR2020K08** | 20 | 20 | 25,0 | 125 | 20,0 | -6.0 | -6.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879409** | **PWLNR2525M08** | 25 | 25 | 32,0 | 150 | 26,0 | -6.0 | -6.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900164** | **PWLNR3232P08** | 32 | 32 | 40,0 | 170 | 26,0 | -6.0 | -6.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3879410** | **PWLNL1616H06** | 16 | 16 | 20,0 | 100 | 14,0 | -6.0 | -6.0 | WN..060408 | **512.134** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879406** | **PWLNL2020K06** | 20 | 20 | 25,0 | 125 | 14,0 | -6.0 | -6.0 | WN..060408 | **512.134** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3900166** | **PWLNL2525M06** | 25 | 25 | 32,0 | 150 | 20,0 | -6.0 | -6.0 | WN..060408 | **512.134** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3879403** | **PWLNL2020K08** | 20 | 20 | 25,0 | 125 | 20,0 | -6.0 | -6.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3879404** | **PWLNL2525M08** | 25 | 25 | 32,0 | 150 | 26,0 | -6.0 | -6.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3900165** | **PWLNL3232P08** | 32 | 32 | 40,0 | 170 | 26,0 | -6.0 | -6.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |



Consulte las plaquitas de las páginas B50 a B51.

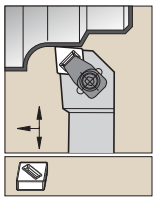



NOTA: H = H1

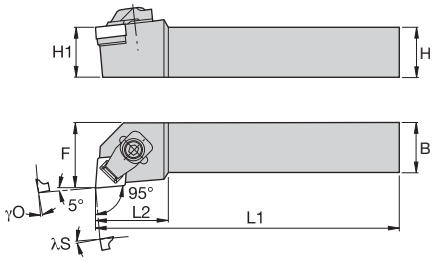
## ■ CCLN-MX 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3032691** | **CCLNR2525M12-MX7** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.X120708 | **552.221** | **554.252** | 2.5mm | **551.316** | 4mm |
| **3032713** | **CCLNR3225P12-MX7** | 32 | 25 | 32,0 | 170 | 32,0 | — | — | -6.0 | -6.0 | CN.X120708 | **552.221** | **554.252** | 2.5mm | **551.316** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3032692** | **CCLNL2525M12-MX7** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.X120708 | **552.221** | **554.252** | 2.5mm | **551.316** | 4mm |

*NOTA: se muestra la versión de fijación MX.*



Consulte las plaquitas de las páginas B50 a B51.

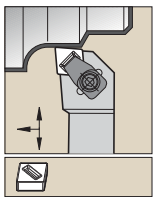



NOTA: H = H1

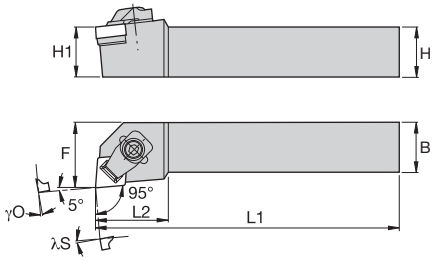
## ■ CCLN-MN 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | sistema de sujeción | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3032715** | **CCLNR2525M12-MN4** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.N120408 | **552.220** | **554.252** | 2.5mm | **551.317** | 4mm |
| **3032717** | **CCLNR2525M12-MN7** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.N120708 | **552.221** | **554.252** | 2.5mm | **551.317** | 4mm |
| **3032719** | **CCLNR3225P12-MN7** | 32 | 25 | 32,0 | 170 | 32,0 | — | — | -6.0 | -6.0 | CN.N120708 | **552.221** | **554.252** | 2.5mm | **551.317** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3032716** | **CCLNL2525M12-MN4** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.N120408 | **552.220** | **554.252** | 2.5mm | **551.317** | 4mm |
| **3032718** | **CCLNL2525M12-MN7** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.N120708 | **552.221** | **554.252** | 2.5mm | **551.317** | 4mm |

*NOTA: se muestra la versión de fijación MX.*



Consulte las plaquitas de las páginas B50 a B51.

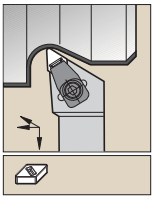



NOTA: H = H1

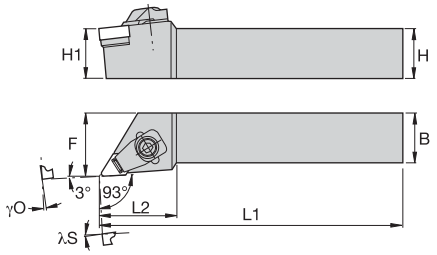
## ■ CCLN-MF 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | sistema de sujeción | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3032723** | **CCLNR2525M12-MF7** | 25 | 25 | 32,0 | 150 | 32,0 | — | — | -6.0 | -6.0 | CN.N120708 | **552.221** | **554.252** | 2.5mm | **551.317** | 4mm |

*NOTA: se muestra la versión de fijación MX.*



Consulte las plaquitas de la página B52.

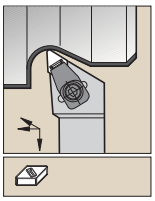



NOTA: H = H1

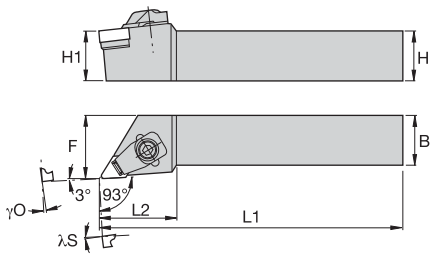
## ■ CDJN-MX 93°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3032726** | **CDJNR2525M15-MX7** | 25 | 25 | 32,0 | 150 | 38,0 | — | — | -6.0 | -6.0 | DN.X150708 | **552.228** | **554.252** | 2.5mm | **551.332** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3032727** | **CDJNL2525M15-MX7** | 25 | 25 | 32,0 | 150 | 38,0 | — | — | -6.0 | -6.0 | DN.X150708 | **552.228** | **554.252** | 2.5mm | **551.332** | 4mm |

*NOTA: se muestra la versión de fijación — MX.*



Consulte las plaquitas de la página B52.

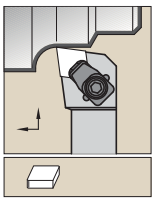



NOTA: H = H1

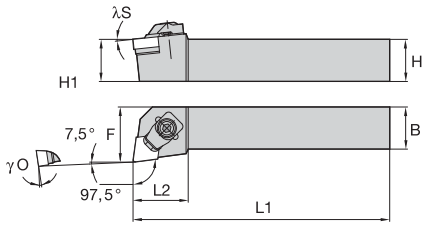
## ■ CDJN-MN 93°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3032728** | **CDJNR2525M15-MN7** | 25 | 25 | 32,0 | 150 | 38,0 | — | — | -6.0 | -6.0 | DN.N150708 | **552.228** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |
| **3032545** | **CDJNR3225P15-MN7** | 32 | 25 | 32,0 | 170 | 38,0 | — | — | -6.0 | -6.0 | DN.N150708 | **552.228** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3032544** | **CDJNL2525M15-MN7** | 25 | 25 | 32,0 | 150 | 38,0 | — | — | -6.0 | -6.0 | DN.N150708 | **552.228** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |
| **3032546** | **CDJNL3225P15-MN7** | 32 | 25 | 32,0 | 170 | 38,0 | — | — | -6.0 | -6.0 | DN.N150708 | **552.228** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |

*NOTA: se muestra la versión de fijación — MX.*



Consulte las plaquitas de la página B53.

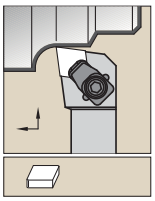



NOTA: H = H1

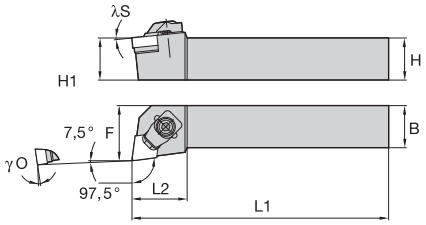
## ■ CELN-MF 97,5°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | rompevirutas | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879700** | **CELNR2525M13MF7** | 25 | 25 | 32,5 | 153 | 32,0 | — | — | -6.0 | -6.0 | ENGN130708 | **552.240** | **554.252** | 2.5mm | **557.125** | **551.317** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879698** | **CELNL2525M13MF7** | 25 | 25 | 32,5 | 153 | 32,0 | — | — | -6.0 | -6.0 | ENGN130708 | **552.240** | **554.252** | 2.5mm | **557.125** | **551.317** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



Consulte las plaquitas de la página B53.

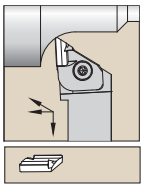



NOTA: H = H1

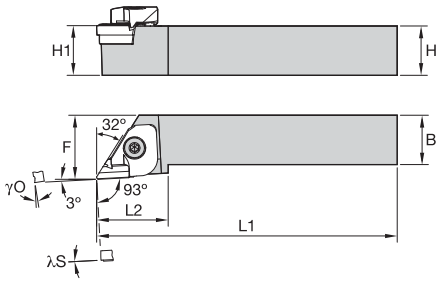
## CELN-MN 97,5˚

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3879701** | **CELNR2525M13MN7** | 25 | 25 | 32,5 | 153 | 32,0 | — | — | -6.0 | -6.0 | ENGN130708 | **552.240** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3879699** | **CELNL2525M13MN7** | 25 | 25 | 32,5 | 153 | 32,0 | — | — | -6.0 | -6.0 | ENGN130708 | **552.240** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



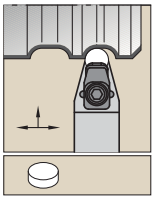
Consulte las plaquitas de la página B53.



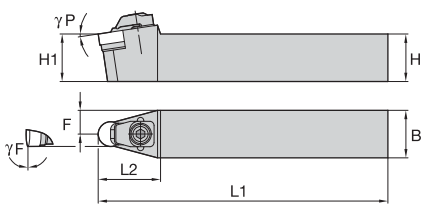

NOTA: H = H1

## CKJN

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | pasador de apoyo | hex. | conjunto de amarre | hex. | llave hexagonal | conjunto de pasador |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | | |
| **3870064** | **CKJNR2525M16** | 25 | 25 | 32,0 | 150 | 36,0 | — | — | 0.0 | -6.0 | KNUX160410R2 | **512.100** | **513.020** | — | **551.129** | 4mm | **170.004** | **513.123** |
| **3870065** | **CKJNR3225P16** | 32 | 25 | 32,0 | 170 | 33,0 | — | — | 0.0 | -6.0 | KNUX160410R2 | **512.100** | **513.020** | — | **551.129** | 4mm | **170.004** | **513.123** |
| | **A izquierdas** | | | | | | | | | | | | | | | | | |
| **3870042** | **CKJNL2525M16** | 25 | 25 | 32,0 | 150 | 36,0 | — | — | 0.0 | -6.0 | KNUX160410L2 | **512.101** | **513.020** | — | **551.130** | 4mm | **170.004** | **513.123** |
| **3870063** | **CKJNL3225P16** | 32 | 25 | 32,0 | 170 | 33,0 | — | — | 0.0 | -6.0 | KNUX160410L2 | **512.101** | **513.020** | — | **551.130** | 4mm | **170.004** | **513.123** |



Consulte las plaquitas de las páginas B54 y B79.

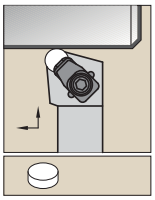



NOTA: H = H1

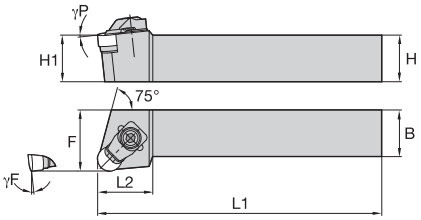
## CRDN-MN

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3032549** | **CRDNN2525M12-MN4** | 25 | 25 | 12,5 | 150 | 30,0 | — | — | 0.0 | -8.5 | RN.N120400 | **552.229** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032550** | **CRDNN3225P12-MN4** | 32 | 25 | 12,5 | 170 | 30,0 | — | — | 0.0 | -8.5 | RN.N120400 | **552.229** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032551** | **CRDNN2525M12-MN7** | 25 | 25 | 12,5 | 150 | 30,0 | — | — | 0.0 | -8.5 | RN.N120700 | **552.230** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032552** | **CRDNN3225P12-MN7** | 32 | 25 | 12,5 | 170 | 30,0 | — | — | 0.0 | -8.5 | RN.N120700 | **552.230** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



Consulte las plaquitas
de las páginas B54 y B79.

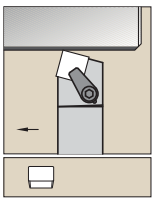



NOTA: H = H1

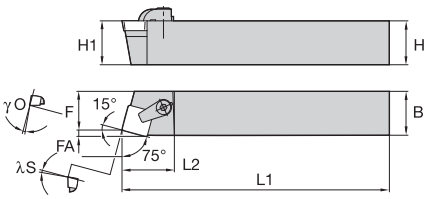
## CRSN-MN

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3032675** | **CRSNR3225P12-MN4** | 32 | 25 | 32,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | RN.N120400 | **552.229** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032677** | **CRSNR2525M12-MN7** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | RN.N120700 | **552.230** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032679** | **CRSNR3225P12-MN7** | 32 | 25 | 32,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | RN.N120700 | **552.230** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3032676** | **CRSNL3225P12-MN4** | 32 | 25 | 32,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | RN.N120400 | **552.229** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032678** | **CRSNL2525M12-MN7** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | -6.0 | -6.0 | RN.N120700 | **552.230** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |
| **3032680** | **CRSNL3225P12-MN7** | 32 | 25 | 32,0 | 170 | 26,0 | — | — | -6.0 | -6.0 | RN.N120700 | **552.230** | **554.252** | 2.5mm | **557.111** | **551.333** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



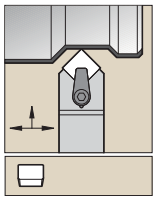
Consulte las plaquitas
de las páginas B34 y B57.



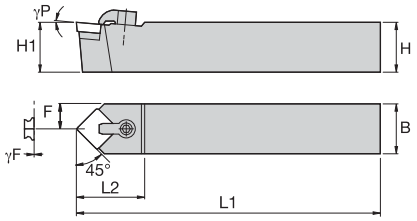

NOTA: H = H1

## CSBP 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | hex. | tornillo del apoyo | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3870068** | **CSBPR2020K12** | 20 | 20 | 17,0 | 125 | 30,0 | 3,1 | — | 0.0 | 5.0 | SP..120308 | **SM840** | 2mm | **MS111** | **CKM10** | **STCM8** | 4mm |
| **3870069** | **CSBPR2525M12** | 25 | 25 | 22,0 | 150 | 30,0 | 3,1 | — | 0.0 | 5.0 | SP..120308 | **SM840** | 2mm | **MS111** | **CKM10** | **STCM8** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3870066** | **CSBPL2020K12** | 20 | 20 | 17,0 | 125 | 30,0 | 3,1 | — | 0.0 | 5.0 | SP..120308 | **SM840** | 2mm | **MS111** | **CKM10** | **STCM8** | 4mm |
| **3870067** | **CSBPL2525M12** | 25 | 25 | 22,0 | 150 | 30,0 | 3,1 | — | 0.0 | 5.0 | SP..120308 | **SM840** | 2mm | **MS111** | **CKM10** | **STCM8** | 4mm |



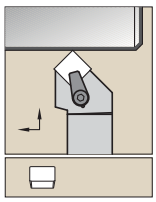
Consulte las plaquitas
de las páginas B34 y B57.



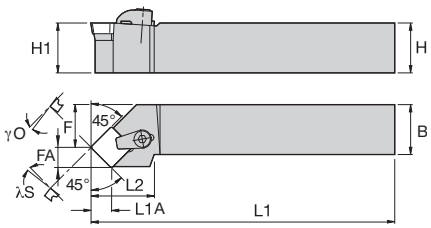

NOTA: H = H1

## CSDP 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3870070** | **CSDPN1616H09** | 16 | 16 | 8,0 | 100 | 25,0 | — | — | 0.0 | 5.0 | SP..090308 | **SM820** | **MS959** | — | **CKM7** | **STCM9** | 2.5mm |
| **3870071** | **CSDPN2020K12** | 20 | 20 | 10,0 | 125 | 32,0 | — | — | 0.0 | 5.0 | SP..120308 | **SM840** | **MS111** | 2mm | **CKM10** | **STCM8** | 4mm |
| **3870072** | **CSDPN2525M12** | 25 | 25 | 12,5 | 150 | 32,0 | — | — | 0.0 | 5.0 | SP..120308 | **SM840** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |



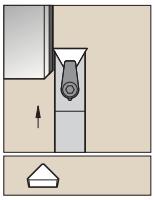
Consulte las plaquitas
de las páginas B34 y B57.

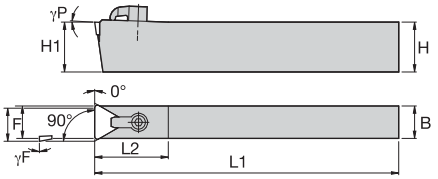



NOTA: H = H1

## CSSP 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3870074** | **CSSPR2020K12** | 20 | 20 | 25,0 | 125 | 32,0 | 8,7 | 8,3 | 0.0 | 5.0 | SP..120308 | **SM840** | **MS111** | 2mm | **CKM10** | **STCM8** | 4mm |
| **3870075** | **CSSPR2525M12** | 25 | 25 | 32,0 | 150 | 32,0 | 8,7 | 8,3 | 0.0 | 5.0 | SP..120308 | **SM840** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3870073** | **CSSPL2525M12** | 25 | 25 | 32,0 | 150 | 32,0 | 8,7 | 8,3 | 0.0 | 5.0 | SP..120308 | **SM840** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |



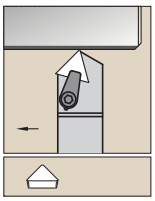


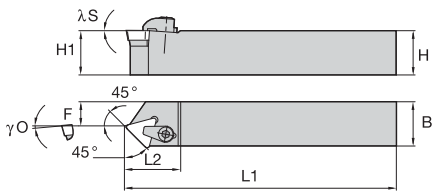

Consulte las plaquitas de las páginas B40 a B41, B58 y B83.

NOTA: H = H1

## ■ CTCPN 90°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3870076** | **CTCPN2510M11** | 25 | 10 | 10,0 | 150 | 26,0 | — | — | 0.0 | 3.0 | TP..110304 | **SM819** | **MS960** | — | **CKM7** | **STCM5** | 2.5mm |
| **3870077** | **CTCPN2514M16** | 25 | 14 | 14,4 | 150 | 28,0 | — | — | 0.0 | 3.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM13** | **STCM4** | 4mm |
| **3870078** | **CTCPN2518M22** | 25 | 18 | 19,2 | 150 | 41,0 | — | — | 0.0 | 3.0 | TP..220408 | **SM837** | **MS125** | 2.5mm | **CKM13** | **STCM4** | 4mm |
| **3870079** | **CTCPN2520M22** | 25 | 20 | 20,2 | 150 | 41,0 | — | — | 0.0 | 3.0 | TP..220408 | **SM837** | **MS125** | 2.5mm | **CKM13** | **STCM4** | 4mm |
| **3870080** | **CTCPN4018R22** | 40 | 18 | 19,2 | 200 | 41,0 | — | — | 0.0 | 3.0 | TP..220408 | **SM837** | **MS125** | 2.5mm | **CKM13** | **STCM4** | 4mm |
| **3870081** | **CTCPN4020R22** | 40 | 20 | 20,2 | 200 | 41,0 | — | — | 0.0 | 3.0 | TP..220408 | **SM837** | **MS125** | 2.5mm | **CKM13** | **STCM4** | 4mm |



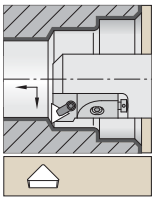


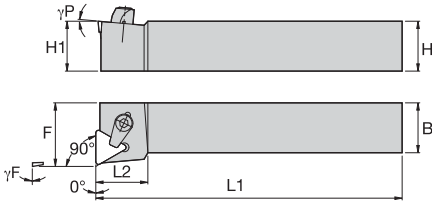

Consulte las plaquitas de las páginas B40 a B41, B58 y B83.

NOTA: H = H1

## ■ CTDP 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3870083** | **CTDPR1212F11** | 12 | 12 | 6,0 | 80 | 22,0 | — | — | 0.0 | 5.0 | TP..110304 | **SM819** | **MS960** | — | **CKM19** | **STCM9** | 2.5mm |
| **3870084** | **CTDPR2525M16** | 25 | 25 | 16,0 | 150 | 30,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3870082** | **CTDPL1212F11** | 12 | 12 | 6,0 | 80 | 22,0 | — | — | 0.0 | 5.0 | TP..110304 | **SM819** | **MS960** | — | **CKM19** | **STCM9** | 2.5mm |



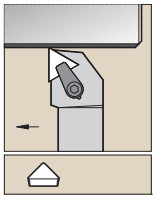


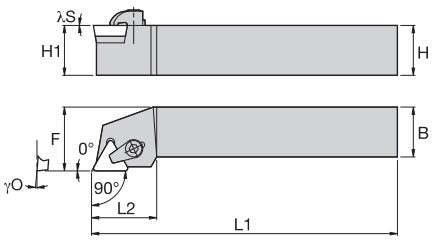

Consulte las plaquitas de las páginas B40 a B41, B58 y B83.

NOTA: H = H1

## CTFP 90°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3870087** | **CTFPR2020K16** | 20 | 20 | 25,0 | 125 | 29,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM10** | **STCM8** | 4mm |
| **3870088** | **CTFPR2525M16** | 25 | 25 | 32,0 | 150 | 29,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3870085** | **CTFPL2020K16** | 20 | 20 | 25,0 | 125 | 29,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM10** | **STCM8** | 4mm |
| **3870086** | **CTFPL2525M16** | 25 | 25 | 32,0 | 150 | 29,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |



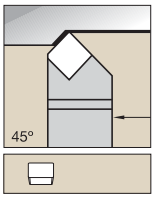



Consulte las plaquitas de las páginas B40 a B41, B58 y B83.

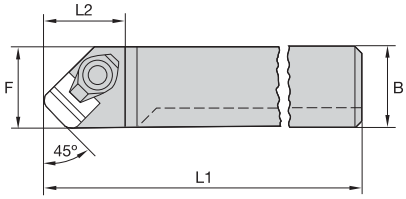
NOTA: H = H1

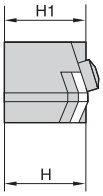
## CTGP 90°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | | |
| **3870092** | **CTGPR1212F11** | 12 | 12 | 16,0 | 80 | 20,0 | — | — | 0.0 | 5.0 | TP..110304 | **SM819** | **MS960** | — | **CKM19** | **STCM9** | 2.5mm |
| **3870103** | **CTGPR1616H11** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | 0.0 | 5.0 | TP..110304 | **SM819** | **MS960** | — | **CKM19** | **STCM9** | 2.5mm |
| **3870104** | **CTGPR2020K11** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 5.0 | TP..110304 | **SM819** | **MS960** | — | **CKM19** | **STCM9** | 2.5mm |
| **3870105** | **CTGPR2020K16** | 20 | 20 | 25,0 | 125 | 26,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM10** | **STCM8** | 4mm |
| **3870106** | **CTGPR2525M16** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |
| **3870107** | **CTGPR2525M22** | 25 | 25 | 32,0 | 150 | 30,0 | — | — | 0.0 | 5.0 | TP..220408 | **SM837** | **MS125** | 2.5mm | **CKM9** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | | |
| **3870089** | **CTGPL1212F11** | 12 | 12 | 16,0 | 80 | 20,0 | — | — | 0.0 | 5.0 | TP..110304 | **SM819** | **MS960** | — | **CKM19** | **STCM9** | 2.5mm |
| **3870090** | **CTGPL2020K16** | 20 | 20 | 25,0 | 125 | 26,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM10** | **STCM8** | 4mm |
| **3870091** | **CTGPL2525M16** | 25 | 25 | 32,0 | 150 | 26,0 | — | — | 0.0 | 5.0 | TP..160308 | **SM841** | **MS111** | 2mm | **CKM9** | **STCM4** | 4mm |

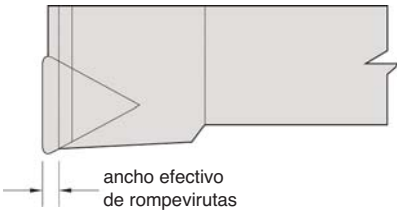



Consulte las plaquitas de la página B34.




NOTA: H = H1




## 572-SCE

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | plaquita guía | apoyo | tornillo del apoyo | llave | amarre | tornillo de fijación | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2031942** | **12191814086** | 40 | 40 | 30,0 | 300 | 41,0 | SOUN1904ZZT | **12148566486** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |
| **2031944** | **12191815086** | 50 | 50 | 35,0 | 350 | 50,0 | SOUN2506ZZT | **12148566586** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |
| | **A izquierdas** | | | | | | | | | | | | | |
| **2031941** | **12191824086** | 40 | 40 | 30,0 | 300 | 41,0 | SOUN1904ZZT | **12148566486** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |
| **2031943** | **12191825086** | 50 | 50 | 35,0 | 350 | 50,0 | SOUN2506ZZT | **12148566586** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |

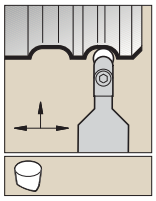
## Recambios

| Número de pedido | Número de catálogo | apoyo | tornillo del apoyo | llave | amarre | tornillo de fijación | hex. | arandela |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **2031942** | **12191814086** | **12148566486** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |
| **2031944** | **12191815086** | **12148566586** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |
| | **A izquierdas** | | | | | | | |
| **2031941** | **12191824086** | **12148566486** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |
| **2031943** | **12191825086** | **12148566586** | **12148024500** | **12148041400** | **12148599900** | **12148021500** | 6mm | **12148597100** |

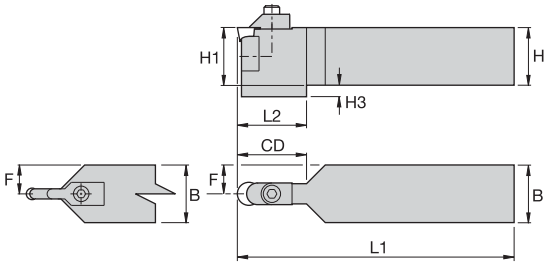
## Accesorios

| para plaquitas intercambiables | | rompevirutas para ancho de filo 2,5 mm | 3,2 mm | 4,0 mm | 6,0 mm | 8,0 mm |
|---|---|---|---|---|---|---|
| **SOUN 1904** | Código 1 214 85... | **...812 11 *** | **...813 11 *** | **...833 11 *** | **...947 11** | **–** |
| **SOUN 2506** | Código 1 214 85... | **–** | **–** | **...833 11 *** | **...844 11 *** | **...845 11 *** |

** Estos accesorios pertenecen a la categoría de recambios.*



Consulte las plaquitas de la página B53.

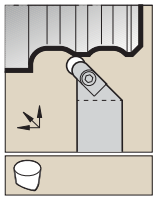



## CRDP

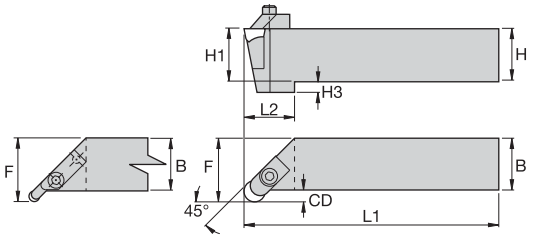
NOTA: H = H1

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | CD | H3 | plaquita guía | juego | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3871510** | **CRDPN2525M06V** | 25 | 25 | 12,5 | 151 | — | 19,0 | — | R..X060400E | **NST1** | **CM214** | **MS1321** | 2.5mm |
| **3871511** | **CRDPN2525M09V** | 25 | 25 | 12,5 | 151 | — | 29,0 | — | R..X090700E | **NST2** | **CM219** | **CS412** | 9/64 |
| **3871513** | **CRDPN2525M12V** | 25 | 25 | 12,5 | 151 | 38,1 | 38,0 | 6,4 | R..X120700E | **NST3** | **CM216** | **CS412** | 9/64 |
| **3871512** | **CRDPN3232P09V** | 32 | 32 | 16,0 | 171 | — | 29,0 | — | R..X090700E | **NST2** | **CM219** | **CS412** | 9/64 |
| **3871514** | **CRDPN3232P12V** | 32 | 32 | 16,0 | 171 | — | 38,0 | — | R..X120700E | **NST3** | **CM216** | **CS412** | 9/64 |

*NOTA: los portaherramientas CRDP puede emplear tipos de plaquita RPGX y RCGX.*



Consulte las plaquitas de la página B53.

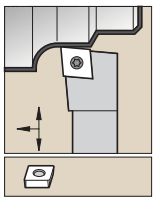



NOTA: H = H1

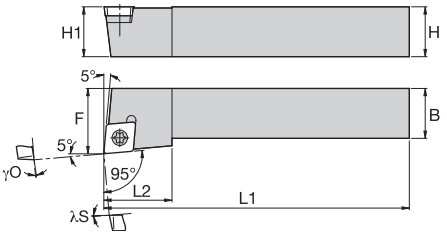
## CRGP

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | CD | H3 | plaquita guía | juego | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3871515** | **CRGPR2525M06V** | 25 | 25 | 32,0 | 151 | — | 7.3 | — | R..X060400E | **NST1** | **CM214** | **MS1321** | 2.5mm |
| **3871517** | **CRGPR2525M09V** | 25 | 25 | 32,0 | 151 | — | 7.3 | — | R..X090700E | **NST2** | **CM219** | **CS412** | 9/64 |
| **3871521** | **CRGPR2525M12V** | 25 | 25 | 32,0 | 151 | 27,1 | 7.3 | 6,4 | R..X120700E | **NST3** | **CM216** | **CS412** | 9/64 |
| **3871519** | **CRGPR3232P09V** | 32 | 32 | 40,0 | 171 | — | 8.3 | — | R..X090700E | **NST2** | **CM219** | **CS412** | 9/64 |
| **3871523** | **CRGPR3232P12V** | 32 | 32 | 40,0 | 171 | 37,1 | 8.3 | — | R..X120700E | **NST3** | **CM216** | **CS412** | 9/64 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3871516** | **CRGPL2525M06V** | 25 | 25 | 32,0 | 151 | — | 7.3 | — | R..X060400E | **NST1** | **CM214** | **MS1321** | 2.5mm |
| **3871518** | **CRGPL2525M09V** | 25 | 25 | 32,0 | 151 | — | 7.3 | — | R..X090700E | **NST2** | **CM219** | **CS412** | 9/64 |
| **3871522** | **CRGPL2525M12V** | 25 | 25 | 32,0 | 151 | 27,1 | 7.3 | 6,4 | R..X120700E | **NST3** | **CM216** | **CS412** | 9/64 |
| **3871520** | **CRGPL3232P09V** | 32 | 32 | 40,0 | 171 | — | 8.3 | — | R..X090700E | **NST2** | **CM219** | **CS412** | 9/64 |
| **3871524** | **CRGPL3232P12V** | 32 | 32 | 40,0 | 171 | 37,1 | 8.3 | — | R..X120700E | **NST3** | **CM216** | **CS412** | 9/64 |

*NOTA: los portaherramientas CRGP puede emplear tipos de plaquita RPGX y RCGX.*



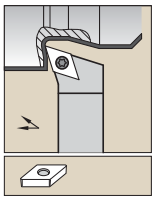
Consulte las plaquitas de las páginas B14 a B16, B46 y B70 a B71.



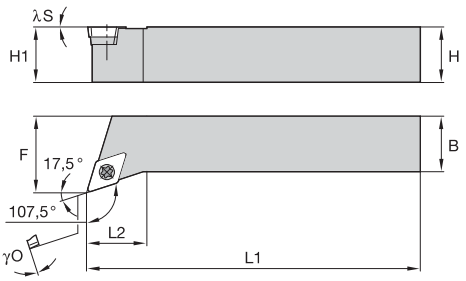

NOTA: H = H1

## SCLC 95°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3900169** | **SCLCR1010E06** | 10 | 10 | 12,0 | 70 | 12,0 | — | — | 0.0 | 0.0 | CC..060204 | **–** | **–** | – | **MS1153** | T7 |
| **3900172** | **SCLCR1212F06** | 12 | 12 | 16,0 | 80 | 12,0 | — | — | 0.0 | 0.0 | CC..060204 | **–** | **–** | – | **MS1153** | T7 |
| **3900170** | **SCLCR1212F09** | 12 | 12 | 16,0 | 80 | 16,0 | — | — | 0.0 | 0.0 | CC..09T308 | **–** | **–** | – | **MS1155** | T15 |
| **3879416** | **SCLCR1616H09** | 16 | 16 | 20,0 | 100 | 16,0 | — | — | 0.0 | 0.0 | CC..09T308 | **SKCP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879417** | **SCLCR2020K09** | 20 | 20 | 25,0 | 125 | 16,0 | — | — | 0.0 | 0.0 | CC..09T308 | **SKCP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879414** | **SCLCR2020K12** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 0.0 | CC..120408 | **SKCP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879418** | **SCLCR2525M12** | 25 | 25 | 32,0 | 150 | 19,8 | — | — | 0.0 | 0.0 | CC..120408 | **SKCP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3900171** | **SCLCL1010E06** | 10 | 10 | 12,0 | 70 | 12,0 | — | — | 0.0 | 0.0 | CC..060204 | **–** | **–** | – | **MS1153** | T7 |
| **3900173** | **SCLCL1212F06** | 12 | 12 | 16,0 | 80 | 12,0 | — | — | 0.0 | 0.0 | CC..060204 | **–** | **–** | – | **MS1153** | T7 |
| **3900168** | **SCLCL1212F09** | 12 | 12 | 16,0 | 80 | 16,0 | — | — | 0.0 | 0.0 | CC..09T308 | **–** | **–** | – | **MS1155** | T15 |
| **3879411** | **SCLCL1616H09** | 16 | 16 | 20,0 | 100 | 16,0 | — | — | 0.0 | 0.0 | CC..09T308 | **SKCP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879412** | **SCLCL2020K09** | 20 | 20 | 25,0 | 125 | 16,0 | — | — | 0.0 | 0.0 | CC..09T308 | **SKCP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879415** | **SCLCL2020K12** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 0.0 | CC..120408 | **SKCP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879413** | **SCLCL2525M12** | 25 | 25 | 32,0 | 150 | 19,8 | — | — | 0.0 | 0.0 | CC..120408 | **SKCP453** | **SRS4** | 4mm | **MS1158** | T15 |



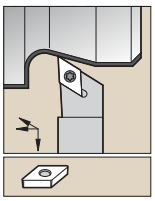
Consulte las plaquitas de las páginas B20 a B21, B47 y B75 a B76.

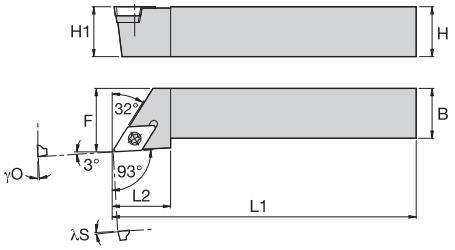



NOTA: H = H1

## SDHC 107,5°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3879435** | **SDHCR1616H11** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879437** | **SDHCR2020K11** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879440** | **SDHCR2525M11** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879436** | **SDHCR2525M15** | 25 | 25 | 32,0 | 150 | 25,0 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879433** | **SDHCL1616H11** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879439** | **SDHCL2020K11** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879438** | **SDHCL2525M11** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879434** | **SDHCL2525M15** | 25 | 25 | 32,0 | 150 | 25,0 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |



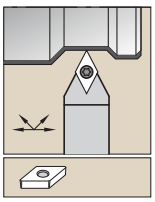


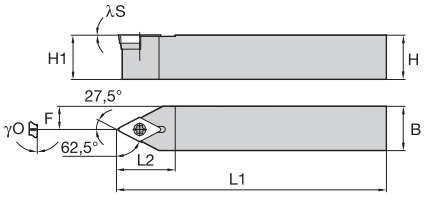

Consulte las plaquitas de las páginas B20 a B21, B47 y B75 a B76.

NOTA: H = H1

## SDJC 93°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3879464** | **SDJCR1010M07** | 10 | 10 | 12 | 150,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3899890** | **SDJCR1212F07** | 12 | 12 | 16 | 80,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3879456** | **SDJCR1616H07** | 16 | 16 | 20 | 100,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3879458** | **SDJCR2020K07** | 20 | 20 | 25 | 125,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3900177** | **SDJCR1212F11** | 12 | 12 | 16 | 80,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3879459** | **SDJCR1616H11** | 16 | 16 | 20 | 100,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879460** | **SDJCR2020K11** | 20 | 20 | 25 | 125,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879461** | **SDJCR2525M11** | 25 | 25 | 32 | 150,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879457** | **SDJCR2020K15** | 20 | 20 | 25 | 125,0 | 32 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879463** | **SDJCR2525M15** | 25 | 25 | 32 | 150,0 | 32 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3900175** | **SDJCR3225P15** | 32 | 25 | 32 | 170,0 | 32 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3899892** | **SDJCL1010E07** | 10 | 10 | 12 | 70,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3899891** | **SDJCL1212F07** | 12 | 12 | 16 | 80,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3879441** | **SDJCL1616H07** | 16 | 16 | 20 | 100,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3879442** | **SDJCL2020K07** | 20 | 20 | 25 | 125,0 | 16 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3900176** | **SDJCL1212F11** | 12 | 12 | 16 | 80,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3879454** | **SDJCL1616H11** | 16 | 16 | 20 | 100,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879462** | **SDJCL2020K11** | 20 | 20 | 25 | 125,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879453** | **SDJCL2525M11** | 25 | 25 | 32 | 150,0 | 22 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879848** | **SDJCL2020K15** | 20 | 20 | 25 | 125,0 | 32 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879455** | **SDJCL2525M15** | 25 | 25 | 32 | 150,0 | 32 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3900174** | **SDJCL3225P15** | 32 | 25 | 32 | 170,0 | 32 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |



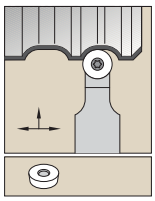



Consulte las plaquitas de las páginas B20 a B21, B47 y B75 a B76.

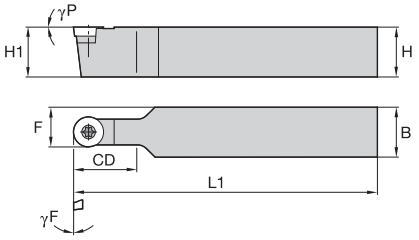
NOTA: H = H1

## SDNC 62,5°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879468** | **SDNCN0808L07** | 8 | 8 | 4,0 | 140 | 16,0 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3879469** | **SDNCN1010M07** | 10 | 10 | 5,0 | 150 | 16,0 | — | — | 0.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3900178** | **SDNCN1212F11** | 12 | 12 | 6,0 | 80 | 22,0 | — | — | — | — | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879465** | **SDNCN1616H11** | 16 | 16 | 8,0 | 100 | 22,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879467** | **SDNCN2020K11** | 20 | 20 | 10,0 | 125 | 22,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879849** | **SDNCN2525M11** | 25 | 25 | 12,5 | 150 | 25,0 | — | — | 0.0 | 0.0 | DC..11T308 | **SKDP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879466** | **SDNCN2525M15** | 25 | 25 | 12,0 | 150 | 28,0 | — | — | 0.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3900179** | **SDNCN3225P15** | 32 | 25 | 12,5 | 170 | 32,5 | — | — | — | — | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |



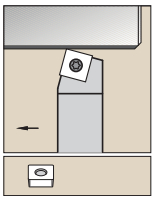
Consulte las plaquitas de las páginas B27 a B28 y B47.



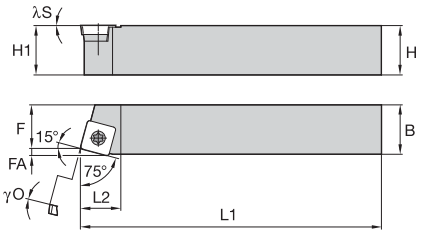

NOTA: H = H1

## SRDC

| Número de pedido | Número de catálogo | H | B | F | L1 | CD | γF° | γP° | plaquita guía | placa de apoyo | parafuso do calço | hex. | tornillo de la placa | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3879735** | **SRDCN1616H06** | 16 | 16 | 11,0 | 100 | 16,0 | 0.0 | 0.0 | RC..0602M0 | **–** | **–** | – | **MS1153** | T7 |
| **3900182** | **SRDCN2020K06** | 20 | 20 | 12,5 | 125 | 19,7 | 0.0 | 0.0 | RC..0602M0 | **–** | **–** | – | **MS1153** | T7 |
| **3900183** | **SRDCN2525M06** | 25 | 25 | 15,0 | 150 | 19,7 | 0.0 | 0.0 | RC..0602M0 | **–** | **–** | – | **MS1153** | T7 |
| **3879702** | **SRDCN1616H08** | 16 | 16 | 12,0 | 100 | 16,0 | 0.0 | 0.0 | RC..0803M0 | **–** | **–** | – | **MS1154** | T9 |
| **3879733** | **SRDCN2020K08** | 20 | 20 | 14,0 | 125 | 20,0 | 0.0 | 0.0 | RC..0803M0 | **–** | **–** | – | **MS1154** | T9 |
| **3879737** | **SRDCN2525M08** | 25 | 25 | 16,5 | 150 | 25,0 | 0.0 | 0.0 | RC..0803M0 | **–** | **–** | – | **MS1154** | T9 |
| **3879736** | **SRDCN2020K10** | 20 | 20 | 15,0 | 125 | 20,0 | 0.0 | 0.0 | RC..10T3M0 | **SKRN100300** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879734** | **SRDCN2525M10** | 25 | 25 | 17,5 | 150 | 25,0 | 0.0 | 0.0 | RC..10T3M0 | **SKRN100300** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879738** | **SRDCN2525M12** | 25 | 25 | 18,5 | 150 | 25,0 | 0.0 | 0.0 | RC..1204M0 | **SKRN1203M0** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3900181** | **SRDCN3225P12** | 32 | 25 | 8,0 | 170 | 28,0 | 0.0 | 0.0 | RC..1204M0 | **SKRN1203M0** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3900180** | **SRDCN3225P16** | 32 | 25 | 20,0 | 170 | 35,0 | 0.0 | 0.0 | RC..1605M0 | **SKRN160400** | **SRS5** | 5mm | **MS1160** | T20 |



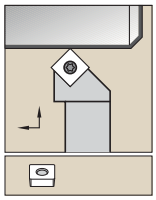
Consulte las plaquitas de las páginas B29, B48 y B80.

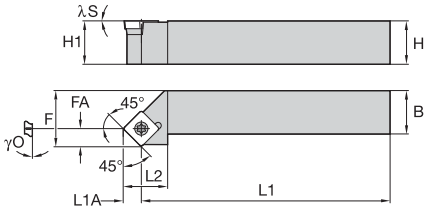



NOTA: H = H1

## SSBC 75°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3879850** | **SSBCR1616H09** | 16 | 16 | 13,0 | 100 | 16,0 | 2,2 | — | 0.0 | 0.0 | SC..096308 | **SKSP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879741** | **SSBCR2020K12** | 20 | 20 | 17,0 | 125 | 21,0 | 3,1 | — | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879740** | **SSBCR2525M12** | 25 | 25 | 22,0 | 150 | 21,0 | 3,1 | — | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879739** | **SSBCL1616H09** | 16 | 16 | 13,0 | 100 | 16,0 | 2,2 | — | 0.0 | 0.0 | SC..09T308 | **SKSP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879852** | **SSBCL2020K12** | 20 | 20 | 17,0 | 125 | 21,0 | 3,1 | — | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879851** | **SSBCL2525M12** | 25 | 25 | 22,0 | 150 | 21,0 | 3,1 | — | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |



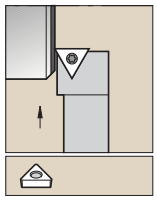


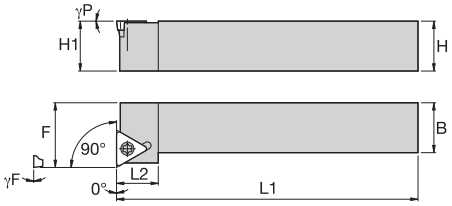

Consulte las plaquitas de las páginas B29, B48 y B80.

NOTA: H = H1

## SSSC 45°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3879747** | **SSSCR1616H09** | 16 | 16 | 20,0 | 100 | 18,0 | 6,1 | 6,1 | 0.0 | 0.0 | SC..09T308 | **SKSP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879746** | **SSSCR2020K12** | 20 | 20 | 25,0 | 125 | 25,0 | 8,3 | 8,3 | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879744** | **SSSCR2525M12** | 25 | 25 | 32,0 | 150 | 25,0 | 8,3 | 8,3 | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879745** | **SSSCL1616H09** | 16 | 16 | 20,0 | 100 | 18,0 | 6,1 | 6,1 | 0.0 | 0.0 | SC..09T308 | **SKSP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879743** | **SSSCL2020K12** | 20 | 20 | 25,0 | 125 | 25,0 | 8,3 | 8,3 | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |
| **3879742** | **SSSCL2525M12** | 25 | 25 | 32,0 | 150 | 25,0 | 8,3 | 8,3 | 0.0 | 0.0 | SC..120408 | **SKSP453** | **SRS4** | 4mm | **MS1158** | T15 |



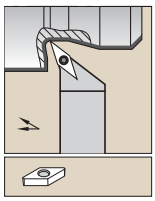



Consulte las plaquitas de las páginas B35, B48 y B82.

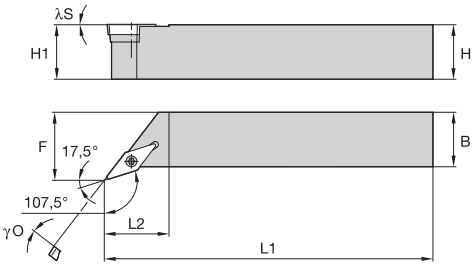
NOTA: H = H1

## STFC 90°

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3900184** | **STFCR1212F11** | 12 | 12 | 16,0 | 80 | 13,0 | — | — | 0.0 | 0.0 | TC..110204 | **–** | **–** | – | **MS1153** | T7 |
| **3879749** | **STFCR1616H16** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | 0.0 | 0.0 | TC..16T308 | **SKTP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879763** | **STFCR2020K16** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 0.0 | TC..16T308 | **SKTP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879750** | **STFCR2525M16** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | 0.0 | 0.0 | TC..16T308 | **SKTP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879751** | **STFCL1616H16** | 16 | 16 | 20,0 | 100 | 20,0 | — | — | 0.0 | 0.0 | TC..16T308 | **SKTP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879748** | **STFCL2020K16** | 20 | 20 | 25,0 | 125 | 20,0 | — | — | 0.0 | 0.0 | TC..16T308 | **SKTP343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879752** | **STFCL2525M16** | 25 | 25 | 32,0 | 150 | 20,0 | — | — | 0.0 | 0.0 | TC..16T308 | **SKTP343** | **SRS3** | 3.5mm | **MS1156** | T15 |



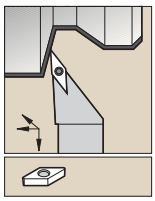
Consulte las plaquitas de las páginas B42, B49 y B85.



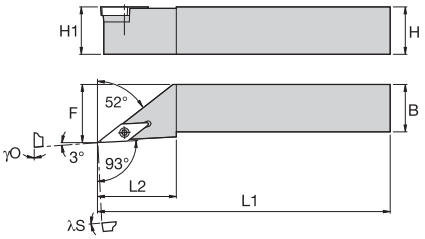

## SVHB 107,5°

NOTA: H = H1

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3879767** | **SVHBR2020K16** | 20 | 20 | 25,0 | 125 | 28,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879765** | **SVHBR2525M16** | 25 | 25 | 32,0 | 150 | 28,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879853** | **SVHBR3225P16** | 32 | 25 | 32,0 | 170 | 25,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879764** | **SVHBL2020K16** | 20 | 20 | 25,0 | 125 | 28,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879766** | **SVHBL2525M16** | 25 | 25 | 32,0 | 150 | 28,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879768** | **SVHBL3225P16** | 32 | 25 | 32,0 | 170 | 25,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |



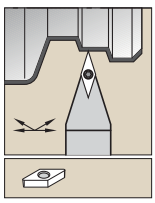
Consulte las plaquitas de las páginas B42, B49 y B85.



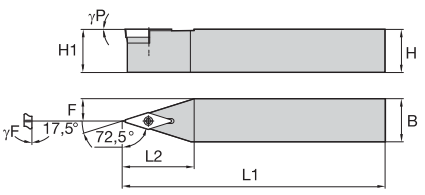

## SVJB 93°

NOTA: H = H1

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3879769** | **SVJBR1616H16** | 16 | 16 | 20,0 | 100 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879776** | **SVJBR2020K16** | 20 | 20 | 25,0 | 125 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879775** | **SVJBR2525M16** | 25 | 25 | 32,0 | 150 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879773** | **SVJBR3225P16** | 32 | 25 | 32,0 | 170 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3879772** | **SVJBL1616H16** | 16 | 16 | 20,0 | 100 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879770** | **SVJBL2020K16** | 20 | 20 | 25,0 | 125 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879774** | **SVJBL2525M16** | 25 | 25 | 32,0 | 150 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879771** | **SVJBL3225P16** | 32 | 25 | 32,0 | 170 | 35,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |



Consulte las plaquitas de las páginas B42, B49 y B85.




## SVVB 72,5°

NOTA: H = H1

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | FA | L1A | γF° | γP° | plaquita guía | placa de apoyo | parafuso do calço | hex. | tornillo de la placa | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3879777** | **SVVBN2020K16** | 20 | 20 | 10,0 | 125 | 33,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879778** | **SVVBN2525M16** | 25 | 25 | 12,5 | 150 | 33,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |
| **3879779** | **SVVBN3225P16** | 32 | 25 | 12,5 | 170 | 33,0 | — | — | 0.0 | 0.0 | VB..160408 | **SKVN343** | **SRS3** | 3.5mm | **MS1156** | T15 |

# Herramientas de mandrinado interior

Actualmente, las operaciones de mandrinado modernas precisan de las herramientas de alto rendimiento más fiables. WIDIA™ ofrece una amplia gama de portaherramientas para mandrinado interior que cumple incluso las demandas de producción más precisas, abarcando piezas de trabajo con múltiples formas y tamaños.

Las barras de mandrinar de WIDIA, disponibles con mango tanto de acero como de metal duro resistente a las vibraciones, además de un orificio de refrigeración, garantizan unos resultados consistentes y una mayor fiabilidad en la producción.

### Sistema de fijación M

- Fijación combinada pasador/cuña de apriete para plaquitas negativas.
- Un sistema de fijación extremadamente resistente, diseñado especialmente para cortes interrumpidos.
- Protegido por un apoyo de metal duro.

### Sistema de fijación P

- Sistema de fijación tipo palanca para plaquitas intercambiables negativas.
- Sin interferencias para el flujo de virutas.
- Rápidos cambios de plaquita.

Sistema de fijación resistente y fácil de manejar.

Un recubrimiento exclusivo y un tratamiento superficial que proporcionan versatilidad y una larga vida a la herramienta.

Bloqueo con amarre y pasador combinado para un rendimiento superior en aplicaciones difíciles.

## Sistema de fijación S

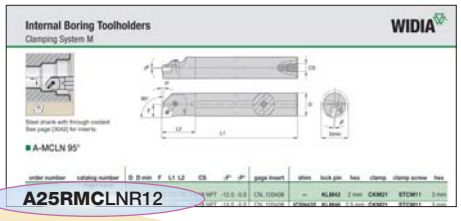
- Sistema de fijación por tornillo para plaquitas intercambiables positivas.
- Diseño compacto para una gran fiabilidad y rentabilidad.
- Apoyo de metal duro para mayor protección de la herramienta.

## Sistema de fijación C

- La fijación ajustable en altura permite el uso de rompevirutas adicionales.
- Sistema de fijación universal para plaquitas intercambiables positivas.
- Un diseño robusto que facilita su manejo.
- Apoyo de metal duro para una protección mucho mayor de la herramienta.

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




| A | 25 | R | M | C |
|---|---|---|---|---|
| Características de construcción de la barra de mandrinar | Diámetro del mango | Longitud de barra de mandrinar | Sistema de fijación de plaquitas | Forma de la plaquita |

### A — Características de construcción de la barra de mandrinar

**S**
Acero para herramientas

**A**
Acero para herramientas con refrigeración interna

**B**
Acero para herramientas con mango de absorción de vibraciones

**C**
Herramienta de metal duro con cabeza de acero fijo

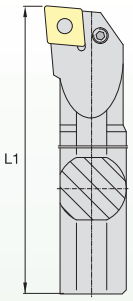
### 25 — Diámetro del mango

El número de código es el diámetro de mango "D". Se ignoran las cifras después del punto decimal. Los números de código de una sola cifra deben ir precedidos de un 0 (cero), p. ej. el código 08 para un diámetro de 8,0 mm

**D**
Acero para herramientas con mango de absorción de vibraciones y suministro de refrigeración interna

**E**
Herramienta de metal duro con cabeza de acero y suministro de refrigeración interna

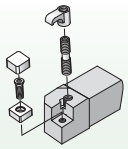
### R — Longitud de barra de mandrinar




| $l_1$ | ISO |
|---|---|
| 32 | A |
| 40 | B |
| 50 | C |
| 60 | D |
| 70 | E |
| 80 | F |
| 90 | G |
| 100 | H |
| 110 | J |
| 125 | K |
| 140 | L |
| 150 | M |
| 160 | N |
| 170 | P |
| 180 | Q |
| 200 | R |
| 250 | S |
| 300 | T |
| 350 | U |
| 400 | V |
| 450 | W |
| 500 | Y |
| Longitud especial | X |

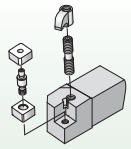
### M — Sistema de fijación de plaquitas

**C**



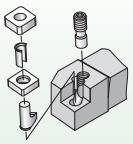
Fijación superior mediante brida para plaquitas sin orificio

**M**



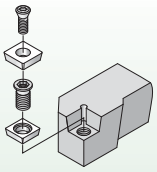
Fijación superior y de orificios para plaquitas con agujero

**P**



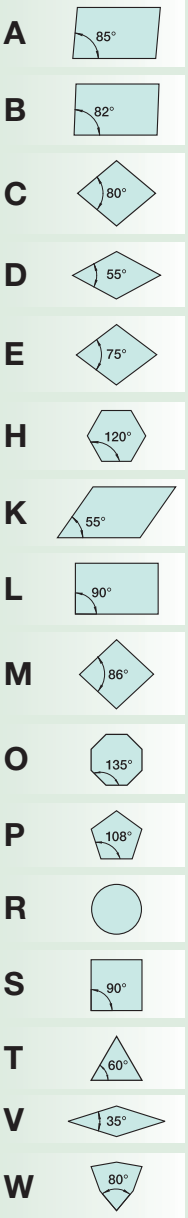
Fijación de plaquitas mediante palanca de ajuste para plaquita con orificio

**S**

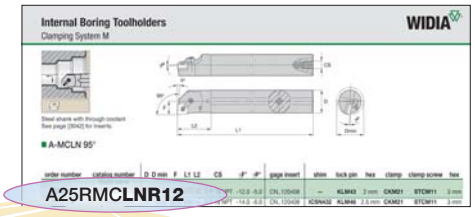


Fijación central mediante tornillo para plaquitas con orificio

### C — Forma de la plaquita

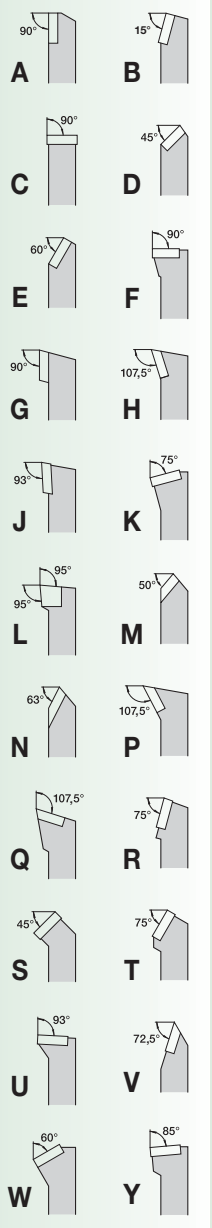


*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*



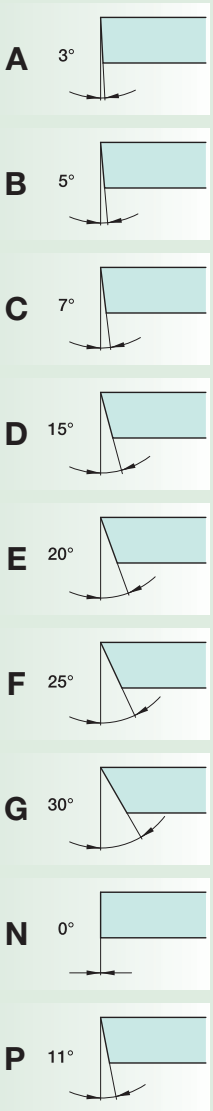

## L

Tipos de barras de mandrinar




## N

Ángulo de incidencia de la plaquita

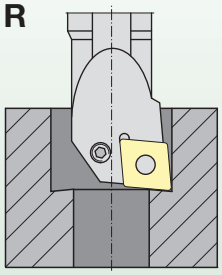



## R

Dirección de la herramienta

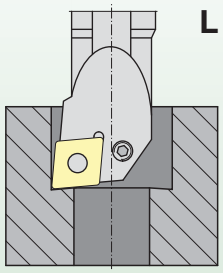
Barra de mandrinar a derechas

R



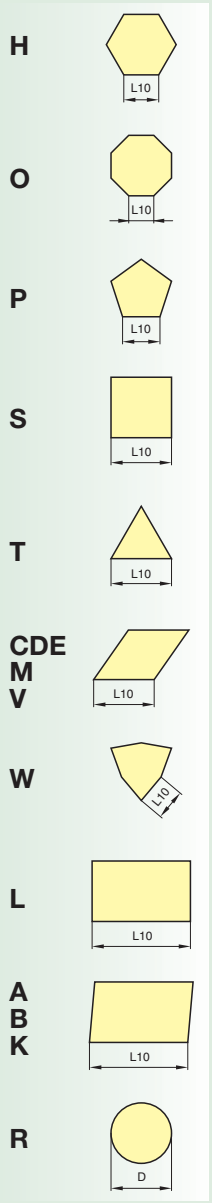
Barra de mandrinar a izquierdas

L



## 12

Tamaño de la plaquita Longitud del filo de corte L10

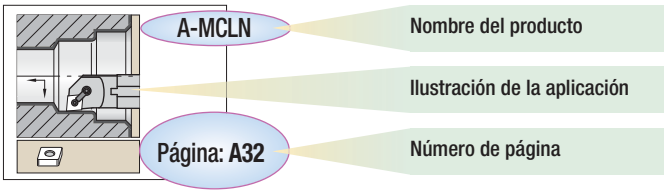



## 

Información adicional

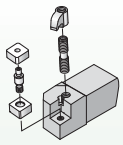
**M..** MF, MN, MX, para plaquitas de PCBN y cerámicas

Cada sistema de fijación exclusivo ofrece distintos productos para satisfacer sus necesidades de portaherramientas específicas. Busque la ilustración que se ajuste a su aplicación y visite la página correspondiente para conseguir la solución correcta.

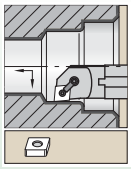



## Sistema de fijación M

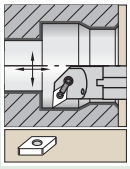
**M**



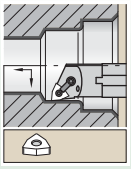
Pasador combinado/fijación por cuña de apriete para plaquitas negativas. Un sistema de fijación extremadamente resistente, diseñado especialmente para cortes interrumpidos. Un apoyo de metal duro protege a la herramienta.



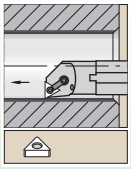
A-MCLN
95°
Página: **A42**



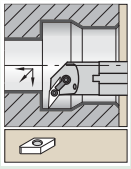
A-MDUN
93°
Página: **A42**



A-MWLN
95°
Página: **A43**



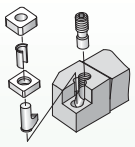
A-MTFN
90°
Página: **A43**



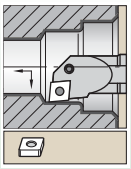
A-MVUN
93°
Página: **A44**

## Sistema de fijación P

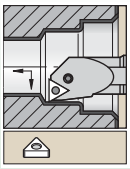
**P**



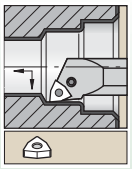
Un sistema de fijación tipo palanca para plaquitas intercambiables negativas con un orificio según el estándar DIN 4988 y plaquitas redondas positivas con un diámetro superior a los 20,0 mm. Las plaquitas con geometrías de control de virutas en una o dos caras tienen desprendimientos positivos de 6° a 18°. Las ventajas de este sistema son unos cambios rápidos de las plaquitas y la no interferencia con el flujo de virutas.



A-PCLN
95°
Página: **A45**



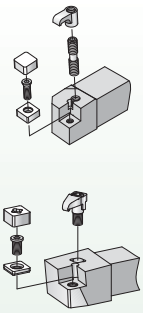
A-PTFN
90°
Página: **A46**



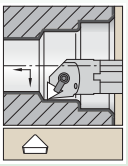
A-PWLN
95°
Página: **A46**

## Sistema de fijación C

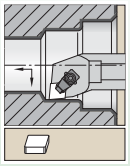
C



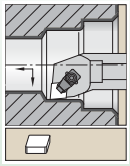
Sistema de fijación superior para plaquitas intercambiables negativas y positivas según el estándar DIN 4968. Este sistema de fijación universal es resistente y fácil de manejar. Algunas fijaciones ajustables en altura permiten el uso de rompevirutas adicionales. Un apoyo de metal duro ofrece una mayor protección a la herramienta. Portaherramientas con alturas de filo de corte ascendente de 16,0 mm y plaquitas con refrigeración interior mayores de 6,35 mm.



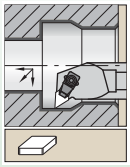
A-CTFP
90°
Página: **A47**



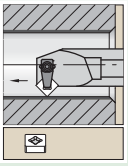
S-CCLN-MX
95°
Página: **A47**



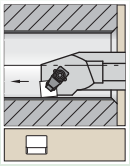
S-CCLN-MN
95°
Página: **A48**



S-CDQN-MX
Página: **A48**



S-CSSN-MX
45°
Página: **A49**

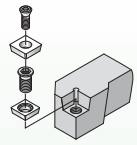


S-CSYN-MN
85°
Página: **A49**

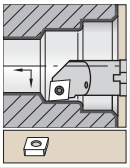
S-CWLN-MX
95°
Página: **A49**

## Sistema de fijación S

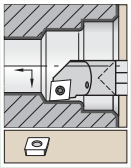
S



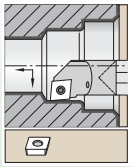
Sistema de fijación por tornillo para plaquitas intercambiables positivas con orificio avellanado según el estándar DIN 4967. Diseño compacto que emplea un mínimo de recambios para una gran fiabilidad y rentabilidad. Un apoyo de metal duro ofrece una mayor protección a la herramienta. Portaherramientas con alturas de filo de corte ascendente de 16,0 mm y plaquitas IC de 9,52 fijas mediante un casquillo roscado.



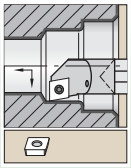
A-SCLC
95°
Página: **A50**



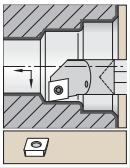
E-SCLC
95°
Página: **A50**



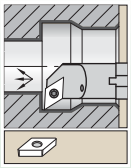
E-SCLP
95°
Página: **A51**



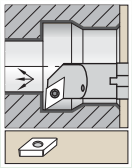
E-SCFC
90°
Página: **A51**



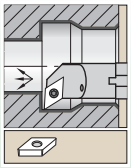
E-SCFP
90°
Página: **A51**



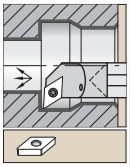
A-SDQC
107,5°
Página: **A52**



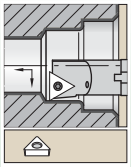
E-SDQC
107,5°
Página: **A52**



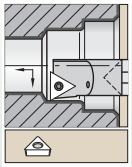
A-SDUC
93°
Página: **A53**



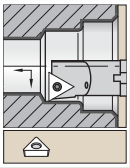
E-SDUC
93°
Página: **A53**



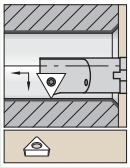
A-STFC
90°
Página: **A54**



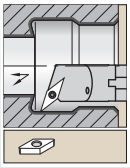
E-STFC
90°
Página: **A54**



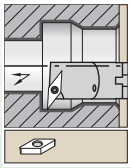
A-STFP
90°
Página: **A55**



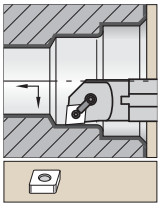
A-STWP
60°
Página: **A55**



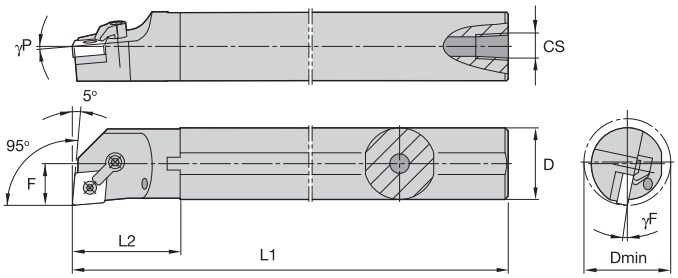
SVQB
107,5°
Página: **A56**



SVUB
93°
Página: **A56**

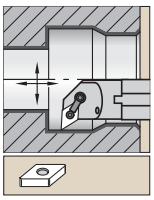


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B16 a B19, B46, B50 y B72 a B73.

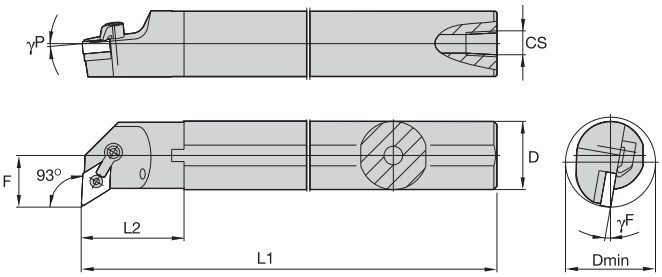



## A-MCLN 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | CS | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3852644** | **A25RMCLNR12** | 25 | 32,0 | 17,0 | 200 | 33 | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **—** | **KLM43** | 2mm | **CKM21** | **STCM11** | 3mm |
| **3852646** | **A32SMCLNR12** | 32 | 40,0 | 22,0 | 250 | — | 1/4-18 NPT | -14.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM11** | 3mm |
| **3852648** | **A40TMCLNR12** | 40 | 50,0 | 27,0 | 300 | — | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM11** | 3mm |
| **3852651** | **A50UMCLNR12** | 50 | 63,0 | 35,0 | 350 | — | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM11** | 3mm |
| **3852650** | **A40TMCLNR16** | 40 | 50,0 | 27,0 | 300 | — | 1/4-18 NPT | -11.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852663** | **A50UMCLNR16** | 50 | 63,0 | 35,0 | 350 | — | 1/4-18 NPT | -12.0 | -5.0 | CN..160612 | **ICSN533** | **KLM58** | 3mm | **CKM21** | **STCM20** | 3mm |
| **3852664** | **A50UMCLNR19** | 50 | 63,0 | 35,0 | 350 | — | 1/4-18 NPT | -12.0 | -5.0 | CN..190612 | **ICSN633** | **KLM68** | 4mm | **CKM12** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3852645** | **A25RMCLNL12** | 25 | 32,0 | 17,0 | 200 | 33 | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **—** | **KLM43** | 2mm | **CKM21** | **STCM11** | 3mm |
| **3852647** | **A32SMCLNL12** | 32 | 40,0 | 22,0 | 250 | — | 1/4-18 NPT | -14.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM11** | 3mm |
| **3852649** | **A40TMCLNL12** | 40 | 50,0 | 27,0 | 300 | — | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM11** | 3mm |
| **3852652** | **A50UMCLNL12** | 50 | 63,0 | 35,0 | 350 | — | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **ICSN432** | **KLM46** | 2.5mm | **CKM21** | **STCM11** | 3mm |

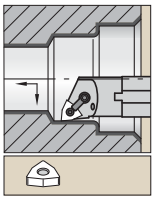


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B22 a B25, B52 y B76 a B78.

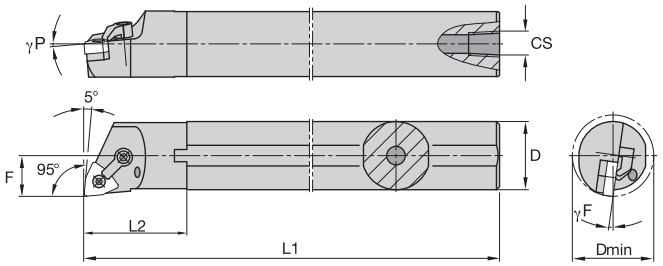



## A-MDUN 93°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | CS | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3852665** | **A25RMDUNR11** | 25 | 32,0 | 17,0 | 200 | 40 | 1/4-18 NPT | -14.0 | -5.0 | DN..110408 | **—** | **KLM33L** | 2mm | **CKM7** | **STCM5** | 2.5mm |
| **3852666** | **A25RMDUNR15** | 25 | 32,0 | 17,0 | 200 | — | 1/4-18 NPT | -14.0 | -5.0 | DN..150608 | **IDSN322** | **KLM46** | 2.5mm | **CKM22** | **STCM11** | 3mm |
| **3852668** | **A32SMDUNR15** | 32 | 40,0 | 22,0 | 250 | — | 1/4-18 NPT | -12.0 | -6.0 | DN..150608 | **IDSN432** | **KLM46** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852670** | **A40TMDUNR15** | 40 | 50,0 | 27,0 | 300 | — | 1/4-18 NPT | -9.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852672** | **A50UMDUNR15** | 50 | 63,0 | 35,0 | 350 | — | 1/4-18 NPT | -7.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3852667** | **A25RMDUNL15** | 25 | 32,0 | 17,0 | 200 | — | 1/4-18 NPT | -14.0 | -5.0 | DN..150608 | **IDSN322** | **KLM46** | 2.5mm | **CKM22** | **STCM11** | 3mm |
| **3852669** | **A32SMDUNL15** | 32 | 40,0 | 22,0 | 250 | — | 1/4-18 NPT | -12.0 | -6.0 | DN..150608 | **IDSN432** | **KLM46** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852671** | **A40TMDUNL15** | 40 | 50,0 | 27,0 | 300 | — | 1/4-18 NPT | -9.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46** | 2.5mm | **CKM22** | **STCM20** | 3mm |
| **3852673** | **A50UMDUNL15** | 50 | 63,0 | 35,0 | 350 | — | 1/4-18 NPT | -7.0 | -5.0 | DN..150608 | **IDSN432** | **KLM46** | 2.5mm | **CKM22** | **STCM20** | 3mm |

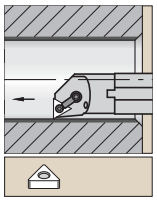


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B43 a B45, B59 y B87.

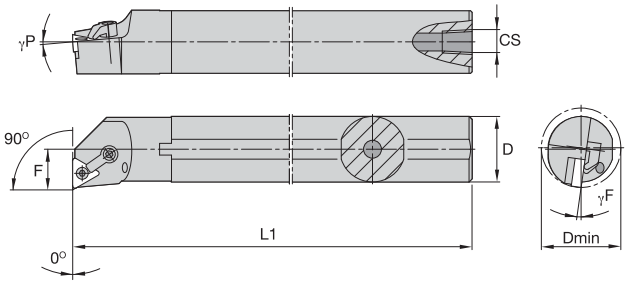



## A-MWLN 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | CS | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3852674** | **A25RMWLNR06** | 25 | 32,0 | 17,0 | 200 | — | 1/4-18 NPT | -12.0 | -5.0 | WN..060408 | **—** | **KLM33L** | 2mm | **CKM6** | **STCM5** | 2.5mm |
| **3852675** | **A25RMWLNR08** | 25 | 32,0 | 17,0 | 200 | 40 | 1/4-18 NPT | -12.0 | -5.0 | WN..080408 | **—** | **KLM43** | 2mm | **CKM20** | **STCM11** | 3mm |
| **3852676** | **A32SMWLNR08** | 32 | 40,0 | 22,0 | 250 | 50 | 1/4-18 NPT | -14.0 | -5.0 | WN..080408 | **IWSN433** | **KLM46** | 2.5mm | **CKM20** | **STCM20** | 3mm |
| **3852677** | **A40TMWLNR08** | 40 | 50,0 | 27,0 | 300 | 55 | 1/4-18 NPT | -12.0 | -5.0 | WN..080408 | **IWSN433** | **KLM46** | 2.5mm | **CKM20** | **STCM20** | 3mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3852678** | **A25RMWLNL08** | 25 | 32,0 | 17,0 | 200 | 40 | 1/4-18 NPT | -12.0 | -5.0 | WN..080408 | **—** | **KLM43** | 2mm | **CKM20** | **STCM11** | 3mm |
| **3852679** | **A32SMWLNL08** | 32 | 40,0 | 22,0 | 250 | 50 | 1/4-18 NPT | -14.0 | -5.0 | WN..080408 | **IWSN433** | **KLM46** | 2.5mm | **CKM20** | **STCM20** | 3mm |
| **3852680** | **A40TMWLNL08** | 40 | 50,0 | 27,0 | 300 | 55 | 1/4-18 NPT | -12.0 | -5.0 | WN..080408 | **IWSN433** | **KLM46** | 2.5mm | **CKM20** | **STCM20** | 3mm |

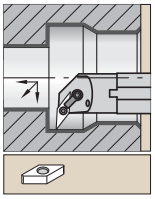


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B36 a B39, B58 y B83.

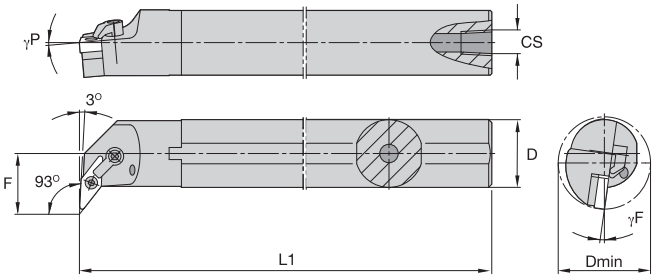



## A-MTFN 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | CS | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3852682** | **A25RMTFNR16** | 25 | 32,0 | 17,0 | 200 | 1/4-18 NPT | -14.0 | -5.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852684** | **A32SMTFNR16** | 32 | 40,0 | 22,0 | 250 | 1/4-18 NPT | -12.0 | -5.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852686** | **A40TMTFNR16** | 40 | 50,0 | 27,0 | 300 | 1/4-18 NPT | -9.0 | -5.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852688** | **A50UMTFNR22** | 50 | 63,0 | 35,0 | 350 | 1/4-18 NPT | -7.0 | -5.0 | TN..220408 | **ITSN433** | **KLM46** | 2.5mm | **CKM9** | **STCM4** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3852681** | **A25RMTFNL16** | 25 | 32,0 | 17,0 | 200 | 1/4-18 NPT | -14.0 | -5.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852683** | **A32SMTFNL16** | 32 | 40,0 | 22,0 | 250 | 1/4-18 NPT | -12.0 | -5.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852685** | **A40TMTFNL16** | 40 | 50,0 | 27,0 | 300 | 1/4-18 NPT | -9.0 | -5.0 | TN..160408 | **ITSN322** | **KLM34L** | 2mm | **CKM21** | **STCM20** | 3mm |
| **3852687** | **A50UMTFNL22** | 50 | 63,0 | 35,0 | 350 | 1/4-18 NPT | -7.0 | -5.0 | TN..220408 | **ITSN433** | **KLM46** | 2.5mm | **CKM9** | **STCM4** | 4mm |

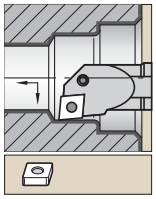


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B43, B56 y B86.

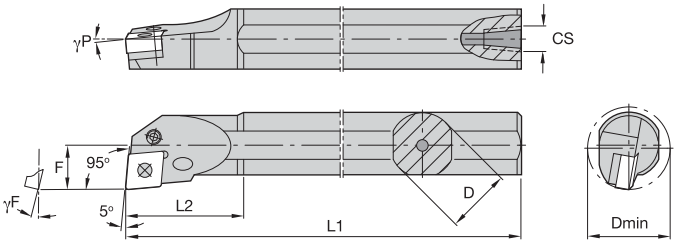



## A-MVUN 93°

| Número de pedido | Número de catálogo | D | D min | F | L1 | CS | γF° | γP° | plaquita guía | apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3852690** | **A25RMVUNR16** | 25 | 37,0 | 22,0 | 200 | 1/4-18 NPT | -12.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852692** | **A32SMVUNR16** | 32 | 40,0 | 22,0 | 250 | 1/4-18 NPT | -12.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3852689** | **A25RMVUNL16** | 25 | 37,0 | 22,0 | 200 | 1/4-18 NPT | -12.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |
| **3852691** | **A32SMVUNL16** | 32 | 40,0 | 22,0 | 250 | 1/4-18 NPT | -12.0 | -5.0 | VN..160408 | **IVSN322** | **KLM34L** | 2mm | **CKM31** | **STCM20** | 3mm |

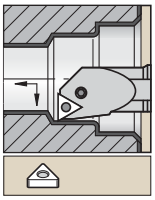


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B16 a B19, B46, B50 y B72 a B73.

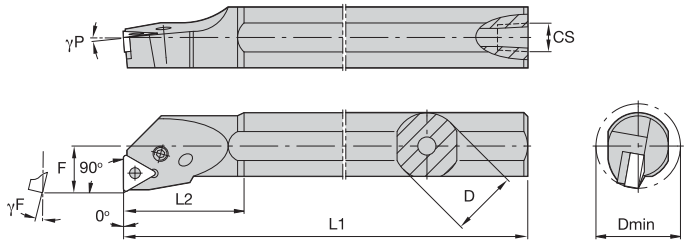



## A-PCLN 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | CS | γF° | γP° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3883468** | **A25TPCLNR12** | 25 | 32 | 17,0 | 300 | 40 | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **–** | **–** | **–** | **511.022** | **514.122** | 10 IP |
| **3883466** | **A32UPCLNR12** | 32 | 40 | 22,0 | 350 | 50 | 1/4-18 NPT | -10.0 | -5.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3883463** | **A40VPCLNR12** | 40 | 50 | 27,0 | 400 | 55 | 1/4-18 NPT | -10.0 | -5.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3883442** | **A40VPCLNR16** | 40 | 50 | 27,0 | 400 | 55 | 1/4-18 NPT | -11.0 | -5.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3883469** | **A25TPCLNL12** | 25 | 32 | 17,0 | 300 | 40 | 1/4-18 NPT | -12.0 | -5.0 | CN..120408 | **–** | **–** | **–** | **511.022** | **514.122** | 10 IP |
| **3883467** | **A32UPCLNL12** | 32 | 40 | 22,0 | 350 | 50 | 1/4-18 NPT | -10.0 | -5.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3883465** | **A40VPCLNL12** | 40 | 50 | 27,0 | 400 | 55 | 1/4-18 NPT | -10.0 | -5.0 | CN..120408 | **512.112** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3883464** | **A40VPCLNL16** | 40 | 50 | 27,0 | 400 | 55 | 1/4-18 NPT | -11.0 | -5.0 | CN..160612 | **512.117** | **513.025** | **515.022** | **511.025** | **514.125** | 15 IP |

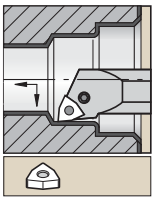


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B36 a B39, B58 y B83.

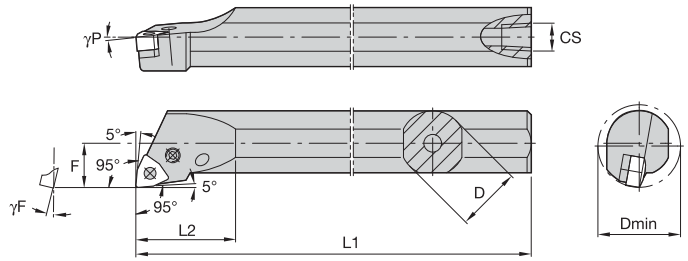



## A-PTFN 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | CS | γF° | γP° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3883263** | **A25TPTFNR16** | 25 | 32 | 17,0 | 300 | 40 | 1/4-18 NPT | -12.0 | -5.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3883151** | **A32UPTFNR16** | 32 | 40 | 22,0 | 350 | 50 | 1/4-18 NPT | -10.0 | -5.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3883149** | **A40VPTFNR22** | 40 | 48 | 27,0 | 400 | 55 | 1/4-18 NPT | -10.0 | -5.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3883264** | **A25TPTFNL16** | 25 | 32 | 17,0 | 300 | 40 | 1/4-18 NPT | -12.0 | -5.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3883152** | **A32UPTFNL16** | 32 | 40 | 22,0 | 350 | 50 | 1/4-18 NPT | -10.0 | -5.0 | TN..160408 | **512.013** | **513.018** | **515.018** | **511.018** | **514.118** | 10 IP |
| **3883150** | **A40VPTFNL22** | 40 | 48 | 27,0 | 400 | 55 | 1/4-18 NPT | -10.0 | -5.0 | TN..220408 | **512.023** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |

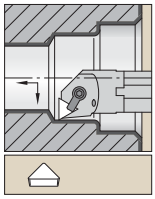


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B43 a B45, B59 y B87.

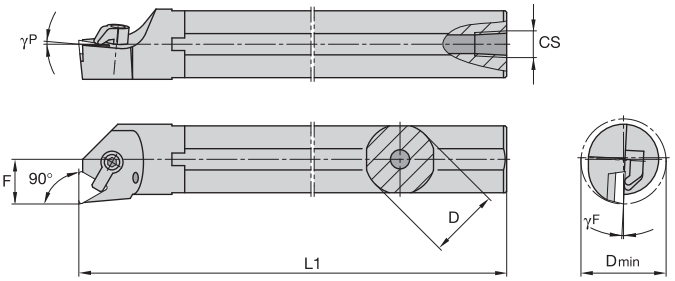



## A-PWLN 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | CS | γF° | γP° | plaquita guía | apoyo | pasador de apoyo | punzón | palanca | tornillo de palanca | Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3883459** | **A16RPWLNR06** | 16 | 27 | 11,0 | 200 | 32 | 1/8-27 NPT | -12.0 | -5.0 | WN..060408 | – | – | – | **511.030** | **514.112** | 8 IP |
| **3883455** | **A20SPWLNR06** | 20 | 25 | 13,0 | 250 | 32 | 1/8-27 NPT | -14.0 | -5.0 | WN..060408 | – | – | – | **511.030** | **514.112** | 8 IP |
| **3883458** | **A25RPWLNR08** | 25 | 32 | 17,0 | 200 | 40 | 1/4-18 NPT | -12.0 | -5.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3883454** | **A32SPWLNR08** | 32 | 40 | 22,0 | 250 | 50 | 1/4-18 NPT | -10.0 | -5.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3883461** | **A16RPWLNL06** | 16 | 27 | 11,0 | 200 | 32 | 1/8-27 NPT | -12.0 | -5.0 | WN..060408 | – | – | – | **511.030** | **514.112** | 8 IP |
| **3883457** | **A20SPWLNL06** | 20 | 25 | 13,0 | 250 | 32 | 1/8-27 NPT | -14.0 | -5.0 | WN..060408 | – | – | – | **511.030** | **514.112** | 8 IP |
| **3883460** | **A25RPWLNL08** | 25 | 32 | 17,0 | 200 | 40 | 1/4-18 NPT | -12.0 | -5.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |
| **3883456** | **A32SPWLNL08** | 32 | 40 | 22,0 | 250 | 50 | 1/4-18 NPT | -10.0 | -5.0 | WN..080408 | **512.135** | **513.023** | **515.018** | **511.023** | **514.123** | 15 IP |

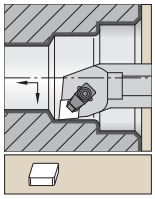


Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B40 a B41, B58 y B83.

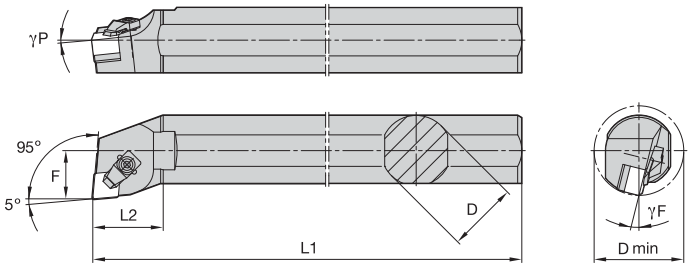



## A-CTFP 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | CS | γF° | γP° | plaquita guía | tornillo apoyo | tornillo del apoyo | hex. | tornillo amarre | tornillo de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3883451** | **A16RCTFPR11** | 16 | 20,0 | 11,0 | 200 | 1/8-27 NPT | -4.0 | 5.0 | TP..110304 | **–** | **–** | – | **CKM19** | **STCM9** | 2.5mm |
| **3883450** | **A25RCTFPR16** | 25 | 32,0 | 17,0 | 200 | 1/4-18 NPT | -3.0 | 5.0 | TP..160308 | **SM841** | **MS110** | 2mm | **CKM10** | **STCM8** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3883453** | **A16RCTFPL11** | 16 | 20,0 | 11,0 | 200 | 1/8-27 NPT | -4.0 | 5.0 | TP..110304 | **–** | **–** | – | **CKM19** | **STCM9** | 2.5mm |
| **3883452** | **A25RCTFPL16** | 25 | 32,0 | 17,0 | 200 | 1/4-18 NPT | -3.0 | 5.0 | TP..160308 | **SM841** | **MS110** | 2mm | **CKM10** | **STCM8** | 4mm |



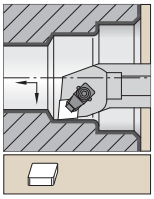
Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B50 a B51.



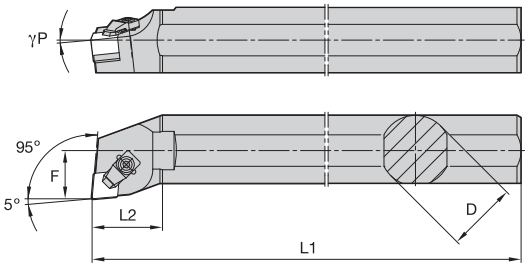

## S-CCLN-MX 95°

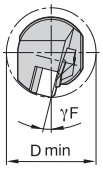
| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | γF° | γP° | plaquita guía | placa de apoyo | parafuso do calço | hex. | sistema de sujeción | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **3029009** | **S40T-CCLNR12-MX7** | 40 | 55 | 27,0 | 300 | 40,0 | -14.0 | -6.0 | CN.X120708 | **552.221** | **554.252** | 2.5mm | **551.316** | 4mm |
| **3883565** | **S32SCCLNR12MX7** | 32 | 40 | 22,0 | 251 | 42,8 | -14.0 | -5.0 | CNGX120708 | **–** | **–** | – | **551.316** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | |
| **3029010** | **S40T-CCLNL12-MX7** | 40 | 55 | 27,0 | 300 | 40,0 | -14.0 | -6.0 | CN.X120708 | **552.221** | **554.252** | 2.5mm | **551.316** | 4mm |
| **3883564** | **S32SCCLNL12MX7** | 32 | 40 | 22,0 | 251 | 42,8 | -14.0 | -5.0 | CNGX120708 | **–** | **–** | – | **551.316** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B50 a B51.

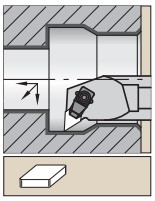


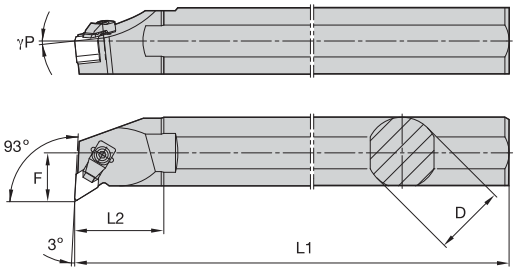

## S-CCLN-MN 95°

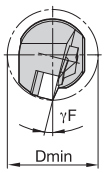
| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | tornillo | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3029011** | **S40T-CCLNR12-MN4** | 40 | 55 | 27,0 | 300 | 40,0 | -14.0 | -6.0 | CN.N120408 | **552.220** | **554.252** | 2.5mm | **557.111** | **554.201** | 4mm |
| **3029143** | **S40T-CCLNR12-MN7** | 40 | 55 | 27,0 | 300 | 40,0 | -14.0 | -6.0 | CN.N120708 | **552.221** | **554.253** | 2.5mm | **557.111** | **554.201** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3029012** | **S40T-CCLNL12-MN4** | 40 | 55 | 27,0 | 300 | 40,0 | -14.0 | -6.0 | CN.N120408 | **552.220** | **554.252** | 2.5mm | **557.111** | **554.201** | 4mm |
| **3029144** | **S40T-CCLNL12-MN7** | 40 | 55 | 27,0 | 300 | 40,0 | -14.0 | -6.0 | CN.N120708 | **552.221** | **554.252** | 2.5mm | **557.111** | **554.201** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



Mango de acero con refrigeración interna
Consulte las plaquitas de la página B52.

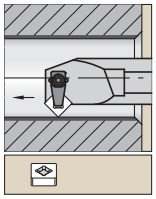


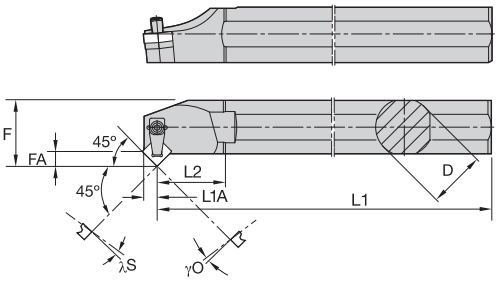

## S-CDQN-MX

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | tornillo | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3883567** | **S40TCDQNR12MX7** | 40 | 50 | 27,0 | 302 | 45,0 | -14.0 | -5.0 | DN.X120708 | **552.225** | **554.254** | 2.5mm | – | – | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3883566** | **S40TCDQNL12MX7** | 40 | 50 | 27,0 | 302 | 45,0 | -14.0 | -5.0 | DN.X120708 | **552.225** | **554.254** | 2.5mm | – | – | 4mm |

*NOTA: se muestra la versión de fijación MN.*



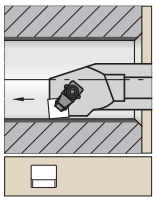
Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B56 a B57.



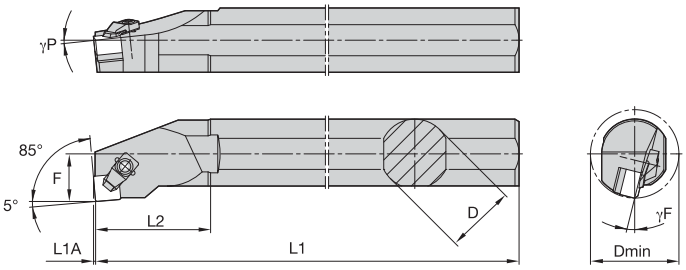

## S-CSSN-MX 45°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | FA | L1A | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3029151** | **S40T-CSSNR12-MX7** | 40 | 55 | 27,0 | 300 | 67,0 | 8,23 | 8,50 | -14.1 | -5.9 | SN.X120708 | **552.232** | **554.252** | 2.5mm | **551.316** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3029152** | **S40T-CSSNL12-MX7** | 40 | 55 | 27,0 | 300 | 67,0 | 8,23 | 8,50 | -14.1 | -5.9 | SN.X120708 | **552.232** | **554.252** | 2.5mm | **551.316** | 4mm |

*NOTA: se muestra la versión de fijación MX.*



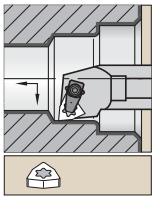
Mango de acero con refrigeración
Consulte las plaquitas de las páginas B55 a B56.



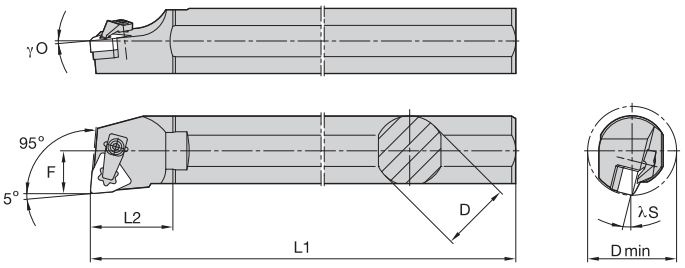

## S-CSYN-MN 85°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | L1A | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | plato de empuje | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3883569** | **S40TCSYNR12-MN7** | 40 | 55 | 27,0 | 300 | 67,0 | 0,97 | -14.0 | -6.0 | SN.N120708 | **552.232** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3883568** | **S40TCSYNL12-MN7** | 40 | 55 | 27,0 | 300 | 67,0 | 0,97 | -14.0 | -6.0 | SN.N120708 | **552.232** | **554.252** | 2.5mm | **557.111** | **551.317** | 4mm |

*NOTA: se muestra la versión de fijación MN.*



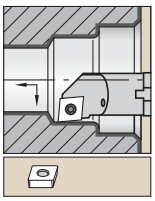
Mango de acero con refrigeración interna
Consulte las plaquitas de la página B59.

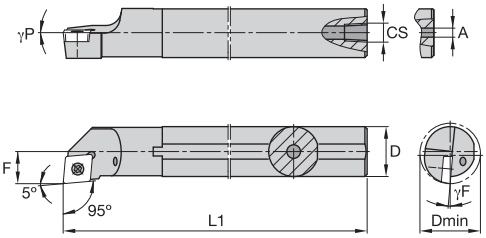



## S-CWLN-MX 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L2 | λS° | γO° | plaquita guía | apoyo | tornillo del apoyo | hex. | conjunto de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **3029153** | **S40T-CWLNR08-MX7** | 40 | 80 | 27,0 | 300 | 55,0 | -10.0 | -5.0 | WN.X080708 | **552.210** | **554.252** | 2.5mm | **551.316** | 4mm |
| | **A izquierdas** | | | | | | | | | | | | | |
| **3029154** | **S40T-CWLNL08-MX7** | 40 | 80 | 27,0 | 300 | 55,0 | -10.0 | -5.0 | WN.X080708 | **552.210** | **554.252** | 2.5mm | **551.316** | 4mm |

*NOTA: se muestra la versión de fijación MX.*

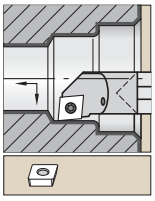


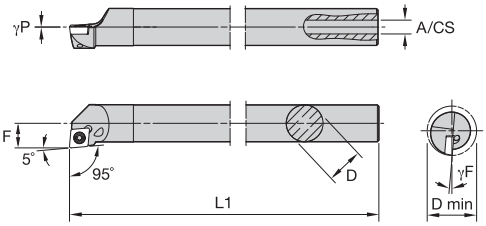



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B14 a B16, B46 y B70 a B71.

## A-SCLC 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3883285** | **A08JSCLCR06** | 8 | 11,0 | 6,0 | 110 | 2,4 | — | -8.0 | 0.0 | CC..060204 | **—** | **—** | — | **MS1939** | T7 |
| **3883283** | **A10KSCLCR06** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -7.0 | 0.0 | CC..060204 | **—** | **—** | — | **MS1153** | T7 |
| **3883271** | **A16RSCLCR09** | 16 | 20,0 | 11,0 | 200 | — | 1/8-27 NPT | -7.0 | 0.0 | CC..09T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883269** | **A20SSCLCR09** | 20 | 25,0 | 13,0 | 250 | — | 1/8-27 NPT | -5.0 | 0.0 | CC..09T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883265** | **A25TSCLCR12** | 25 | 32,0 | 17,0 | 300 | — | 1/4-18 NPT | -7.0 | 0.0 | CC..120408 | **—** | **—** | — | **MS1157** | T15 |
| **3883266** | **A32TSCLCR12** | 32 | 40,0 | 22,0 | 300 | — | 1/4-18 NPT | -7.0 | 0.0 | CC..120408 | **SKCP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3883286** | **A08JSCLCL06** | 8 | 11,0 | 6,0 | 110 | 2,4 | — | -8.0 | 0.0 | CC..060204 | **—** | **—** | — | **MS1939** | T7 |
| **3883284** | **A10KSCLCL06** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -7.0 | 0.0 | CC..060204 | **—** | **—** | — | **MS1153** | T7 |
| **3883272** | **A16RSCLCL09** | 16 | 20,0 | 11,0 | 200 | — | 1/8-27 NPT | -7.0 | 0.0 | CC..09T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883270** | **A20SSCLCL09** | 20 | 25,0 | 13,0 | 250 | — | 1/8-27 NPT | -5.0 | 0.0 | CC..09T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883267** | **A25TSCLCL12** | 25 | 32,0 | 17,0 | 300 | — | 1/4-18 NPT | -7.0 | 0.0 | CC..120408 | **—** | **—** | — | **MS1157** | T15 |
| **3883268** | **A32TSCLCL12** | 32 | 40,0 | 22,0 | 300 | — | 1/4-18 NPT | -7.0 | 0.0 | CC..120408 | **SKCP453** | **SRS4** | 4mm | **MS1158** | T15 |

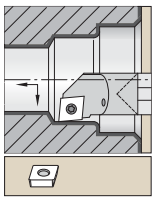


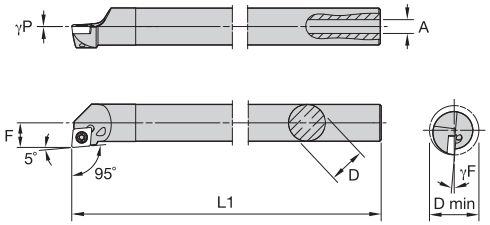



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B14 a B16, B46 y B70 a B71.

## E-SCLC 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2023603** | **E08KSCLCR065** | 8 | 10,0 | 5,0 | 125 | 3,0 | — | -15.0 | 0.0 | CC..060204 | **12148036300** | T8 |
| **2010068** | **E08KSCLCR06** | 8 | 11,0 | 6,0 | 125 | 3,0 | — | -12.0 | 0.0 | CC..060204 | **12148036300** | T8 |
| **2023608** | **E12QSCLCR06** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -8.0 | 0.0 | CC..060204 | **12148068700** | T8 |
| **2010139** | **E16RSCLCR09** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -7.0 | 0.0 | CC..090308 | **12148038800** | T15 |
| **2023621** | **E20SSCLCR09** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -5.0 | 0.0 | CC..090308 | **12148038800** | T15 |
| **2031029** | **E25TSCLCR09** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -3.0 | 0.0 | CC..090308 | **12148038800** | T15 |
| **2023614** | **E16RSCLCR09T3** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -7.0 | 0.0 | CC..09T308 | **12148038800** | T15 |
| **2010184** | **E20SSCLCR09T3** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -5.0 | 0.0 | CC..09T308 | **12148038800** | T15 |
| **2010224** | **E25TSCLCR09T3** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -3.0 | 0.0 | CC..09T308 | **12148038800** | T15 |
| **2023632** | **E32USCLCR12** | 32 | 40,0 | 22,0 | 350 | — | G 1/4 | -10.0 | 0.0 | CC..120408 | **12148007300** | T20 |
| | **A izquierdas** | | | | | | | | | | | |
| **2031020** | **E08KSCLCL065** | 8 | 10,0 | 5,0 | 125 | 3,0 | — | -15.0 | 0.0 | CC..060204 | **12148036300** | T8 |
| **2023601** | **E08KSCLCL06** | 8 | 11,0 | 6,0 | 125 | 3,0 | — | -12.0 | 0.0 | CC..060204 | **12148036300** | T8 |
| **2031022** | **E10MSCLCL06** | 10 | 13,0 | 7,0 | 150 | 3,5 | — | -10.0 | 0.0 | CC..060204 | **12148036300** | T8 |
| **2023607** | **E12QSCLCL06** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -8.0 | 0.0 | CC..060204 | **12148068700** | T8 |
| **2023613** | **E16RSCLCL09** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -7.0 | 0.0 | CC..090308 | **12148038800** | T15 |
| **2031026** | **E20SSCLCL09** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -5.0 | 0.0 | CC..090308 | **12148038800** | T15 |
| **2010215** | **E25TSCLCL09** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -3.0 | 0.0 | CC..090308 | **12148038800** | T15 |
| **2023615** | **E16RSCLCL09T3** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -7.0 | 0.0 | CC..09T308 | **12148038800** | T15 |
| **2031027** | **E20SSCLCL09T3** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -5.0 | 0.0 | CC..09T308 | **12148038800** | T15 |
| **2031028** | **E25TSCLCL09T3** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -3.0 | 0.0 | CC..09T308 | **12148038800** | T15 |

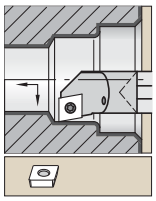


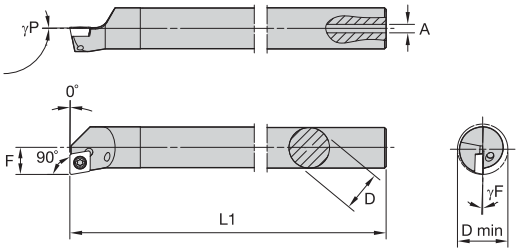



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B20 y B74 a B75.

## E-SCLP 95°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **2023598** | **E06JSCLPR04** | 6 | 8,0 | 4,5 | 110 | 2,0 | -10.0 | 0.0 | CP..04T104 | **12148005800** | T6 |
| | **A izquierdas** | | | | | | | | | | |
| **2023597** | **E06JSCLPL04** | 6 | 8,0 | 4,5 | 110 | 2,0 | -10.0 | 0.0 | CP..04T104 | **12148005800** | T6 |

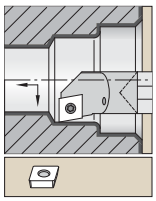


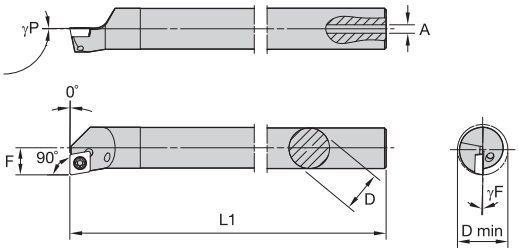



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B14 a B16, B46 y B70 a B71.

## E-SCFC 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **2023600** | **E08KSCFCR06** | 8 | 11,0 | 6,0 | 125,0 | 3,0 | -12.0 | 0.0 | CC..060204 | **12148036300** | T8 |
| | **A izquierdas** | | | | | | | | | | |
| **2031019** | **E08KSCFCL06** | 8 | 11,0 | 6,0 | 125,0 | 3,0 | -12.0 | 0.0 | CC..060204 | **12148036300** | T8 |

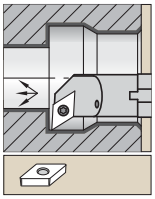


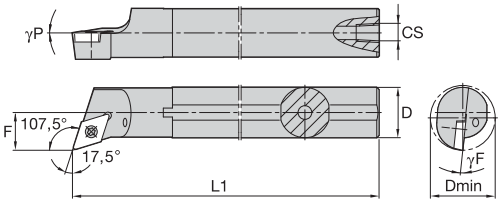



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B20 y B74 a B75.

## E-SCFP 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **2010047** | **E06JSCFPR04** | 6 | 8,0 | 4,5 | 110,0 | 2,0 | -10.0 | 0.0 | CP..04T104 | **12148005800** | T6 |
| | **A izquierdas** | | | | | | | | | | |
| **2031018** | **E06JSCFPL04** | 6 | 8,0 | 4,5 | 110,0 | 2,0 | -10.0 | 0.0 | CP..04T104 | **12148005800** | T6 |

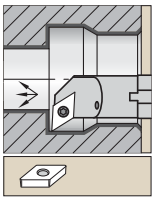


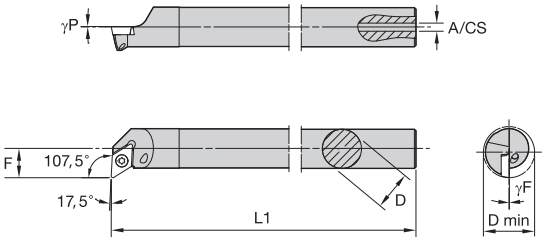



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B20 a B21, B47 y B75 a B76.

## A-SDQC 107,5°

| Número de pedido | Número de catálogo | D | D min | F | L1 | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **3883476** | **A16RSDQCR07** | 16 | 20,0 | 11,0 | 200,0 | 1/8-27 NPT | -5.0 | 0.0 | DC..070204 | **MS1153** | T7 |
| **3883474** | **A20SSDQCR11** | 20 | 25,0 | 13,0 | 250,0 | 1/8-27 NPT | -5.0 | 0.0 | DC..11T308 | **MS1155** | T15 |
| **3883462** | **A25TSDQCR11** | 25 | 32,0 | 17,0 | 300,0 | 1/4-18 NPT | -4.0 | 0.0 | DC..11T308 | **MS1155** | T15 |
| | **A izquierdas** | | | | | | | | | | |
| **3883477** | **A16RSDQCL07** | 16 | 20,0 | 11,0 | 200,0 | 1/8-27 NPT | -5.0 | 0.0 | DC..070204 | **MS1153** | T7 |
| **3883475** | **A20SSDQCL11** | 20 | 25,0 | 13,0 | 250,0 | 1/8-27 NPT | -5.0 | 0.0 | DC..11T308 | **MS1155** | T15 |
| **3883473** | **A25TSDQCL11** | 25 | 32,0 | 17,0 | 300,0 | 1/4-18 NPT | -4.0 | 0.0 | DC..11T308 | **MS1155** | T15 |

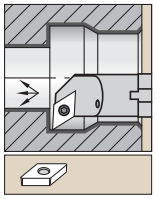


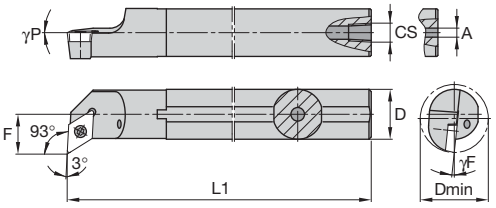



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B20 a B21, B47 y B75 a B76.

## E-SDQC 107,5°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2010111** | **E12QSDQCRO7** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -7.0 | 0.0 | DC..070204 | **12148080000** | T8 |
| **2031025** | **E16RSDQCR07** | 16 | 20,0 | 11,0 | 200 | — | — | -5.0 | 0.0 | DC..070204 | **12148080000** | T8 |
| **2023623** | **E20SSDQCR11** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -7.0 | 0.0 | DC..11T308 | **12148038800** | T15 |
| | **A izquierdas** | | | | | | | | | | | |
| **2031023** | **E12QSDQCL07** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -7.0 | 0.0 | DC..070204 | **12148080000** | T8 |
| **2010148** | **E16RSDQCL07** | 16 | 20,0 | 11,0 | 200 | — | — | -5.0 | 0.0 | DC..070204 | **12148080000** | T8 |
| **2023622** | **E20SSDQCL11** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -7.0 | 0.0 | DC..11T308 | **12148038800** | T15 |

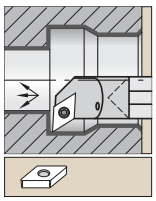


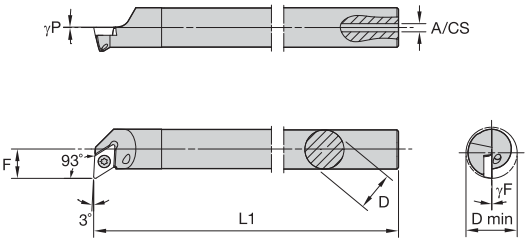



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B20 a B21, B47 y B75 a B76.

## A-SDUC 93°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | apoyo | tornillo del apoyo | hex. | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3883297** | **A10KSDUCR07** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -7.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3883294** | **A16RSDUCR07** | 16 | 20,0 | 11,0 | 200 | — | 1/8-27 NPT | -4.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3883293** | **A16RSDUCR11** | 16 | 20,0 | 11,0 | 200 | — | 1/8-27 NPT | -6.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883291** | **A20SSDUCR11** | 20 | 25,0 | 13,0 | 250 | — | 1/8-27 NPT | -5.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883288** | **A25TSDUCR11** | 25 | 32,0 | 17,0 | 300 | — | 1/8-27 NPT | -4.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883287** | **A32TSDUCR15** | 32 | 40,0 | 22,0 | 300 | — | 1/8-27 NPT | -7.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3883298** | **A10KSDUCL07** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -7.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3883296** | **A16RSDUCL07** | 16 | 20,0 | 11,0 | 200 | — | 1/8-27 NPT | -4.0 | 0.0 | DC..070204 | **—** | **—** | — | **MS1153** | T7 |
| **3883295** | **A16RSDUCL11** | 16 | 20,0 | 11,0 | 200 | — | 1/8-27 NPT | -6.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883292** | **A20SSDUCL11** | 20 | 25,0 | 13,0 | 250 | — | 1/8-27 NPT | -5.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883290** | **A25TSDUCL11** | 25 | 32,0 | 17,0 | 300 | — | 1/8-27 NPT | -4.0 | 0.0 | DC..11T308 | **—** | **—** | — | **MS1155** | T15 |
| **3883289** | **A32TSDUCL15** | 32 | 40,0 | 22,0 | 300 | — | 1/8-27 NPT | -7.0 | 0.0 | DC..150408 | **SKDP453** | **SRS4** | 4mm | **MS1158** | T15 |

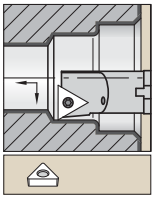


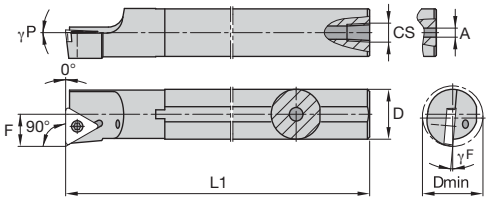



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B20 a B21, B47 y B75 a B76.

## E-SDUC 93°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2023611** | **E12QSDUCR07** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -7.0 | 0.0 | DC..070204 | **12148068700** | T8 |
| **2010157** | **E16RSDUCR07** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -5.0 | 0.0 | DC..070204 | **12148080000** | T8 |
| **2023624** | **E20SSDUCR11** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -7.0 | 0.0 | DC..11T308 | **12148038800** | T15 |
| **2023630** | **E25TSDUCR11** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -5.0 | 0.0 | DC..11T308 | **12148038800** | T15 |
| | **A izquierdas** | | | | | | | | | | | |
| **2023610** | **E12QSDUCL07** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -7.0 | 0.0 | DC..070204 | **12148068700** | T8 |
| **2023617** | **E16RSDUCL07** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -5.0 | 0.0 | DC..070204 | **12148080000** | T8 |
| **2010193** | **E20SSDUCL11** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -7.0 | 0.0 | DC..11T308 | **12148038800** | T15 |
| **2023629** | **E25TSDUCL11** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -5.0 | 0.0 | DC..11T308 | **12148038800** | T15 |

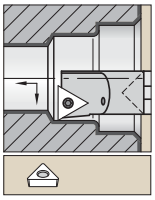


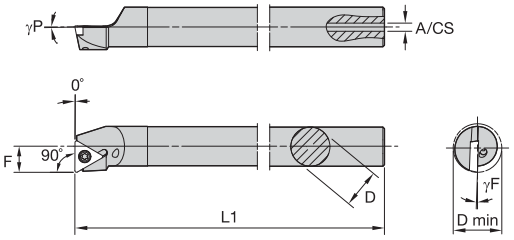



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B35, B48 y B82.

## A-STFC 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **3883382** | **A10KSTFCR11** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -7.0 | 0.0 | TC..110204 | **MS1153** | T7 |
| | **A izquierdas** | | | | | | | | | | | |
| **3883443** | **A10KSTFCL11** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -7.0 | 0.0 | TC..110204 | **MS1153** | T7 |

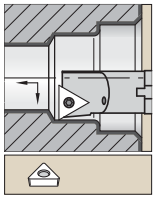


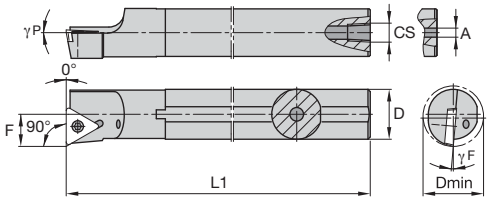



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B35, B48 y B82.

## E-STFC 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2031888** | **E10MSTFCR11** | 10 | 13,0 | 7,0 | 150 | 3,5 | — | -10.0 | 0.0 | TC..110204 | **12148068700** | T8 |
| **2031024** | **E12QSTFCR11** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -8.0 | 0.0 | TC..110204 | **12148068700** | T8 |
| **2010174** | **E16RSTFCR16** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -9.0 | 0.0 | TC..16T308 | **12148038800** | T15 |
| **2023626** | **E20SSTFCR16** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -7.0 | 0.0 | TC..16T308 | **12148038800** | T15 |
| **2023631** | **E25TSTFCR16** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -5.0 | 0.0 | TC..16T308 | **12148038800** | T15 |
| | **A izquierdas** | | | | | | | | | | | |
| **2010090** | **E10MSTFCL11** | 10 | 13,0 | 7,0 | 150 | 3,5 | — | -10.0 | 0.0 | TC..110204 | **12148068700** | T8 |
| **2010120** | **E12QSTFCL11** | 12 | 16,0 | 9,0 | 180 | 4,5 | — | -8.0 | 0.0 | TC..110204 | **12148068700** | T8 |
| **2023618** | **E16RSTFCL16** | 16 | 20,0 | 11,0 | 200 | 4,5 | — | -9.0 | 0.0 | TC..16T308 | **12148038800** | T15 |
| **2023625** | **E20SSTFCL16** | 20 | 25,0 | 13,0 | 250 | — | G 1/8 | -7.0 | 0.0 | TC..16T308 | **12148038800** | T15 |
| **2010233** | **E25TSTFCL16** | 25 | 32,0 | 17,0 | 300 | — | G 1/4 | -5.0 | 0.0 | TC..16T308 | **12148038800** | T15 |

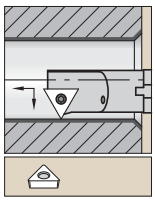


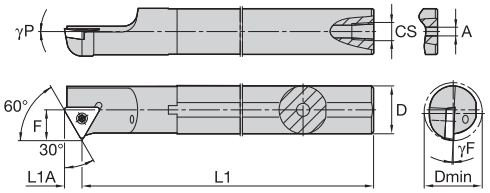



Mango de acero con refrigeración interna
Consulte las plaquitas de la página B84.

## A-STFP 90°

| Número de pedido | Número de catálogo | D | D min | F | L1 | A | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **3883446** | **A10KSTFPR11** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -4.0 | 0.0 | TP..110204 | **MS1153** | T7 |
| **3883444** | **A16RSTFPR11** | 16 | 20,0 | 11,0 | 200 | — | 1/16-27 NPT | 0.0 | 0.0 | TP..110204 | **MS1153** | T7 |
| | **A izquierdas** | | | | | | | | | | | |
| **3883447** | **A10KSTFPL11** | 10 | 13,0 | 7,0 | 125 | 3,2 | — | -4.0 | 0.0 | TP..110204 | **MS1153** | T7 |
| **3883445** | **A16RSTFPL11** | 16 | 20,0 | 11,0 | 200 | — | 1/16-27 NPT | 0.0 | 0.0 | TP..110204 | **MS1153** | T7 |

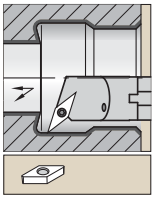


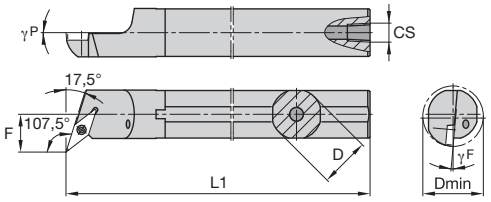



Mango de acero con refrigeración interna
Consulte las plaquitas de la página B84.

## A-STWP 60°

| Número de pedido | Número de catálogo | D | D min | F | L1 | L1A | A | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **3883448** | **A10KSTWPR11** | 10 | 13,0 | 7,0 | 125 | 5,0 | 3,2 | -4.0 | 0.0 | TP..110204 | **MS1153** | T7 |
| | **A izquierdas** | | | | | | | | | | | |
| **3883449** | **A10KSTWPL11** | 10 | 13,0 | 7,0 | 125 | 5,0 | 3,2 | -4.0 | 0.0 | TP..110204 | **MS1153** | T7 |

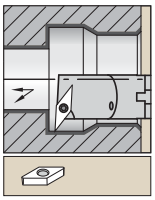


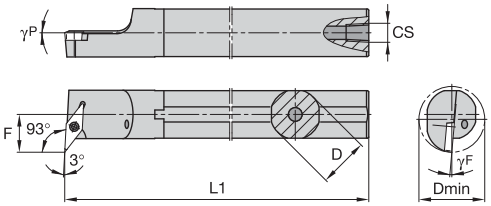



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B42, B49 y B85.

## A-SVQB 107,5°

| Número de pedido | Número de catálogo | D | D min | F | L1 | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **3883436** | **A16RSVQBR11** | 16 | 20,0 | 11,0 | 200 | 1/8-27 NPT | -7.0 | 0.0 | VB..110304 | **MS1153** | T7 |
| **3883434** | **A25TSVQBR16** | 25 | 32,0 | 17,0 | 300 | 1/4-18 NPT | -6.0 | 0.0 | VB..160408 | **MS1155** | T15 |
| | **A izquierdas** | | | | | | | | | | |
| **3883437** | **A16RSVQBL11** | 16 | 20,0 | 11,0 | 200 | 1/8-27 NPT | -7.0 | 0.0 | VB..110304 | **MS1153** | T7 |
| **3883435** | **A25TSVQBL16** | 25 | 32,0 | 17,0 | 300 | 1/4-18 NPT | -6.0 | 0.0 | VB..160408 | **MS1155** | T15 |

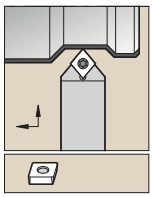


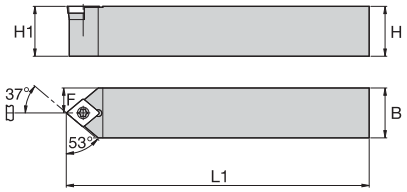



Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas B42, B49 y B85.

## A-SVUB 93°

| Número de pedido | Número de catálogo | D | D min | F | L1 | CS | γF° | γP° | plaquita guía | tornillo de la plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **3883440** | **A20SSVUBR11** | 20 | 25,0 | 13,0 | 250 | 1/8-27 NPT | -6.0 | 0.0 | VB..110304 | **MS1153** | T7 |
| **3883438** | **A25TSVUBR16** | 25 | 32,0 | 17,0 | 300 | 1/4-18 NPT | -6.0 | 0.0 | VB..160408 | **MS1155** | T15 |
| | **A izquierdas** | | | | | | | | | | |
| **3883441** | **A20SSVUBL11** | 20 | 25,0 | 13,0 | 250 | 1/8-27 NPT | -6.0 | 0.0 | VB..110304 | **MS1153** | T7 |
| **3883439** | **A25TSVUBL16** | 25 | 32,0 | 17,0 | 300 | 1/4-18 NPT | -6.0 | 0.0 | VB..160408 | **MS1155** | T15 |

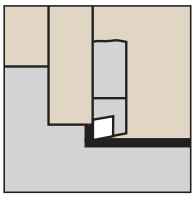


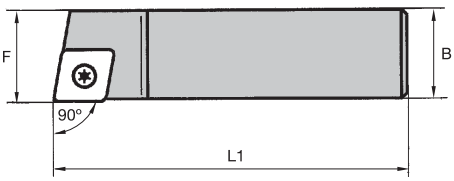


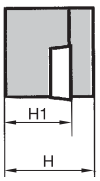

Consulte las plaquitas de las páginas B14 a B16, B46 y B70 a B71.

## 53°

| Número de pedido | Número de catálogo | B | F | H | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **2031094** | **12157210200** | 8,00 | 4,50 | 8,00 | 6,00 | 32,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031101** | **12157210600** | 10,00 | 5,00 | 10,00 | 7,50 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031111** | **12157211000** | 12,00 | 6,50 | 12,00 | 9,00 | 50,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031116** | **12157211400** | 16,00 | 8,00 | 16,00 | 12,00 | 60,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031109** | **12157200200** | 12,00 | 6,50 | 12,00 | 9,00 | 50,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2031262** | **12157200400** | 16,00 | 8,00 | 16,00 | 12,00 | 60,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2031137** | **12157201000** | 20,00 | 10,50 | 20,00 | 14,00 | 100,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| | **A izquierdas** | | | | | | | | | |
| **2028218** | **12157210300** | 8,00 | 4,50 | 8,00 | 6,00 | 32,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2012010** | **12157210700** | 10,00 | 5,00 | 10,00 | 7,50 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2012111** | **12157211100** | 12,00 | 6,50 | 12,00 | 9,00 | 50,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2012199** | **12157211500** | 16,00 | 8,00 | 16,00 | 12,00 | 60,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031107** | **12157200300** | 12,00 | 6,50 | 12,00 | 9,00 | 50,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2019362** | **12157200500** | 16,00 | 8,00 | 16,00 | 12,00 | 60,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2031135** | **12157201100** | 20,00 | 10,50 | 20,00 | 14,00 | 100,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |



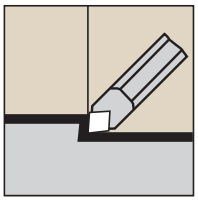


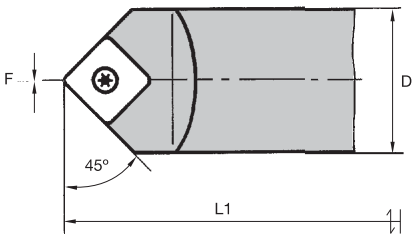



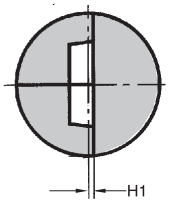

Consulte las plaquitas de las páginas B14 a B16, B46 y B70 a B71.

## 90°

| Número de pedido | Número de catálogo | B | F | H | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **2024102** | **12157210400** | 10,00 | 10,30 | 10,00 | 7,50 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031112** | **12157210800** | 12,00 | 12,30 | 12,00 | 9,00 | 50,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031117** | **12157211200** | 16,00 | 16,30 | 16,00 | 12,00 | 60,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031110** | **12157200600** | 12,00 | 12,30 | 12,00 | 9,00 | 50,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2012203** | **12157200800** | 16,00 | 16,30 | 16,00 | 12,00 | 60,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| | **A izquierdas** | | | | | | | | | |
| **2031100** | **12157210500** | 10,00 | 10,30 | 10,00 | 7,50 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2012113** | **12157210900** | 12,00 | 12,30 | 12,00 | 9,00 | 50,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031115** | **12157211300** | 16,00 | 16,30 | 16,00 | 12,00 | 60,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2031108** | **12157200700** | 12,00 | 12,30 | 12,00 | 9,00 | 50,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2031114** | **12157200900** | 16,00 | 16,30 | 16,00 | 12,00 | 60,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2031136** | **12157201300** | 20,00 | 20,30 | 20,00 | 14,00 | 100,00 | CC..09T3.. | **12148037700** | T15 | 3,0 |



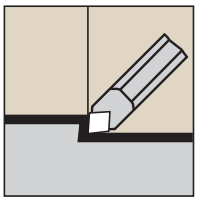


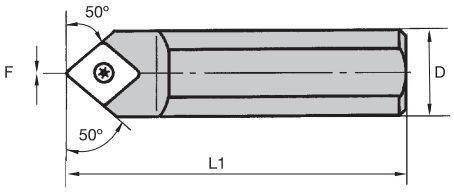



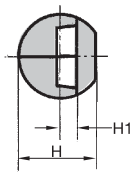

Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B29, B48 y B80.

## ■ 45°

| Número de pedido | Número de catálogo | D | F | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | | | |
| **2031213** | **S30MSSDCN12** | 30,00 | 0,00 | 0,50 | 150,00 | SC..1204.. | **12148007200** | T20 | 3,5 |



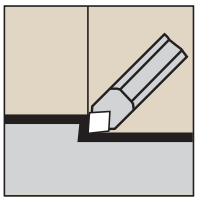


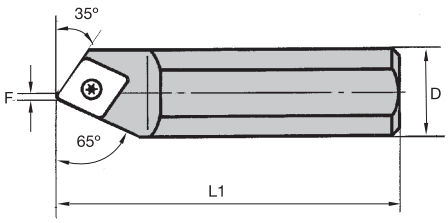



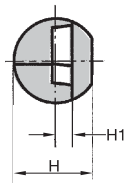

Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B14 a B16, B46 y B70 a B71.

## ■ 50°

| Número de pedido | Número de catálogo | D | F | H | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | | | | |
| **2024091** | **S08ASCMCN065** | 8,00 | 0,00 | 7,00 | 6,00 | 32,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2012035** | **S10BSCMCN06** | 10,00 | 0,00 | 9,00 | 7,00 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031113** | **S12DSCMCN06** | 12,00 | 0,00 | 11,00 | 8,00 | 60,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031119** | **S16FSCMCN09** | 16,00 | 0,00 | 15,00 | 10,00 | 80,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2030994** | **12157301800** | 16,00 | 0,00 | 15,00 | 10,00 | 80,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |



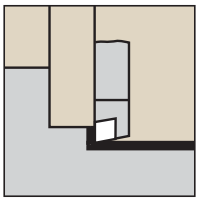


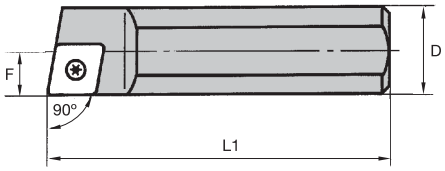



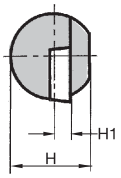

Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B14 a B16, B46 y B70 a B71.

## ■ 65°

| Número de pedido | Número de catálogo | D | F | H | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **2031097** | **S08ASCNCR06** | 8,00 | 1,00 | 7,00 | 2,00 | 32,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2024106** | **S10BSCQCR06** | 10,00 | 1,00 | 9,00 | 2,00 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| | **A izquierdas** | | | | | | | | | |
| **2031096** | **S08ASCNCL066** | 8,00 | 1,00 | 7,00 | 2,00 | 32,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2024105** | **S10BSCQCL06** | 10,00 | 1,00 | 9,00 | 2,00 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |



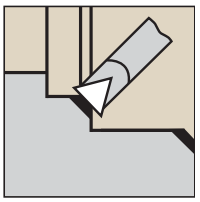


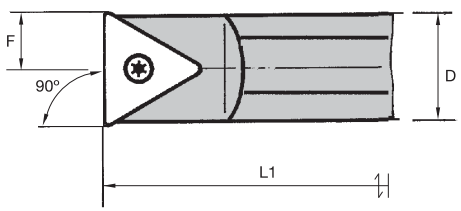



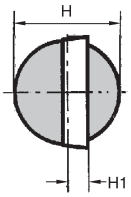

Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B14 a B16, B46 y B70 a B71.

## ■ 90°

| Número de pedido | Número de catálogo | D | F | H | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **2031103** | **S10BSCACR06** | 10,00 | 5,30 | 9,00 | 7,00 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2024123** | **S12DSCACR06** | 12,00 | 6,30 | 11,00 | 8,00 | 60,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031118** | **S16FSCACR09** | 16,00 | 8,00 | 15,00 | 10,00 | 80,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2030995** | **12157301400** | 16,00 | 8,00 | 15,00 | 10,00 | 80,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2030999** | **12157301600** | 20,00 | 10,00 | 18,00 | 10,50 | 125,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| | **A izquierdas** | | | | | | | | | |
| **2031095** | **S08ASCACL069** | 8,00 | 4,30 | 7,00 | 6,00 | 32,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2031102** | **S10BSCACL06** | 10,00 | 5,30 | 9,00 | 7,00 | 40,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2012133** | **S12DSCACL06** | 12,00 | 6,30 | 11,00 | 8,00 | 60,00 | CC..0602.. | **12148068700** | T8 | 1,0 |
| **2012209** | **S16FSCACL09** | 16,00 | 8,00 | 15,00 | 10,00 | 80,00 | CC..0903.. | **12148095100** | T15 | 3,0 |
| **2030993** | **12157301500** | 16,00 | 8,00 | 15,00 | 10,00 | 80,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |
| **2030998** | **12157301700** | 20,00 | 10,00 | 18,00 | 10,50 | 125,00 | CC..09T3.. | **12148095100** | T15 | 3,0 |






Mango de acero con refrigeración interna
Consulte las plaquitas de las páginas
B35, B48 y B82.

## ■ 90°

| Número de pedido | Número de catálogo | D | F | H | H1 | L1 | plaquita guía | tornillo de la plaquita | Torx | Nm |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | | | | |
| **2031104** | **S10BSTCCN11** | 10,00 | 5,20 | 9,00 | 2,00 | 40,00 | TC..1102.. | **12148068700** | T8 | 1,0 |
| **2012225** | **S16FSTCCN16** | 16,00 | 7,65 | 14,50 | 2,00 | 80,00 | TC..16T3.. | **12148038800** | T15 | 3,0 |

# Cartuchos

Las operaciones de mecanizado modernas exigen unos portaherramientas de alto rendimiento que proporcionen un diseño sencillo y una versatilidad de aplicación.

Los cartuchos WIDIA™ estándar son ideales para herramientas de torneado con uno o varios filos de corte. Una amplia gama de tamaños y estilos de cartuchos que ofrece múltiples posibilidades de aplicación y combinaciones.

## Sistema de fijación M

- Amarre combinado pasador/cuña para plaquitas negativas.
- Un sistema de fijación extremadamente resistente, diseñado especialmente para cortes interrumpidos.
- Un apoyo de metal duro protege a la herramienta.

## Sistema de fijación P

- Un sistema de fijación tipo palanca para plaquitas intercambiables negativas con un orificio según el estándar DIN 4988 y plaquitas redondas positivas con un diámetro superior a los 20,0 mm.
- Las plaquitas con geometrías de control de virutas en una o dos caras tienen desprendimientos positivos de 6° a 18°.
- Las ventajas de este sistema son unos cambios rápidos de las plaquitas y la no interferencia con el flujo de virutas.

Un montaje sencillo y seguro en la herramienta con un solo tornillo de amarre.

Mismos sistemas de fijación que los portaherramientas de torneado estándar.

Una alta precisión en la dimensión “F” asegura una aplicación apropiada dentro de las dimensiones de mandrinado mínimas.

Los tamaños generales de los estándares DIN e ISO son ideales para las herramientas de centrado, mandrinado y torneado con uno o varios dientes.

Posicionamiento axial y radial preciso mediante tornillos de ajuste.

## Sistema de fijación C

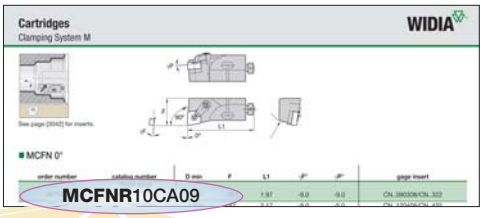
- Sistema de fijación superior para plaquitas intercambiables negativas y positivas según el estándar DIN 4968.
- Este sistema de fijación universal es robusto y de manejo sencillo.
- Algunas fijaciones ajustables en altura permiten el uso de rompevirutas adicionales.
- Un apoyo de metal duro ofrece una mayor protección a la herramienta.

## Sistema de fijación S

- Sistema de fijación por tornillo para plaquitas intercambiables positivas con orificio avellanado según el estándar DIN 4967.
- Diseño compacto que emplea un mínimo de recambios para una gran fiabilidad y rentabilidad.
- Un apoyo de metal duro ofrece una mayor protección a la herramienta.
- Portaherramientas con alturas de filo de corte ascendente de 16,0 mm y plaquitas IC de 9,52 mm fijas mediante un casquillo roscado.

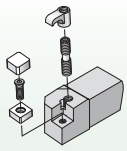
## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.



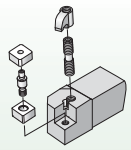

### M
Sistema de fijación de plaquitas

**C**



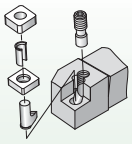
Fijación superior mediante brida para plaquitas sin orificio

**M**



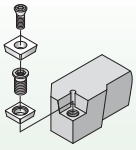
Fijación superior y de orificios para plaquitas con agujero

**P**



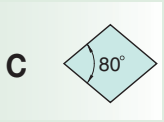
Fijación de plaquitas mediante palanca de ajuste para plaquita con orificio

**S**

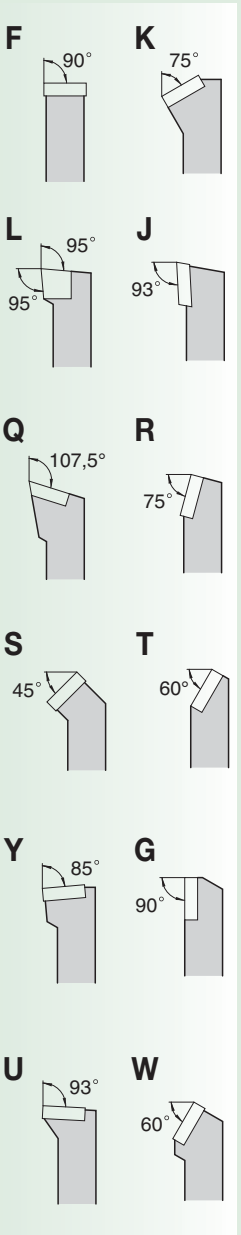


Fijación central mediante tornillo para plaquitas con orificio

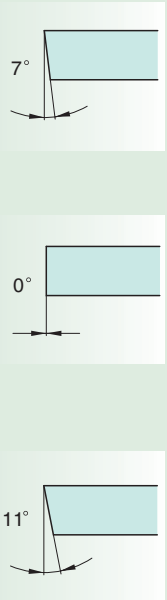
### C
Forma de la plaquita




### F
Cartucho Tipo

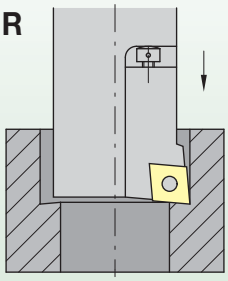



### N
Características de la Ángulo de incidencia

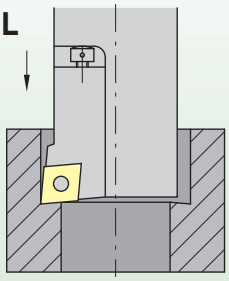



### R
Dirección de la herramienta

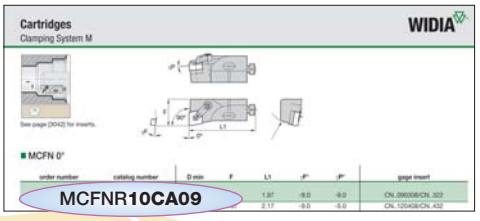
Cartucho a derechas



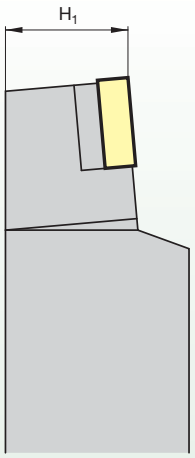

Cartucho a izquierdas



*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*



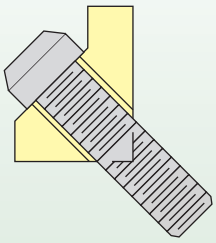

| 10 | C | A | 09 | |
|---|---|---|---|---|
| Tamaño del cartucho | Código de identificación del cartucho | Diseño de montaje del cartucho | Tamaño de la plaquita Longitud del filo de corte L10 | Información adicional |

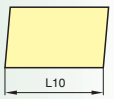


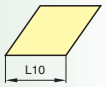

**H1** = altura del filo de corte del cartucho, en mm.

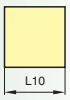
**C** = cartucho

Diseño A según la ISO 5611



**C** 


**D** 

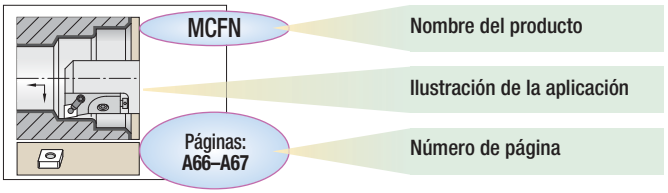

**S** 


**T**


**W**

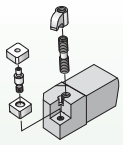

**R**

Cada sistema de fijación exclusivo ofrece distintos productos para satisfacer sus necesidades de portaherramientas específicas. Busque la ilustración que se ajuste a su aplicación y visite la página correspondiente para conseguir la solución correcta.

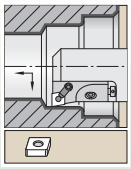



## Sistema de fijación M

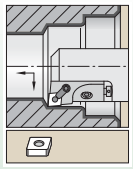
**M**

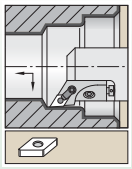


Pasador combinado/fijación de cuña de apriete para plaquitas negativas. Un sistema de fijación extremadamente resistente, diseñado especialmente para cortes interrumpidos. Un apoyo de metal duro protege a la herramienta.


MCFN
90°
Páginas:
**A66–A67**

MCKN
75°
Páginas:
**A66–A67**

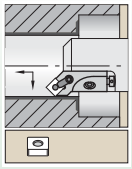

MCLN
95°
Páginas:
**A68–A69**

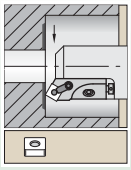

MDJN
93°
Páginas:
**A68–A69**

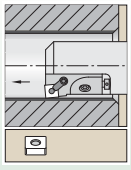
MDQN
107,5°
Páginas:
**A70–A71**

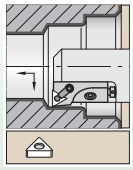
MSKN
75°
Páginas:
**A70–A71**

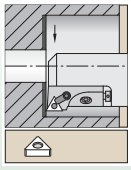
MSRN
75°
Páginas:
**A72–A73**


MSSN
45°
Páginas:
**A72–A73**


MSTN
60°
Páginas:
**A74–A75**

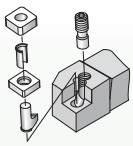

MSYN
85°
Páginas:
**A74–A75**


MTFN
90°
Páginas:
**A76–A77**


MTGN
90°
Páginas:
**A76–A77**

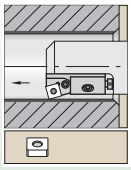
## Sistema de fijación P

**P**



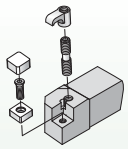
Un sistema de fijación tipo palanca para plaquitas intercambiables negativas con un orificio según el estándar DIN 4988 y plaquitas redondas positivas con un diámetro superior a los 20,0 mm. Las plaquitas con geometrías de control de virutas en una o dos caras tienen desprendimientos positivos de 6° a 18°. Las ventajas de este sistema son unos cambios rápidos de las plaquitas y la no interferencia con el flujo de virutas.

PCLN
95°
Páginas:
**A78–A79**


PSKN
75°
Páginas:
**A78–A79**

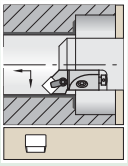
## Sistema de fijación C

**C**

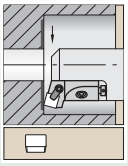


Sistema de fijación superior para plaquitas intercambiables negativas y positivas según el estándar DIN 4968. Este sistema de fijación universal es resistente y fácil de manejar. Algunas fijaciones ajustables en altura permiten el uso de rompevirutas adicionales. Un apoyo de metal duro ofrece una mayor protección a la herramienta.

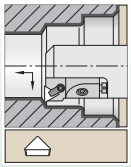
CSKP
75°
Páginas:
**A80–A81**



CSSP
45°
Páginas:
**A80–A81**



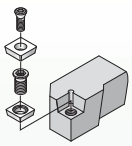
CSRP
75°
Páginas:
**A80–A81**



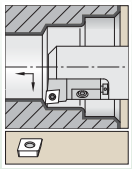
CTFP
90°
Páginas:
**A82–A83**

## Sistema de fijación S

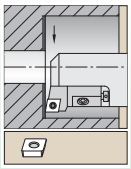
**S**



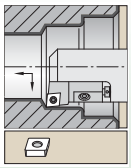
Sistema de fijación por tornillo para plaquitas intercambiables positivas con orificio avellanado según el estándar DIN 4967. Diseño compacto que emplea un mínimo de recambios para una gran fiabilidad y rentabilidad. Un apoyo de metal duro ofrece una mayor protección a la herramienta. Portaherramientas con alturas de filo de corte ascendente de 16,0 mm y plaquitas IC de 9,52 fijas mediante un casquillo roscado.



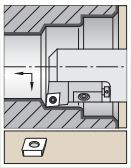
SCFP
90°
Páginas:
**A84–A85**



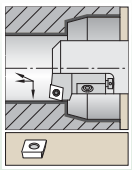
SCGP
90
Páginas:
**A84–A85**



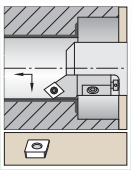
SCLC
95°
Páginas:
**A84–A85**



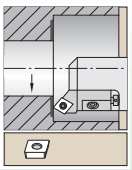
SCLP
95°
Páginas:
**A86–A87**



SCRP
75°
Páginas:
**A86–A87**

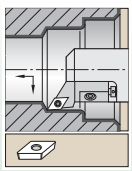


SCSP
45°
Páginas:
**A88–A89**

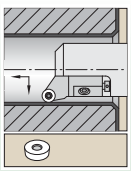


SCTP
60°
Páginas:
**A88–A89**

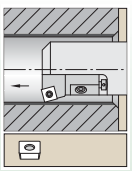
SCWP
60°
Páginas:
**A88–A89**



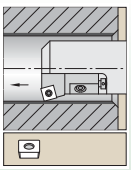
SDJP
93°
Páginas:
**A90–A91**



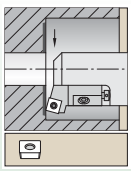
SRGC
Páginas:
**A90–A91**



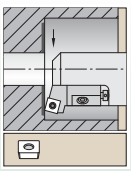
SSKC
75°
Páginas:
**A90–A91**



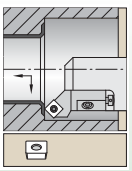
SSKP
75°
Páginas:
**A92–A93**



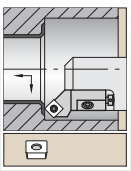
SSRC
75°
Páginas:
**A92–A93**



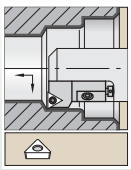
SSRP
75°
Páginas:
**A92–A93**



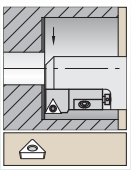
SSSC
45°
Páginas:
**A94–A95**



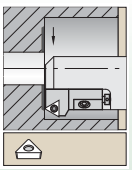
SSSP
45°
Páginas:
**A94–A95**



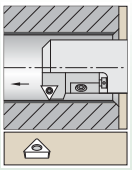
STFP
90°
Páginas:
**A96–A97**



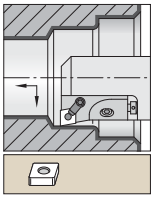
STGP
90°
Páginas:
**A96–A97**

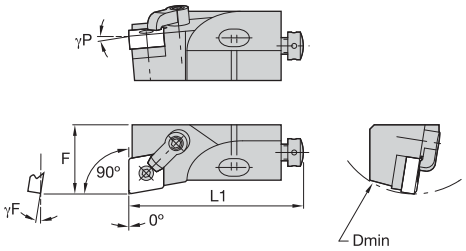


STTP
60°
Páginas:
**A98–A99**



STWP
60°
Páginas:
**A98–A99**

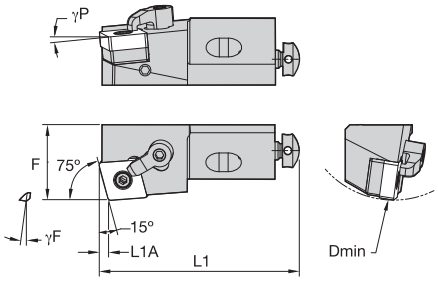





Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.

## MCFN 90°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870421** | **MCFNR10CA09** | 40 | 14,0 | 50 | -9.0 | -9.0 | CN..090308/CN..322 |
| **3870420** | **MCFNR12CA12** | 50 | 20,0 | 55 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870419** | **MCFNR16CA12** | 60 | 25,0 | 63 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870418** | **MCFNR20CA12** | 70 | 25,0 | 70 | -9.0 | -5.0 | CN..120408/CN..432 |
| | **A izquierdas** | | | | | | |
| **3870423** | **MCFNL12CA12** | 50 | 20,0 | 55 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870422** | **MCFNL16CA12** | 60 | 25,0 | 63 | -9.0 | -5.0 | CN..120408/CN..432 |



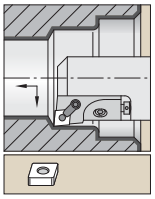

Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.

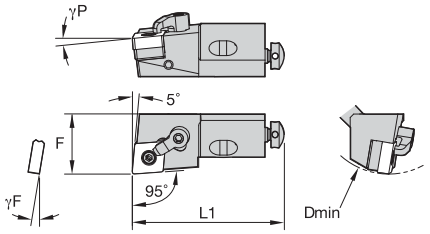
## MCKN 75°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870416** | **MCKNR12CA12** | 50 | 20,0 | 55 | 3,08 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870415** | **MCKNR16CA12** | 60 | 25,0 | 63 | 3,08 | -9.0 | -5.0 | CN..120408/CN..432 |
| | **A izquierdas** | | | | | | | |
| **3870417** | **MCKNL12CA12** | 50 | 20,0 | 55 | 3,08 | -9.0 | -5.0 | CN..120408/CN..432 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ICSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ICSN432 | KLM46 | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ICSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ICSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |

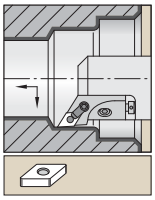


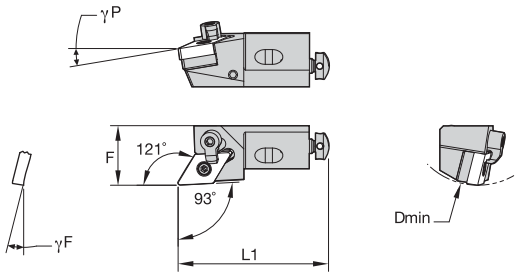



Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.

## MCLN 95°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870410** | **MCLNR12CA12** | 50 | 20,0 | 55 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870409** | **MCLNR16CA12** | 60 | 25,0 | 63 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870408** | **MCLNR20CA12** | 70 | 25,0 | 70 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870407** | **MCLNR25CA19** | 100 | 32,0 | 100 | -9.0 | -5.0 | CN..190612/CN..643 |
| | **A izquierdas** | | | | | | |
| **3870414** | **MCLNL12CA12** | 50 | 20,0 | 55 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870413** | **MCLNL16CA12** | 60 | 25,0 | 63 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870412** | **MCLNL20CA12** | 70 | 25,0 | 70 | -9.0 | -5.0 | CN..120408/CN..432 |
| **3870411** | **MCLNL25CA19** | 100 | 32,0 | 100 | -9.0 | -5.0 | CN..190612/CN..643 |





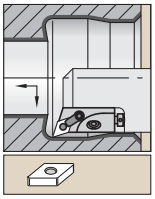

Consulte las plaquitas de las páginas B22 a B25, B52 y B76 a B78.

## MDJN 93°

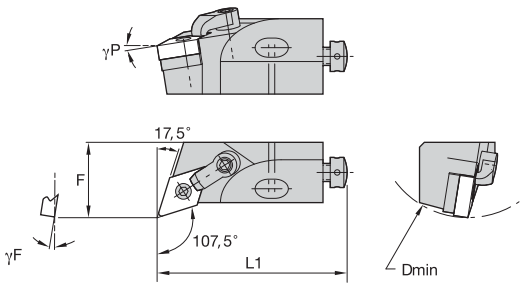
| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870405** | **MDJNR16CA15** | 60 | 25,0 | 63 | -9.0 | -9.0 | DN..150408/DN..3.532 |
| **3870404** | **MDJNR20CA15** | 70 | 25,0 | 70 | -8.5 | -8.5 | DN..150408/DN..3.532 |
| | **A izquierdas** | | | | | | |
| **3870406** | **MDJNL16CA15** | 60 | 25,0 | 63 | -9.0 | -9.0 | DN..150408/DN..3.532 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | **KLM43** | 2mm | **CKM34** | **STCM38** | 2mm | **KUAM22** | 2mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **ICSN432** | **KLM46S** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **ICSN432** | **KLM46** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **ICSN633** | **KLM68** | 4mm | **CKM35** | **STCM8** | 4mm | **KUAM27** | 4mm | **KUAM32** | **MS364** | 8mm | **CSWM 100 080** |
| – | **KLM43** | 2mm | **CKM34** | **STCM38** | 2mm | **KUAM22** | 2mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **ICSN432** | **KLM46S** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **ICSN432** | **KLM46** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **ICSN633** | **KLM68** | 4mm | **CKM35** | **STCM8** | 4mm | **KUAM27** | 4mm | **KUAM32** | **MS364** | 8mm | **CSWM 100 080** |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IDSN432** | **KLM46S** | 2.5mm | **CKM36** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **IDSN432** | **KLM46** | 2.5mm | **CKM41** | **STCM40** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **IDSN432** | **KLM46S** | 2.5mm | **CKM36** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |



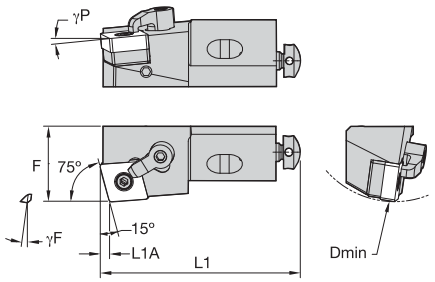
Consulte las plaquitas de las páginas B22 a B25, B52 y B76 a B78.




## MDQN 107,5°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870361** | **MDQNR16CA15** | 60 | 25,0 | 63 | -9.0 | -6.0 | DN..150408/DN..3.532 |
| **3870360** | **MDQNR20CA15** | 70 | 25,0 | 70 | -9.0 | -8.0 | DN..150408/DN..3.532 |
| | **A izquierdas** | | | | | | |
| **3870403** | **MDQNL16CA15** | 60 | 25,0 | 63 | -9.0 | -6.0 | DN..150408/DN..3.532 |
| **3870362** | **MDQNL20CA15** | 70 | 25,0 | 70 | -9.0 | -8.0 | DN..150408/DN..3.532 |

Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.

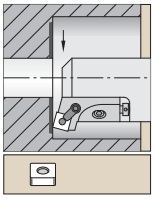


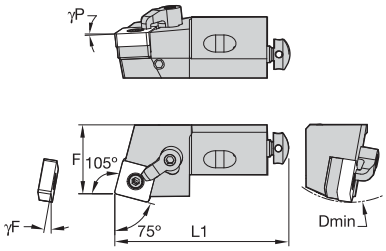

## MSKN 75°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870352** | **MSKNR10CA09** | 40 | 14,0 | 50 | 2,22 | -9.0 | -5.0 | SN..090308/SN..322 |
| **3870351** | **MSKNR12CA12** | 50 | 20,0 | 55 | 3,04 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870350** | **MSKNR16CA12** | 60 | 25,0 | 63 | 3,04 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870349** | **MSKNR20CA15** | 70 | 25,0 | 70 | 3,74 | -9.0 | -5.0 | SN..150612/SN..543 |
| **3870348** | **MSKNR25CA19** | 100 | 32,0 | 100 | 4,56 | -9.0 | -5.0 | SN..190612/SN..543 |
| | **A izquierdas** | | | | | | | |
| **3870356** | **MSKNL10CA09** | 40 | 14,0 | 50 | 2,22 | -9.0 | -5.0 | SN..090308/SN..322 |
| **3870355** | **MSKNL12CA12** | 50 | 20,0 | 55 | 3,04 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870354** | **MSKNL16CA12** | 60 | 25,0 | 63 | 3,04 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870353** | **MSKNL20CA15** | 70 | 25,0 | 70 | 3,74 | -9.0 | -5.0 | SN..150612/SN..543 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **IDSN432** | **KLM46S** | 2.5mm | **CKM36** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **IDSN432** | **KLM46** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **IDSN432** | **KLM46S** | 2.5mm | **CKM36** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **IDSN432** | **KLM46** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **–** | **KLM33** | 2mm | **CKM36** | **STCM38** | 2mm | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **–** | **KLM43** | 2mm | **CKM34** | **STCM38** | 2mm | **KUAM22** | 2mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **ISSN432** | **KLM46S** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **SKSN566K** | **KLM54** | 2.5mm | **CKM37** | **STCM40** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **ISSN633** | **KLM68** | 4mm | **CKM35** | **STCM8** | 4mm | **KUAM27** | 4mm | **KUAM32** | **MS364** | 8mm | **CSWM 100 080** |
| **–** | **KLM33** | 2mm | **CKM36** | **STCM38** | 2mm | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **–** | **KLM43** | 2mm | **CKM34** | **STCM38** | 2mm | **KUAM22** | 2mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **ISSN432** | **KLM46S** | 2.5mm | **CKM34** | **STCM9** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **SKSN566K** | **KLM54** | 2.5mm | **CKM37** | **STCM40** | 2.5mm | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |

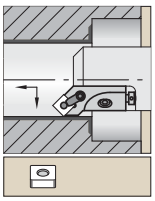


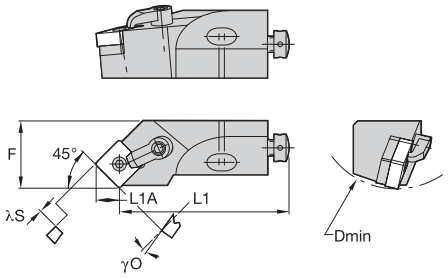



Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.

## MSRN 75°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870344** | **MSRNR10CA09** | 40 | 14,0 | 50 | -9.0 | -5.0 | SN..090308/SN..322 |
| **3870343** | **MSRNR12CA12** | 50 | 20,0 | 55 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870342** | **MSRNR16CA12** | 60 | 25,0 | 63 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870341** | **MSRNR20CA15** | 70 | 25,0 | 70 | -9.0 | -5.0 | SN..150612/SN..543 |
| | **A izquierdas** | | | | | | |
| **3870347** | **MSRNL12CA12** | 50 | 20,0 | 55 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870346** | **MSRNL16CA12** | 60 | 25,0 | 63 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870345** | **MSRNL20CA15** | 70 | 25,0 | 70 | -9.0 | -5.0 | SN..150612/SN..543 |





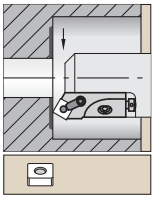

Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.

## MSSN 45°

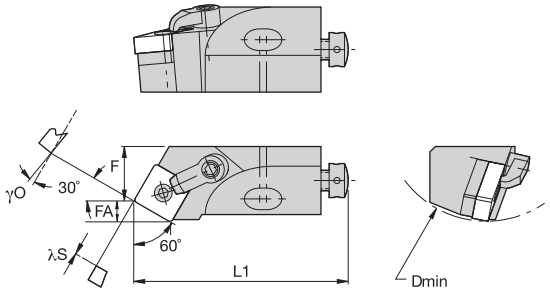
| Número de pedido | Número de catálogo | D min | F | L1 | L1A | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870336** | **MSSNR10CA09** | 40 | 14,0 | 44 | 6,09 | -13.0 | 0.0 | SN..090308/SN..322 |
| **3870335** | **MSSNR12CA12** | 50 | 20,0 | 47 | 8,33 | -13.0 | 0.0 | SN..120408/SN..432 |
| **3870334** | **MSSNR16CA12** | 60 | 25,0 | 53 | 8,33 | -13.0 | 0.0 | SN..120408/SN..432 |
| **3870333** | **MSSNR20CA15** | 70 | 25,0 | 60 | 10,25 | -13.0 | 0.0 | SN..150612/SN..543 |
| | **A izquierdas** | | | | | | | |
| **3870340** | **MSSNL10CA09** | 40 | 14,0 | 44 | 6,09 | -13.0 | 0.0 | SN..090308/SN..322 |
| **3870339** | **MSSNL12CA12** | 50 | 20,0 | 47 | 8,33 | -13.0 | 0.0 | SN..120408/SN..432 |
| **3870338** | **MSSNL16CA12** | 60 | 25,0 | 53 | 8,33 | -13.0 | 0.0 | SN..120408/SN..432 |
| **3870337** | **MSSNL20CA15** | 70 | 25,0 | 60 | 10,25 | -13.0 | 0.0 | SN..150612/SN..543 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ISSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| SKSN566K | KLM54 | 2.5mm | CKM37 | STCM40 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ISSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| SKSN566K | KLM54 | 2.5mm | CKM37 | STCM40 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ISSN432 | KLM46S | 2.5mm | CKM36 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| SKSN566K | KLM54 | 2.5mm | CKM37 | STCM40 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ISSN432 | KLM46S | 2.5mm | CKM36 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| SKSN566K | KLM54 | 2.5mm | CKM37 | STCM40 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

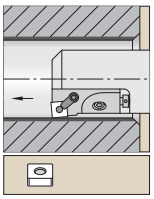


Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.

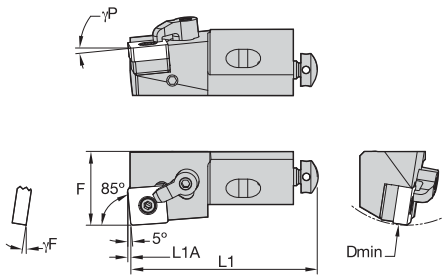



## MSTN 60°

| Número de pedido | Número de catálogo | D min | F | L1 | FA | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870312** | **MSTNR10CA09** | 40 | 9,0 | 50 | 13,31 | -11.0 | 0.0 | SN..090308/SN..322 |
| **3870311** | **MSTNR12CA12** | 50 | 13,0 | 55 | 5,86 | -11.0 | 0.0 | SN..120408/SN..432 |
| **3870310** | **MSTNR16CA12** | 60 | 15,0 | 63 | 5,90 | 0.0 | -11.0 | SN..120408/SN..432 |



Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.

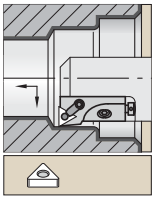


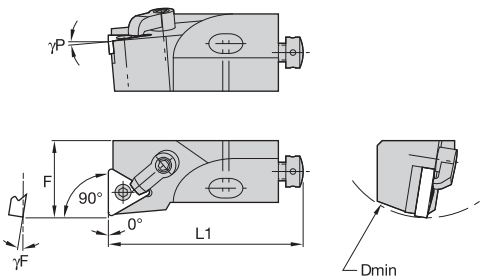

## MSYN 85°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870308** | **MSYNR10CA09** | 40 | 14,0 | 50 | 0,75 | -9.0 | -5.0 | SN..090308/SN..322 |
| **3870307** | **MSYNR12CA12** | 50 | 20,0 | 55 | 1,02 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870306** | **MSYNR16CA12** | 60 | 25,0 | 63 | 1,02 | -9.0 | -5.0 | SN..120408/SN..432 |
| **3870305** | **MSYNR25CA19** | 100 | 32,0 | 100 | 1,54 | -9.0 | -5.0 | SN..190612/SN..643 |
| | **A izquierdas** | | | | | | | |
| **3870309** | **MSYNL10CA09** | 40 | 14,0 | 50 | 0,75 | -9.0 | -5.0 | SN..090308/SN..322 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ISSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | KLM43 | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ISSN432 | KLM46S | 2.5mm | CKM34 | STCM9 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ISSN633 | KLM68 | 4mm | CKM35 | STCM8 | 4mm | KUAM27 | 4mm | KUAM33 | MS364 | 8mm | CSWM 100 080 |
| – | KLM33 | 2mm | CKM36 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |

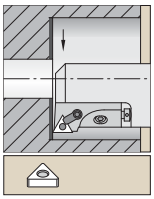


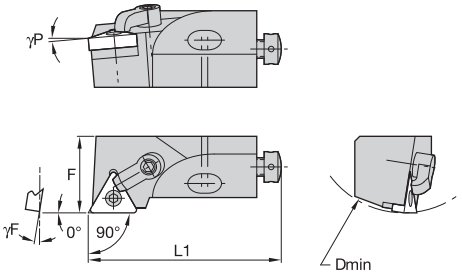



Consulte las plaquitas de las páginas B36 a B39, B58 y B83.

## MTFN 90°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871303** | **MTFNR12CA16** | 50 | 20,0 | 55 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871302** | **MTFNR16CA16** | 60 | 25,0 | 63 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871301** | **MTFNR20CA22** | 70 | 25,0 | 70 | -9.0 | -5.0 | TN..220408/TN..432 |
| **3871300** | **MTFNR25CA27** | 100 | 32,0 | 100 | -9.0 | -5.0 | TN..270612/TN..443 |
| | **A izquierdas** | | | | | | |
| **3871306** | **MTFNL12CA16** | 50 | 20,0 | 55 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871305** | **MTFNL16CA16** | 60 | 25,0 | 63 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871304** | **MTFNL20CA22** | 70 | 25,0 | 70 | -9.0 | -5.0 | TN..220408/TN..432 |





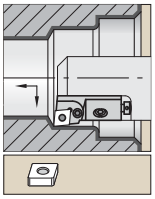

Consulte las plaquitas de las páginas B36 a B39, B58 y B83.

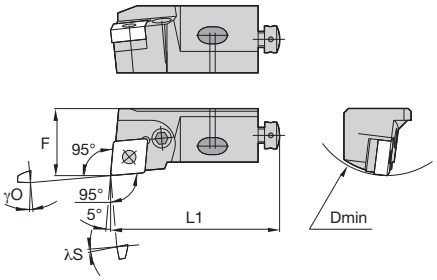
## MTGN 90°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871296** | **MTGNR12CA16** | 50 | 20,0 | 55 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871295** | **MTGNR16CA16** | 60 | 25,0 | 63 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871294** | **MTGNR20CA22** | 70 | 25,0 | 70 | -9.0 | -5.0 | TN..220408/TN..432 |
| | **A izquierdas** | | | | | | |
| **3871299** | **MTGNL12CA16** | 50 | 20,0 | 55 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871298** | **MTGNL16CA16** | 60 | 25,0 | 63 | -9.0 | -5.0 | TN..160408/TN..332 |
| **3871297** | **MTGNL20CA22** | 70 | 25,0 | 70 | -9.0 | -5.0 | TN..220408/TN..432 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33L | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ITSN322 | KLM34L | 2mm | CKM34 | STCM9 | 2mm | KUAM25 | 2mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ITSN433 | KLM46 | 2.5mm | CKM35 | STCM37 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ITSN534 | KLM58 | 3mm | CKM38 | STCM39 | 3mm | KUAM26 | 3mm | KUAM32 | MS364 | 8mm | CSWM 100 080 |
| – | KLM33L | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ITSN322 | KLM34L | 2mm | CKM34 | STCM9 | 2mm | KUAM25 | 2mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ITSN433 | KLM46 | 2.5mm | CKM35 | STCM37 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

| apoyo | pasador de fijación | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | KLM33L | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ITSN322 | KLM34L | 2mm | CKM34 | STCM9 | 2mm | KUAM25 | 2mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ITSN433 | KLM46 | 2.5mm | CKM35 | STCM37 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| – | KLM33L | 2mm | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| ITSN322 | KLM34L | 2mm | CKM34 | STCM9 | 2mm | KUAM25 | 2mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| ITSN433 | KLM46 | 2.5mm | CKM35 | STCM37 | 2.5mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

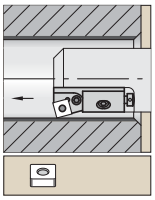


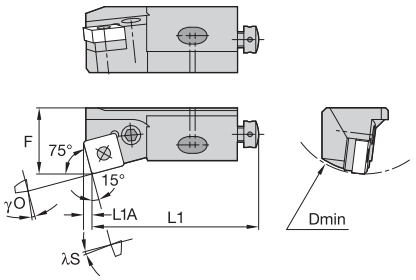



Consulte las plaquitas de las páginas B16 a B19, B46, B50 y B72 a B73.

## ■ PCLN 95°

| Número de pedido | Número de catálogo | D min | F | L1 | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871291** | **PCLNR12CA12** | 50 | 20,0 | 55 | -6.0 | -9.0 | CN..120408/CN..432 |
| **3871290** | **PCLNR16CA12** | 60 | 25,0 | 63 | -6.0 | -7.0 | CN..120408/CN..432 |
| | **A izquierdas** | | | | | | |
| **3871293** | **PCLNL16CA12** | 60 | 25,0 | 63 | -6.0 | -7.0 | CN..120408/CN..432 |
| **3871292** | **PCLNL20CA16** | 70 | 25,0 | 70 | — | — | CN..160612/CN..543 |





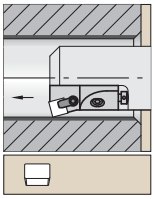

Consulte las plaquitas de las páginas B30 a B33, B55 a B56 y B81.

## ■ PSKN 75°

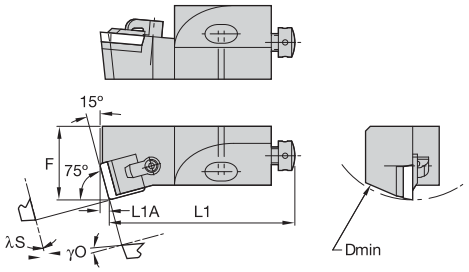
| Número de pedido | Número de catálogo | D min | F | L1 | L1A | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3871287** | **PSKNR12CA12** | 50 | 20,0 | 55 | 3,05 | -8.0 | -6.0 | SN..120408/SN..432 |
| **3871286** | **PSKNR16CA12** | 60 | 25,0 | 63 | 3,05 | -6.0 | -6.0 | SN..120408/SN..432 |
| **3871289** | **PSKNR20CA15** | 70 | 25,0 | 70 | 3,75 | — | — | SN..150612/SN..543 |
| | **A izquierdas** | | | | | | | |
| **3871288** | **PSKNL16CA12** | 60 | 25,0 | 63 | 3,05 | -6.0 | -6.0 | SN..120408/SN..432 |

| apoyo | pasador de apoyo | palanca | tornillo de palanca | Torx Plus | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|
| – | – | 511.022 | 514.122 | 10 IP | KUAM28 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| 512.112 | 513.023 | 511.023 | 514.123 | 15 IP | KUAM23 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| 512.112 | 513.023 | 511.023 | 514.123 | 15 IP | KUAM23 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| 512.117 | 513.025 | 511.025 | 514.125 | 15 IP | KUAM23 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

| apoyo | pasador de apoyo | palanca | tornillo de palanca | Torx Plus | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|
| – | – | 511.022 | 514.122 | 10 IP | KUAM28 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| 512.063 | 513.023 | 511.023 | 514.123 | 15 IP | KUAM23 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| 512.025 | 513.025 | 511.025 | 514.125 | 15 IP | KUAM23 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| 512.063 | 513.023 | 511.023 | 514.123 | 15 IP | KUAM23 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

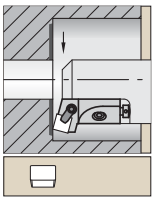


Consulte las plaquitas de las páginas B34 y B57.

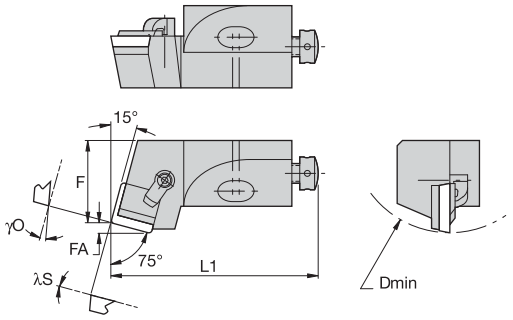



## ■ CSKP 75°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870437** | **CSKPR10CA3** | 40 | 14,0 | 50 | 2,24 | 0.0 | 5.0 | SP..090308/SP..322 |
| **3870436** | **CSKPR12CA4** | 50 | 20,0 | 55 | 3,06 | 0.0 | 5.0 | SP..120308/SP..422 |



Consulte las plaquitas de las páginas B34 y B57.

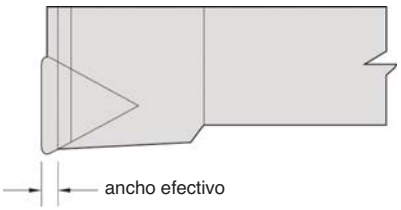



## ■ CSRP 75°

| Número de pedido | Número de catálogo | D min | F | L1 | FA | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870435** | **CSRPR10CA3** | 40 | 14,0 | 50 | 2,20 | 0.0 | 0.0 | SP..090308/SP..322 |
| **3870434** | **CSRPR12CA4** | 50 | 20,0 | 55 | 3,02 | 3.0 | 0.0 | SP..120308/SP..422 |

## Rompevirutas para cartuchos tipo C

| plaquita | rompevirutas | ancho efectivo |
|---|---|---|
| SP..090308/SP..322 | CBS-12 | 2.1 |
| – | CBS-12D** | 2.1 |
| SP..120308/SP..422 | CBS16 | 4.4 |
| – | CBS-16D** | 2.8 |
| – | CBS-16N | 3.0 |
| – | CBS16F | 2.1 |

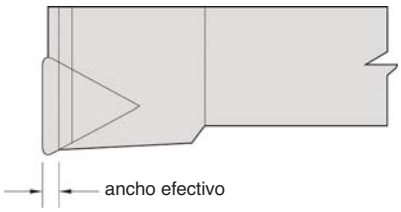



***Para rompevirutas en filos de corte principales y secundarios.*

| amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|
| CKM34 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |

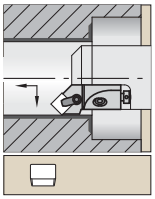
## Rompevirutas para cartuchos tipo C

| plaquita | rompevirutas | ancho efectivo |
|---|---|---|
| SP..090308/SP..322 | CBS-12 | 2.1 |
| – | CBS-12D** | 2.1 |
| SP..120308/SP..422 | CBS16 | 4.4 |
| | CBS-16D** | 2.8 |
| – | CBS-16N | 3.0 |
| – | CBS16F | 2.1 |

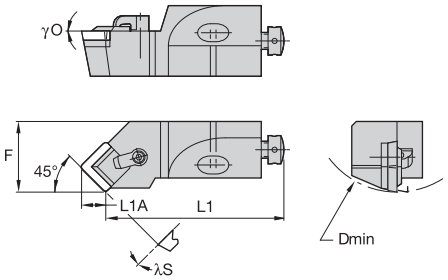



***Para rompevirutas en filos de corte principales y secundarios.*

| amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|
| CKM34 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |

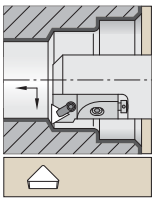


Consulte las plaquitas de las páginas B34 y B57.

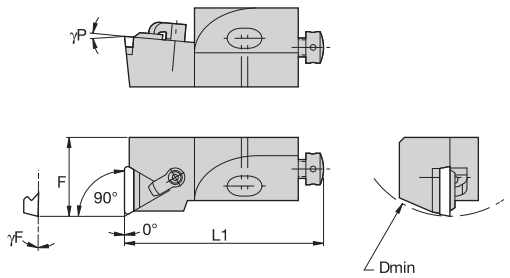



## CSSP 45°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870430** | **CSSPR10CA3** | 40 | 14,0 | 44 | 6,08 | 0.0 | 0.0 | SP..090308/SP..322 |
| **3870429** | **CSSPR12CA4** | 50 | 20,0 | 47 | 8,32 | 0.0 | 0.0 | SP..120308/SP..422 |
| | **A izquierdas** | | | | | | | |
| **3870433** | **CSSPL10CA3** | 40 | 14,0 | 44 | 6,08 | 0.0 | 0.0 | SP..090308/SP..322 |
| **3870432** | **CSSPL12CA4** | 50 | 20,0 | 47 | 8,32 | 0.0 | 0.0 | SP..120308/SP..422 |
| **3870431** | **CSSPL20CA4** | 70 | 25,0 | 60 | 8,33 | 0.0 | 0.0 | SP..120308/SP..422 |



Consulte las plaquitas de las páginas B40 a B41, B58 y B83.

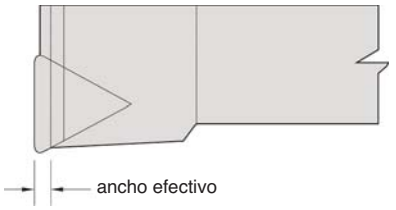



## CTFP 90°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870427** | **CTFPR10CA2** | 40 | 14,0 | 50 | 0.0 | 5.0 | TP..110304/TP..421 |
| **3870426** | **CTFPR12CA3** | 50 | 20,0 | 55 | 0.0 | 5.0 | TP..160308/TP..322 |
| **3870425** | **CTFPR16CA3** | 60 | 25,0 | 63 | 0.0 | 5.0 | TP..160308/TP..322 |
| **3870424** | **CTFPR20CA4** | 70 | 25,0 | 70 | 0.0 | 5.0 | TP..220408/TP..432 |
| | **A izquierdas** | | | | | | |
| **3870428** | **CTFPL12CA3** | 50 | 20,0 | 55 | 0.0 | 5.0 | TP..160308/TP..322 |

## Rompevirutas para cartuchos tipo C

| plaquita | rompevirutas | ancho efectivo |
|---|---|---|
| SP..090308/SP..322 | CBS-12 | 2.1 |
| – | CBS-12D** | 2.1 |
| SP..120308/SP..422 | CBS16 | 4.4 |
| – | CBS-16D** | 2.8 |
| – | CBS-16N | 3.0 |
| – | CBS16F | 2.1 |

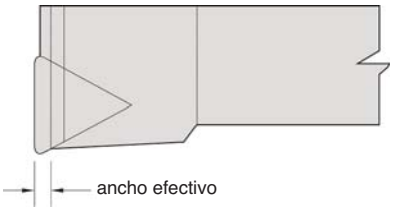



***Para rompevirutas en filos de corte principales y secundarios.*

| apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | – | – | CKM34 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | – | – | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| – | – | – | CKM34 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | – | – | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| SM840 | MS111 | 2mm | CKM20 | STCM11 | 3mm | KUAM26 | 3mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |

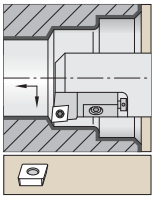
## Rompevirutas para cartuchos tipo C

| plaquita | rompevirutas | ancho efectivo |
|---|---|---|
| TP..110304/TP..421 | CBT-8 | 2.2 |
| TP..160308/TP..322 | CBT-12* | 4.0 |
| – | CBT-12* | 2.7 |
| – | CBT-12* | 2.2 |
| TP..220408/TP..432 | CBT-16 | 5.5 |
| – | CBT-16N | 3.2 |
| – | CBT-16F | 2.1 |

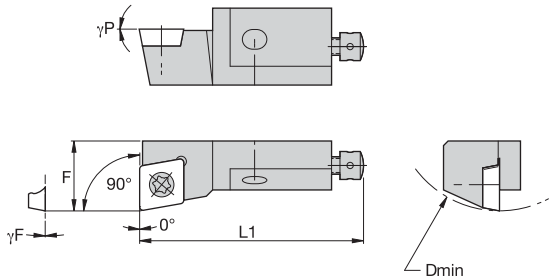



**Sólo con porta de tipo CTC.*

| apoyo | tornillo del apoyo | hex. | amarre | tornillo de fijación | hex. | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| – | – | – | CKM34 | STCM38 | 2mm | KUAM28 | 2mm | KUAM30 | 191.405 | 4mm | CSWM 060 050 |
| – | – | – | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |
| SM841 | MS109 | 2mm | CKM34 | STCM38 | 2mm | KUAM24 | 2mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| SM837 | MS125 | 2.5mm | CKM35 | STCM8 | 4mm | KUAM25 | 2.5mm | KUAM32 | 191.407 | 5mm | CSWM 080 050 |
| – | – | – | CKM34 | STCM38 | 2mm | KUAM22 | 2mm | KUAM31 | 191.406 | 4mm | CSWM 060 050 |

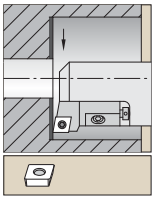


Consulte las plaquitas de las páginas B20 y B74 a B75.

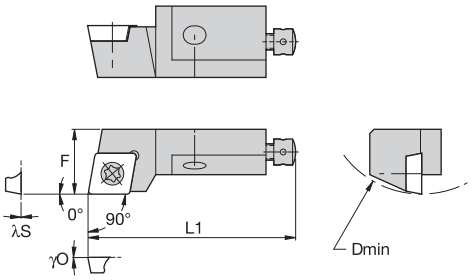



## ■ SCFP 90°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871284** | **SCFPR06CA05** | 20 | 8,0 | 25 | 0.0 | 0.0 | CP..050204/CP..18151 |
| **3871283** | **SCFPR08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |
| **3871272** | **SCFPR10CA09** | 40 | 14,0 | 50 | 0.0 | 0.0 | CP..09T308/CP..3252 |
| | **A izquierdas** | | | | | | |
| **3871285** | **SCFPL08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |

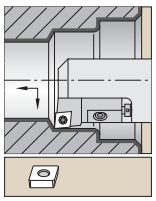


Consulte las plaquitas de las páginas B20 y B74 a B75.

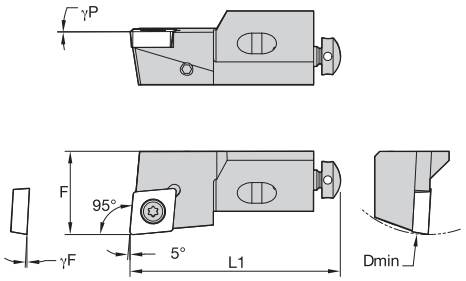



## ■ SCGP 90°

| Número de pedido | Número de catálogo | D min | F | L1 | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871270** | **SCGPR08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |
| | **A izquierdas** | | | | | | |
| **3871271** | **SCGPL08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |



Consulte las plaquitas de las páginas B14 a B16, B46 y B70 a B71.



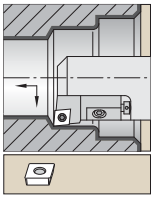

## ■ SCLC 95°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871268** | **SCLCR10CA09** | 40 | 14,0 | 50 | -3.0 | 0.0 | CC..09T308/CC..3252 |
| **3871265** | **SCLCR12CA12** | 50 | 20,0 | 55 | -3.0 | 0.0 | CC..120408/CC..432 |
| | **A izquierdas** | | | | | | |
| **3871267** | **SCLCL12CA12** | 50 | 20,0 | 55 | -3.0 | 0.0 | CC..120408/CC..432 |
| **3871266** | **SCLCL16CA12** | 60 | 25,0 | 63 | -3.0 | 0.0 | CC..120408/CC..432 |

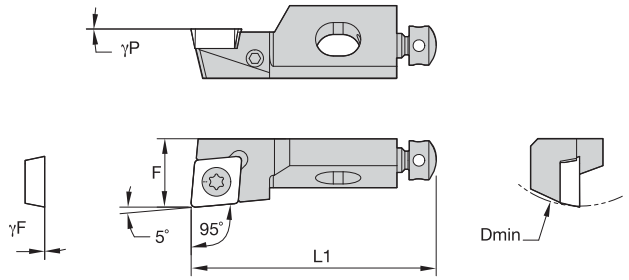
| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1933** | T7 | **KUAM34** | 1.5mm | **KUAM35** | **MS2173** | 2mm | **CSWM 035 040** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |

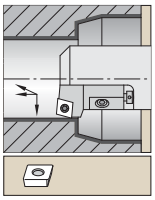


Consulte las plaquitas de las páginas B20 y B74 a B75.

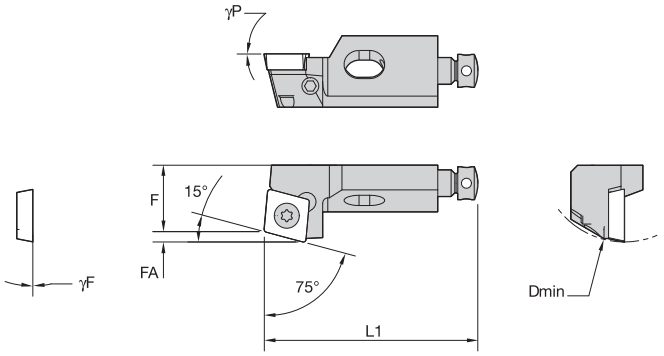



## SCLP 95°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871261** | **SCLPR06CA05** | 20 | 8,0 | 25 | 0.0 | 0.0 | CP..050204/CP..18151 |
| **3871260** | **SCLPR08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |
| **3871259** | **SCLPR10CA09** | 40 | 14,0 | 50 | 0.0 | 0.0 | CP..09T308/CP..3252 |
| | **A izquierdas** | | | | | | |
| **3871264** | **SCLPL06CA05** | 20 | 8,0 | 25 | 0.0 | 0.0 | CP..050204/CP..18151 |
| **3871263** | **SCLPL08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |
| **3871262** | **SCLPL10CA09** | 40 | 14,0 | 50 | 0.0 | 0.0 | CP..09T308/CP..3252 |



Consulte las plaquitas de las páginas B20 y B74 a B75.

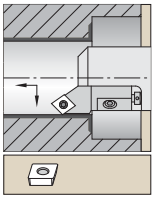



## SCRP 75°

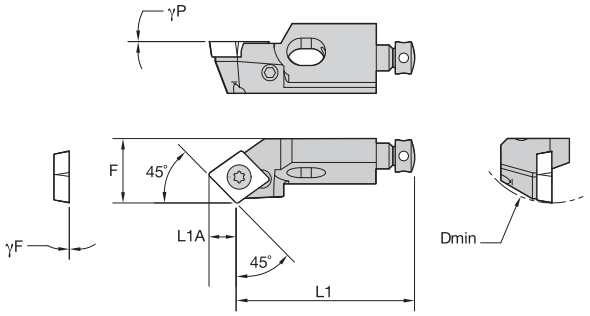
| Número de pedido | Número de catálogo | D min | F | L1 | FA | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3871257** | **SCRPR08CA06** | 25 | 10,0 | 32 | 1,51 | 0.0 | 0.0 | CP..060204/CP..2151 |
| | **A izquierdas** | | | | | | | |
| **3871258** | **SCRPL08CA06** | 25 | 10,0 | 32 | 1,51 | 0.0 | 0.0 | CP..060204/CP..2151 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1933** | T7 | **KUAM34** | 1.5mm | **KUAM35** | **MS2173** | 2mm | **CSWM 035 040** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1933** | T7 | **KUAM34** | 1.5mm | **KUAM35** | **MS2173** | 2mm | **CSWM 035 040** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |

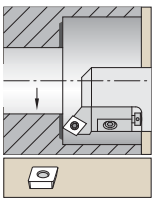


Consulte las plaquitas de las páginas B20 y B74 a B75.

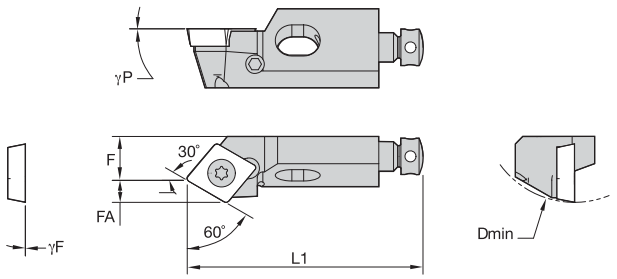



## ■ SCSP 45°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3871255** | **SCSPR06CA05** | 20 | 8,0 | 21 | 3,65 | 0.0 | 0.0 | CP..050204/CP..18151 |
| **3871254** | **SCSPR08CA06** | 25 | 10,0 | 28 | 4,22 | 0.0 | 0.0 | CP..060204/CP..2151 |
| | **A izquierdas** | | | | | | | |
| **3871256** | **SCSPL08CA06** | 25 | 10,0 | 28 | 4,22 | 0.0 | 0.0 | CP..060204/CP..2151 |

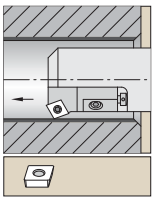


Consulte las plaquitas de las páginas B20 y B74 a B75.

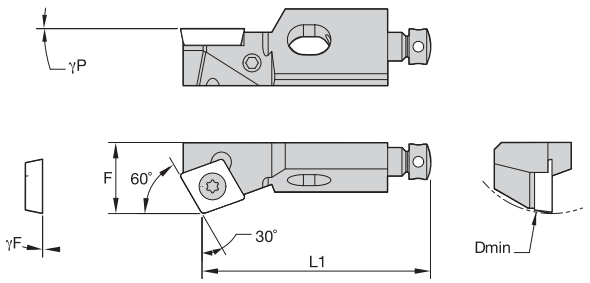



## ■ SCTP 60°

| Número de pedido | Número de catálogo | D min | F | L1 | FA | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3871252** | **SCTPR06CA05** | 20 | 5,5 | 25 | 2,60 | 0.0 | 0.0 | CP..050204/CP..18151 |
| **3871251** | **SCTPR08CA06** | 25 | 6,0 | 32 | 2,95 | 0.0 | 0.0 | CP..060204/CP..2151 |
| | **A izquierdas** | | | | | | | |
| **3871253** | **SCTPL08CA06** | 25 | 6,0 | 32 | 2,95 | 0.0 | 0.0 | CP..060204/CP..2151 |



Consulte las plaquitas de las páginas B20 y B74 a B75.




## ■ SCWP 60°

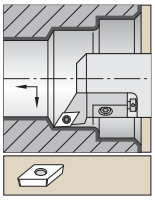
| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871249** | **SCWPR08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |
| | **A izquierdas** | | | | | | |
| **3871250** | **SCWPL08CA06** | 25 | 10,0 | 32 | 0.0 | 0.0 | CP..060204/CP..2151 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1933** | T7 | **–** | – | **KUAM35** | **MS2173** | 2mm | **CSWM 035 040** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |

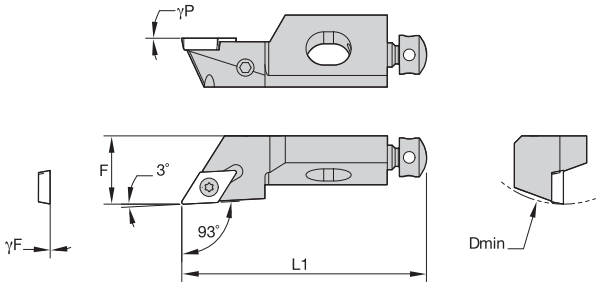

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1933** | T7 | **–** | – | **KUAM35** | **MS2173** | 2mm | **CSWM 035 040** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |



| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |

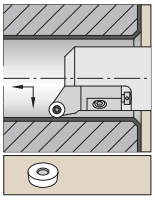


Consulte las plaquitas de las páginas B78 a B79.

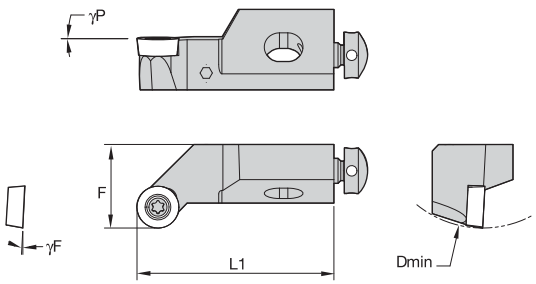



## SDJP 93°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871247** | **SDJPR10CA07** | 40 | 14,0 | 50 | 0.0 | 0.0 | DP..070204/DP..2151 |
| | **A izquierdas** | | | | | | |
| **3871248** | **SDJPL10CA07** | 40 | 14,0 | 50 | 0.0 | 0.0 | DP..070204/DP..2151 |

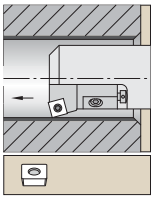


Consulte las plaquitas de las páginas B27 a B28 y B47.

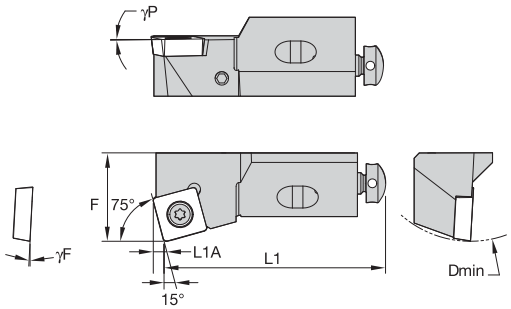



## SRGC

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3871245** | **SRGCR08CA06** | 25 | 10,0 | 32 | -4.0 | 0.0 | RC..0602M0/RC..215 |
| **3871244** | **SRGCR10CA08** | 40 | 14,0 | 50 | -3.0 | 0.0 | RC..0803M0/RC..0803M0 |
| | **A izquierdas** | | | | | | |
| **3871246** | **SRGCL12CA10** | 50 | 20,0 | 55 | -3.0 | 0.0 | RC..10T3M0/RC..10T3M0 |



Consulte las plaquitas de las páginas B29, B48 y B80.



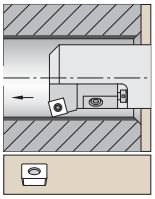

## SSKC 75°

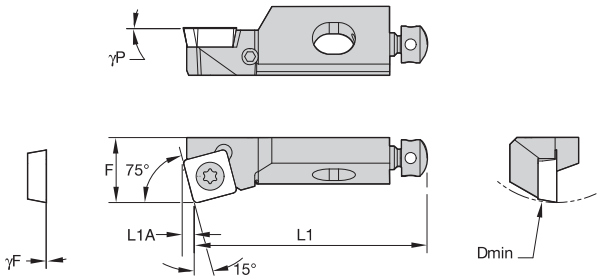
| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3871192** | **SSKCR10CA09** | 40 | 14,0 | 50 | 2,24 | -4.3 | -2.5 | SC..09T308/SC..3252 |
| **3871191** | **SSKCR12CA12** | 50 | 20,0 | 55 | 3,06 | -3.0 | 0.0 | SC..120408/SC..432 |
| **3871190** | **SSKCR16CA12** | 60 | 25,0 | 63 | 3,06 | -3.0 | 0.0 | SC..120408/SC..432 |
| | **A izquierdas** | | | | | | | |
| **3871243** | **SSKCL12CA12** | 50 | 20,0 | 55 | 3,06 | -3.0 | 0.0 | SC..120408/SC..432 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1153** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1154** | T9 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |

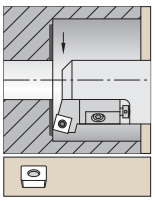


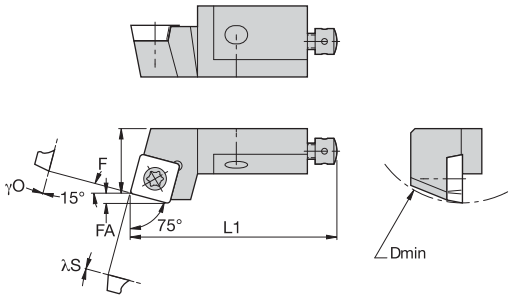



Consulte las plaquitas de las páginas B29, B48 y B80.

## SSKP 75°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870393** | **SSKPR10CA09** | 40 | 14,0 | 50 | 2,2 | 0.0 | 0.0 | SP..09T308/SP..3252 |
| **3870392** | **SSKPR12CA09** | 50 | 20,0 | 55 | 2,2 | 0.0 | 0.0 | SP..09T308/SP..3252 |
| | **A izquierdas** | | | | | | | |
| **3870394** | **SSKPL10CA09** | 40 | 14,0 | 50 | 2,2 | 0.0 | 0.0 | SP..09T308/SP..3252 |

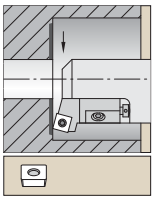


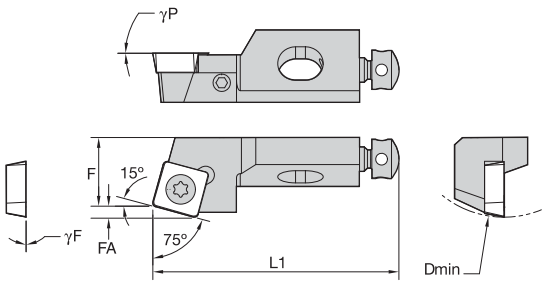



Consulte las plaquitas de las páginas B29, B48 y B80.

## SSRC 75°

| Número de pedido | Número de catálogo | D min | F | L1 | FA | λS° | γO° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870390** | **SSRCR12CA12** | 50 | 20,0 | 55 | 3,06 | -3.0 | 0.0 | SC..120408/SC..432 |
| | **A izquierdas** | | | | | | | |
| **3870391** | **SSRCL12CA12** | 50 | 20,0 | 55 | 3,06 | -3.0 | 0.0 | SC..120408/SC..432 |






Consulte las plaquitas de las páginas B29, B48 y B80.

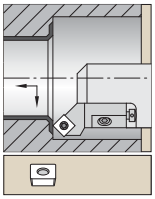
## SSRP 75°

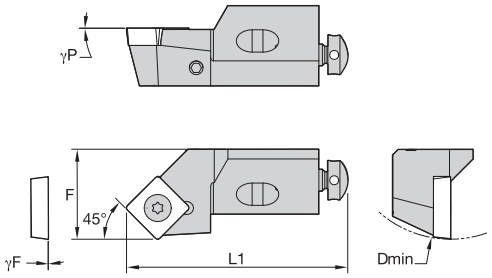
| Número de pedido | Número de catálogo | D min | F | FA | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870388** | **SSRPR10CA09** | 40 | 14,0 | 2,2 | 50 | 0.0 | 0.0 | SP..09T308/SP..3252 |
| | **A izquierdas** | | | | | | | |
| **3870389** | **SSRPL10CA09** | 40 | 14,0 | 2,2 | 50 | 0.0 | 0.0 | SP..09T308/SP..3252 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |

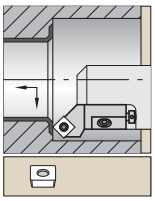


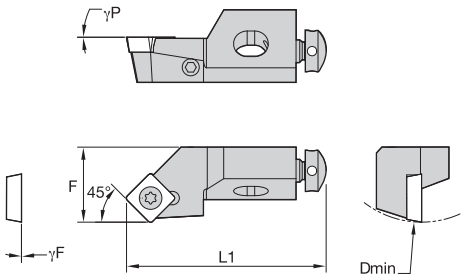



Consulte las plaquitas de las páginas B29, B48 y B80.

## SSSC 45°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870386** | **SSSCR10CA09** | 40 | 14,0 | 44 | -3.0 | 0.0 | SC..09T308/SC..3252 |
| **3870385** | **SSSCR12CA12** | 50 | 20,0 | 47 | -3.0 | 0.0 | SC..120408/SC..432 |
| **3870384** | **SSSCR16CA12** | 60 | 25,0 | 53 | 0.0 | 0.0 | SC..120408/SC..432 |
| | **A izquierdas** | | | | | | |
| **3870387** | **SSSCL12CA12** | 50 | 20,0 | 47 | -3.0 | 0.0 | SC..120408/SC..432 |





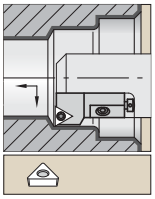

Consulte las plaquitas de las páginas B29, B48 y B80.

## SSSP 45°

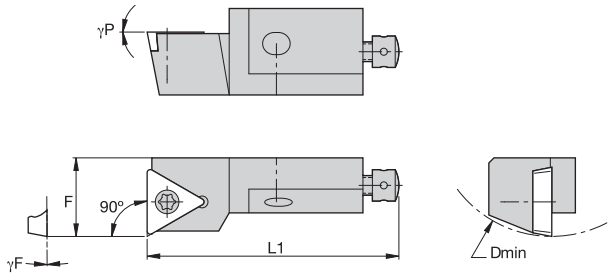
| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870382** | **SSSPR10CA09** | 40 | 14,0 | 44 | 0.0 | 0.0 | SP..09T308/SP..3252 |
| | **A izquierdas** | | | | | | |
| **3870383** | **SSSPL10CA09** | 40 | 14,0 | 44 | 0.0 | 0.0 | SP..09T308/SP..3252 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1157** | T15 | **KUAM25** | 2.5mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **MS1157** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |

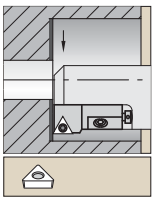


Consulte las plaquitas de la página B84.

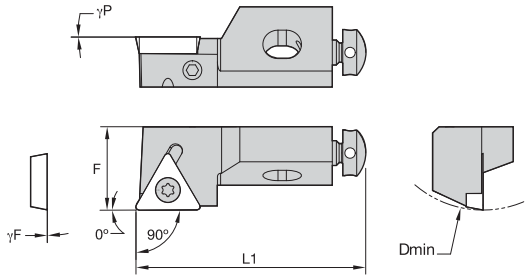



## STFP 90°

| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870378** | **STFPR08CA09** | 25 | 10,0 | 32 | 0.0 | 0.0 | TP..090204/TP..18151 |
| **3870377** | **STFPR10CA11** | 40 | 14,0 | 50 | 0.0 | 0.0 | TP..110204/TP..2151 |
| **3870376** | **STFPR12CA16** | 50 | 20,0 | 55 | 0.0 | 0.0 | TP..16T308/TP..3252 |
| **3870375** | **STFPR16CA16** | 60 | 25,0 | 63 | 0.0 | 0.0 | TP..16T308/TP..3252 |
| | **A izquierdas** | | | | | | |
| **3870381** | **STFPL08CA09** | 25 | 10,0 | 32 | 0.0 | 0.0 | TP..090204/TP..18151 |
| **3870380** | **STFPL10CA11** | 40 | 14,0 | 50 | 0.0 | 0.0 | TP..110204/TP..2151 |
| **3870379** | **STFPL12CA16** | 50 | 20,0 | 55 | 0.0 | 0.0 | TP..16T308/TP..3252 |



Consulte las plaquitas de la página B84.

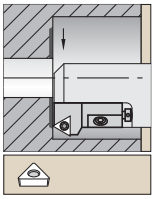



## STGP 90°

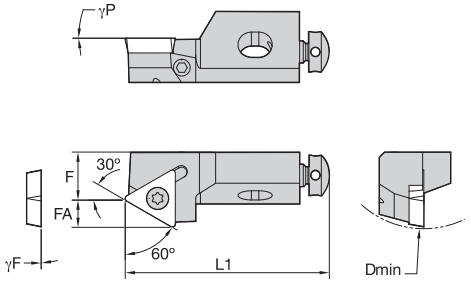
| Número de pedido | Número de catálogo | D min | F | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3870372** | **STGPR08CA09** | 25 | 10,0 | 32 | 0.0 | 0.0 | TP..090204/TP..18151 |
| **3870371** | **STGPR10CA11** | 40 | 14,0 | 50 | 0.0 | 0.0 | TP..110204/TP..2151 |
| **3870370** | **STGPR12CA16** | 50 | 20,0 | 55 | 0.0 | 0.0 | TP..16T308/TP..3252 |
| | **A izquierdas** | | | | | | |
| **3870374** | **STGPL08CA09** | 25 | 10,0 | 32 | 0.0 | 0.0 | TP..090204/TP..18151 |
| **3870373** | **STGPL10CA11** | 40 | 14,0 | 50 | 0.0 | 0.0 | TP..110204/TP..2151 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1152** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM25** | 4mm | **KUAM32** | **191.407** | 5mm | **CSWM 080 050** |
| **MS1152** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1152** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1152** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |

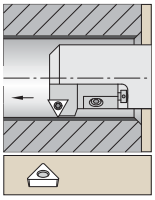


Consulte las plaquitas de las páginas B84.

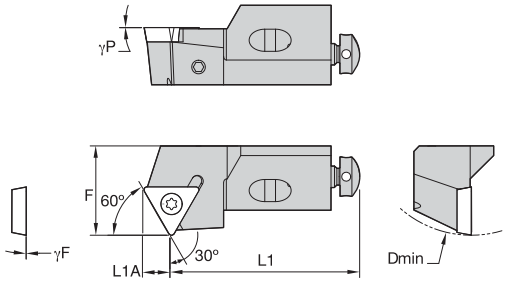



## ■ STTP 60°

| Número de pedido | Número de catálogo | D min | F | FA | L1 | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870369** | **STTPR08CA09** | 25 | 6,0 | 4,3 | 32 | 0.0 | 0.0 | TP..090204/TP..18151 |
| **3870368** | **STTPR10CA11** | 40 | 9,0 | 4,9 | 50 | 0.0 | 0.0 | TP..110204/TP..2151 |
| **3870367** | **STTPR12CA16** | 50 | 13,0 | 7,2 | 55 | 0.0 | 0.0 | TP..16T308/TP..3252 |



Consulte las plaquitas de las páginas B84.




## ■ STWP 60°

| Número de pedido | Número de catálogo | D min | F | L1 | L1A | γF° | γP° | plaquita guía |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3870364** | **STWPR08CA09** | 25 | 10,0 | 28 | 4,3 | 0.0 | 0.0 | TP..090204/TP..18151 |
| **3870363** | **STWPR10CA11** | 40 | 14,0 | 44 | 5,0 | 0.0 | 0.0 | TP..110204/TP..2151 |
| **3870252** | **STWPR12CA16** | 50 | 20,0 | 47 | 7,2 | 0.0 | 0.0 | TP..16T308/TP..3252 |
| | **A izquierdas** | | | | | | | |
| **3870366** | **STWPL10CA11** | 40 | 14,0 | 44 | 5,0 | 0.0 | 0.0 | TP..110204/TP..2151 |
| **3870365** | **STWPL12CA16** | 50 | 20,0 | 47 | 7,2 | 0.0 | 0.0 | TP..16T308/TP..3252 |

| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1152** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |


| tornillo de la plaquita | Torx | tornillo de ajuste radial | hex. | tornillo de ajuste axial | tornillo de montaje | hex. | arandela |
|---|---|---|---|---|---|---|---|
| **MS1152** | T7 | **KUAM34** | 1.5mm | **KUAM20** | **MS2175** | 2.5mm | **CSWM 040 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |
| **MS1153** | T7 | **KUAM28** | 2mm | **KUAM30** | **191.405** | 4mm | **CSWM 060 050** |
| **MS1155** | T15 | **KUAM23** | 2.5mm | **KUAM31** | **191.406** | 4mm | **CSWM 060 050** |

# Herramientas de cambio rápido KM™: la elección para las aplicaciones pesadas.

# ISO 26622

# Consiga la máxima producción de una máquina

La amplia línea de productos WIDIA de accesorios y herramientas de cambio rápido KM™ ofrece el paquete de herramientas más completo que existe actualmente en el mercado: fácil de configurar y mucho más robusto que los de la competencia.

KM™
CAMBIO RÁPIDO

Si busca mejorar su eficacia en mecanizado general hasta un 60%, lo conseguirá con las herramientas de cambio rápido KM™. Su diseño único cónico con tres superficies de contacto lo convierte en el sistema de herramientas de cambio rápido más rígido y preciso que existe. Las herramientas de cambio rápido KM™, muy versátiles y fáciles de emplear en un torno, un centro de mecanizado, multihusillo o máquina de fresado y torneado, reducen significativamente el cambio de herramientas y los tiempos muertos al mismo tiempo que aumenta la producción, permitiendo que el proceso sea más rápido y continuo entre los distintos cambios de herramienta.

- Las mejores herramientas de cambio rápido modular, rígido y de aplicaciones pesadas que existen en el mercado actualmente.
- Los materiales avanzados de herramientas de corte implican un aumento de la producción y menos cambios de herramientas.
- Todas las herramientas necesarias para completar un proceso de producción o turno de operación en un conjunto completo.
- Mejora del mantenimiento de la herramienta, aumento del tiempo de actividad de la máquina y descenso de los porcentajes de no cumplimiento de los estándares.

WIDIA™
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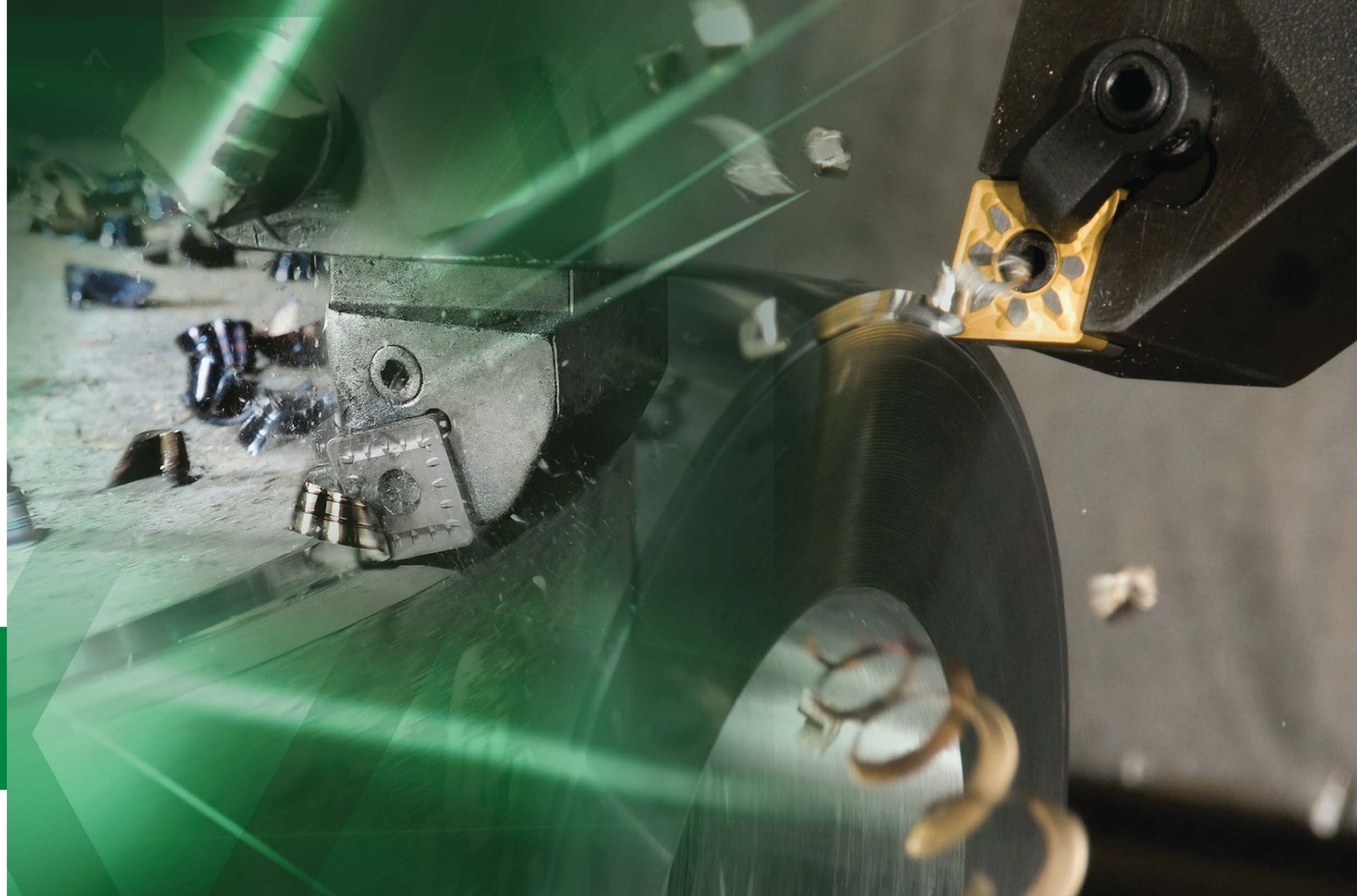


WIDIA

## Velocidad y avance para plaquitas negativas

- P Acero
- M Acero inoxidable
- K Fundición
- N Materiales no férreos
- S Aleaciones de alta temperatura
- H Materiales endurecidos

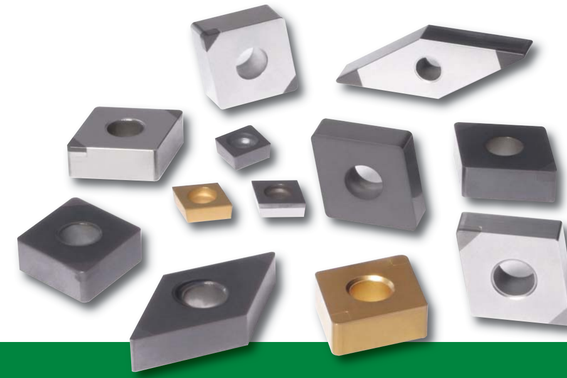
## Velocidad de corte (vc) m/min

| DIN ISO 513 | VDI 3323 | Acabado (ap x f = 1 x 0,1) | | | | | | | | | Medio (ap x f = 2 x 0,2) | | | | | | | | | Desbaste (ap x f = 4 x 0,25) | | | | | | | | | Desbaste pesado (ap x f = 6 x 0,6) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. |
| P | Geometría | 22 | | | 22 • FW • 49 | | | | | | 22 • 49 • AP • MW • 5 | | | | | | | | | 49 • 5 • 8 | | | | | | | | | 5 • 8 • SR | | | | | | | | |
| | ap [mm] • avance [mm] | 0,20–2 • 0,05–0,20 | | | 0,20–2 • 0,05–0,20 | | | | | | 0,60–5 • 0,10–0,40 | | | | | | | | | 1–8 • 0,20–0,60 | | | | | | | | | 2–15 • 0,40–1,00 | | | | | | | | |
| | | TTI15 | | | TN7105 | | | TN7110 | | | TN7110 • TN6010 | | | TN7115 • TN6025 | | | TN7115 | | | TN7125 | | | | | | | | | TN7125 | | | TN7135 | | |
| | 1 | 390 | 550 | 660 | 360 | 520 | 620 | 340 | 490 | 590 | 280 | 400 | 480 | 250 | 360 | 430 | 200 | 290 | 350 | 180 | 260 | 310 | | | | | | | 150 | 220 | 260 | 150 | 210 | 250 |
| | 2 | 380 | 540 | 650 | 360 | 510 | 610 | 340 | 480 | 580 | 260 | 370 | 440 | 240 | 340 | 410 | 190 | 270 | 320 | 130 | 190 | 230 | | | | | | | 110 | 160 | 190 | 110 | 150 | 180 |
| | 3 | 320 | 460 | 550 | 310 | 440 | 530 | 290 | 420 | 500 | 180 | 260 | 310 | 170 | 240 | 290 | 160 | 230 | 280 | 130 | 180 | 220 | | | | | | | 110 | 150 | 180 | 100 | 140 | 170 |
| | 4 | 290 | 410 | 490 | 270 | 390 | 470 | 260 | 370 | 440 | 190 | 270 | 320 | 180 | 250 | 300 | 130 | 190 | 230 | 110 | 150 | 180 | | | | | | | 90 | 130 | 160 | 70 | 100 | 120 |
| | 5 | 220 | 320 | 380 | 210 | 300 | 360 | 200 | 280 | 340 | 140 | 200 | 240 | 130 | 190 | 230 | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | 65 | 90 | 110 | 55 | 80 | 95 |
| | 6 | 300 | 430 | 520 | 290 | 410 | 490 | 270 | 390 | 470 | 200 | 290 | 350 | 190 | 270 | 320 | 140 | 200 | 240 | 110 | 160 | 190 | | | | | | | 90 | 130 | 160 | 75 | 110 | 130 |
| | 7 | 290 | 410 | 490 | 270 | 390 | 470 | 260 | 370 | 440 | 190 | 270 | 320 | 180 | 250 | 300 | 130 | 190 | 230 | 110 | 150 | 180 | | | | | | | 85 | 120 | 140 | 70 | 100 | 120 |
| | 8 | 250 | 350 | 420 | 230 | 330 | 400 | 220 | 320 | 380 | 160 | 230 | 280 | 150 | 210 | 250 | 110 | 150 | 180 | 85 | 120 | 140 | | | | | | | 70 | 100 | 120 | 65 | 90 | 110 |
| | 9 | 220 | 320 | 380 | 210 | 300 | 360 | 200 | 280 | 340 | 140 | 200 | 240 | 130 | 190 | 230 | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | 65 | 90 | 110 | 55 | 80 | 95 |
| | 10 | 300 | 430 | 520 | 290 | 410 | 490 | 270 | 390 | 470 | 190 | 270 | 320 | 190 | 270 | 320 | 140 | 200 | 240 | 110 | 160 | 190 | | | | | | | 90 | 130 | 160 | 75 | 110 | 130 |
| | 11 | 220 | 320 | 380 | 210 | 300 | 360 | 200 | 280 | 340 | 130 | 190 | 230 | 120 | 170 | 200 | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | 65 | 90 | 110 | 55 | 80 | 95 |
| | 12 | 180 | 260 | 310 | 180 | 250 | 300 | 150 | 220 | 260 | 140 | 200 | 240 | 130 | 180 | 220 | 120 | 170 | 200 | 110 | 150 | 180 | | | | | | | 110 | 150 | 180 | 100 | 140 | 170 |
| | 13.1 | 150 | 220 | 260 | 150 | 210 | 250 | 130 | 190 | 230 | 120 | 170 | 200 | 110 | 150 | 180 | 100 | 140 | 170 | 90 | 130 | 160 | | | | | | | 85 | 120 | 140 | 75 | 110 | 130 |
| | 13.2 | 80 | 110 | 130 | 75 | 105 | 125 | 65 | 95 | 115 | 60 | 85 | 100 | 55 | 75 | 90 | 50 | 70 | 85 | 45 | 65 | 80 | | | | | | | 45 | 60 | 70 | 40 | 55 | 65 |
| M | Geometría | 22 | | | 22 • FW • 48 | | | | | | 22 • 48 • AP • MW • SM | | | | | | | | | 48 • SM • 65 | | | | | | | | | SM • SR | | | | | |
| | ap [mm] • avance [mm] | 0,20–2 • 0,05–0,20 | | | 0,20–2 • 0,05–0,20 | | | | | | 0,60–5 • 0,12–0,40 | | | | | | | | | 0,50–6 • 0,10–0,60 | | | | | | | | | 4–15 • 0,40–1 | | | | | |
| | | TTI15 | | | TN8025 • TN6010 | | | | | | TN8025 • TN6010 | | | TN6025 | | | TN8025 | | | TN6025 | | | | | | | | | TN7115 | | | | | |
| | 14.1 | 280 | 400 | 480 | 180 | 260 | 300 | | | | 150 | 220 | 260 | 140 | 190 | 230 | 140 | 200 | 240 | 110 | 150 | 180 | | | | | | | 110 | 150 | 180 | | | |
| | 14.2 | 250 | 370 | 440 | 140 | 200 | 240 | | | | 130 | 180 | 220 | 110 | 160 | 190 | 110 | 160 | 190 | 85 | 120 | 140 | | | | | | | 85 | 120 | 140 | | | |
| | 14.3 | 190 | 270 | 320 | 110 | 150 | 180 | | | | 100 | 140 | 170 | 85 | 120 | 140 | 85 | 120 | 140 | 65 | 90 | 110 | | | | | | | 65 | 90 | 110 | | | |
| | 14.4 | 140 | 200 | 240 | 90 | 130 | 160 | | | | 75 | 110 | 130 | 70 | 95 | 110 | 70 | 100 | 120 | 55 | 80 | 95 | | | | | | | 60 | 80 | 95 | | | |
| K | Geometría | 22 | | | 22 • FW • 5 • 22 | | | | | | 5 • MW • NMA | | | NMA • P30 | | | 22 • 5 • NMA | | | NMA | | | | | | | | | 5 • NMA | | | | | |
| | ap [mm] • avance [mm] | 0,20–2 • 0,05–0,20 | | | 0,20–2 • 0,05–0,20 | | | | | | 1–8 • 0,20–0,60 | | | 0,50–4 • 0,20–0,40 | | | 1–8 • 0,20–0,60 | | | 1–8 • 0,20–0,80 | | | | | | | | | 2–15 • 0,25–1,20 | | | | | |
| | | TTI15 | | | TN5105 • TN5120 • TN6010 | | | | | | TN5105 • TN5120 • TN6010 | | | CW2015 | | | TN5105 • TN5120 | | | CW5025 | | | | | | | | | TN5105 • TN5120 | | | | | |
| | 15 | – | – | – | 290 | 410 | 490 | | | | 230 | 330 | 400 | 300 | 600 | 900 | 180 | 260 | 310 | 350 | 650 | 1000 | | | | | | | 160 | 230 | 280 | | | |
| | 16 | – | – | – | 230 | 330 | 400 | | | | 180 | 250 | 300 | 200 | 350 | 550 | 140 | 200 | 240 | 250 | 400 | 600 | | | | | | | 120 | 170 | 200 | | | |
| | 17 | 280 | 400 | 480 | 250 | 360 | 430 | | | | 210 | 300 | 360 | 350 | 650 | 900 | 180 | 250 | 300 | 400 | 700 | 1100 | | | | | | | 150 | 220 | 260 | | | |
| | 18 | 280 | 350 | 420 | 240 | 340 | 410 | | | | 190 | 270 | 320 | 250 | 400 | 600 | 150 | 210 | 250 | 300 | 450 | 700 | | | | | | | 130 | 180 | 220 | | | |
| | 19 | – | – | – | 340 | 490 | 590 | | | | 290 | 410 | 490 | 300 | 600 | 900 | 240 | 340 | 410 | 350 | 650 | 1000 | | | | | | | 220 | 310 | 370 | | | |
| | 20 | – | – | – | 290 | 410 | 490 | | | | 230 | 330 | 400 | 250 | 400 | 600 | 180 | 260 | 310 | 300 | 450 | 700 | | | | | | | 160 | 230 | 280 | | | |
| N | Geometría | | | | | | | 1–4 • 0,10–0,40 | | | | | | 1–4 • 0,10–0,40 | | | | | | 1–4 • 0,10–0,40 | | | | | | | | | | | | | | | |
| | ap [mm] • avance [mm] | | | | | | | THM • TN6010 | | | | | | THM • TN6025 | | | | | | THM | | | | | | | | | | | | | | |
| | 21 | | | | | | | 800 | 1000 | 3000 | | | | 500 | 1000 | 2500 | | | | 300 | 1000 | 2000 | | | | | | | | | | | | |
| | 22 | | | | | | | 400 | 1000 | 2000 | | | | 300 | 1000 | 1800 | | | | 300 | 1000 | 1500 | | | | | | | | | | | | |
| | 23 | | | | | | | 600 | 1000 | 1500 | | | | 500 | 800 | 1300 | | | | 200 | 700 | 1200 | | | | | | | | | | | | |
| | 24 | | | | | | | 600 | 1000 | 1500 | | | | 500 | 800 | 1300 | | | | 200 | 700 | 1200 | | | | | | | | | | | | |
| | 25 | | | | | | | 400 | 700 | 1000 | | | | 300 | 600 | 800 | | | | 200 | 500 | 700 | | | | | | | | | | | | |
| | 26 | | | | | | | 400 | 500 | 600 | | | | 300 | 400 | 500 | | | | 250 | 350 | 400 | | | | | | | | | | | | |
| | 27 | | | | | | | 400 | 500 | 600 | | | | 300 | 400 | 500 | | | | 200 | 300 | 400 | | | | | | | | | | | | |
| | 28 | | | | | | | 200 | 300 | 400 | | | | 150 | 250 | 350 | | | | 100 | 200 | 300 | | | | | | | | | | | | |
| | 29 | | | | | | | 100 | 150 | 200 | | | | 100 | 140 | 180 | | | | 80 | 120 | 150 | | | | | | | | | | | | |
| | 30 | | | | | | | 150 | 200 | 250 | | | | 120 | 180 | 220 | | | | 100 | 150 | 200 | | | | | | | | | | | | |
| S | Geometría | < 1 • 0,10 | | | 22 • SM • 48 | | | 22 • SM • 48 | | | 22 • SM • 48 | | | GN | | | | | | 22 • SM • 48 | | | | | | | | | | | | | | |
| | ap [mm] • avance [mm] | | | | 0,50–4 • 0,10–0,50 | | | 0,50–4 • 0,10–0,50 | | | 0,50–4 • 0,10–0,50 | | | 0,50–4 • 0,10–0,50 | | | 0,50–4 • 0,10–0,50 | | | 0,50–6 • 0,10–0,60 | | | | | | | | | | | | | | |
| | | THM | | | TN6025 | | | TN6010 • TN6025 | | | TN6010 • TN6025 • TN8025 | | | CW3020 | | | THM | | | TN8025 | | | | | | | | | | | | | | |
| | 31 | 35 | 50 | 60 | 49 | 70 | 85 | 55 | 80 | 95 | 49 | 70 | 85 | 170 | 200 | 370 | 26 | 38 | 45 | 42 | 60 | 70 | | | | | | | | | | | | |
| | 32 | 28 | 40 | 48 | 39 | 55 | 65 | 46 | 65 | 80 | 42 | 60 | 70 | 170 | 200 | 370 | 21 | 30 | 36 | 34 | 49 | 60 | | | | | | | | | | | | |
| | 33 | 22 | 32 | 38 | 31 | 44 | 55 | 34 | 48 | 60 | 30 | 43 | 50 | 170 | 220 | 370 | 17 | 24 | 29 | 25 | 36 | 43 | | | | | | | | | | | | |
| | 34 | 14 | 20 | 24 | 18 | 26 | 31 | 21 | 30 | 36 | 19 | 27 | 32 | 200 | 250 | 370 | 11 | 15 | 18 | 16 | 23 | 27 | | | | | | | | | | | | |
| | 35 | 14 | 20 | 24 | 20 | 28 | 34 | 22 | 32 | 38 | 20 | 29 | 35 | 200 | 250 | 370 | 11 | 15 | 18 | 17 | 24 | 29 | | | | | | | | | | | | |
| | 36 | 55 | 80 | 95 | – | – | – | – | – | – | – | – | – | – | – | – | 42 | 60 | 70 | – | – | – | | | | | | | | | | | | |
| | 37 | 28 | 40 | 48 | 39 | 55 | 65 | 42 | 60 | 70 | 39 | 55 | 65 | – | – | – | 21 | 30 | 36 | 32 | 45 | 55 | | | | | | | | | | | | |

## Velocidad y avance para plaquitas positivas

- P Acero
- M Acero inoxidable
- K Fundición
- N Materiales no férreos
- S Aleaciones de alta temperatura
- H Materiales endurecidos

| DIN ISO 513 | VDI 3323 | Acabado (ap x f = 1 x 0,1) | | | | | | | | | Medio (ap x f = 2 x 0,2) | | | | | | | | | Desbaste (ap x f = 4 x 0,25) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. | min. | Inicio | máx. |
| P | Geometría | 2 • 41 | | | 2 • MU | | | | | | 2 • MU • CMT | | | | | | | | | MU • CMT | | | | | | | | | | | | | | |
| | ap [mm] • avance [mm] | 0,20–2 • 0,05–0,20 | | | 0,20–2 • 0,05–0,20 | | | | | | 0,30–4,50 • 0,08–0,35 | | | | | | | | | 0,70–5 • 0,12–0,40 | | | | | | | | | | | | | | |
| | | TTI15 | | | TN7105 | | | TN7110 | | | TN7115 • TN6025 | | | TN7115 • TN6025 | | | | | | TN7115 | | | TN7125 | | | | | | | | | | | |
| | 1 | 390 | 550 | 660 | 360 | 520 | 620 | 340 | 490 | 590 | 280 | 400 | 480 | 250 | 360 | 430 | | | | 200 | 290 | 350 | 180 | 260 | 310 | | | | | | | | | |
| | 2 | 380 | 540 | 650 | 360 | 510 | 610 | 340 | 480 | 580 | 260 | 370 | 440 | 240 | 340 | 410 | | | | 190 | 270 | 320 | 130 | 190 | 230 | | | | | | | | | |
| | 3 | 320 | 460 | 550 | 310 | 440 | 530 | 290 | 420 | 500 | 180 | 260 | 310 | 170 | 240 | 290 | | | | 160 | 230 | 280 | 130 | 180 | 220 | | | | | | | | | |
| | 4 | 290 | 410 | 490 | 270 | 390 | 470 | 260 | 370 | 440 | 190 | 270 | 320 | 180 | 250 | 300 | | | | 130 | 190 | 230 | 110 | 150 | 180 | | | | | | | | | |
| | 5 | 220 | 320 | 380 | 210 | 300 | 360 | 200 | 280 | 340 | 140 | 200 | 240 | 130 | 190 | 230 | | | | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | | | |
| | 6 | 300 | 430 | 520 | 290 | 410 | 490 | 270 | 390 | 470 | 200 | 290 | 350 | 190 | 270 | 320 | | | | 140 | 200 | 240 | 110 | 160 | 190 | | | | | | | | | |
| | 7 | 290 | 410 | 490 | 270 | 390 | 470 | 260 | 370 | 440 | 190 | 270 | 320 | 180 | 250 | 300 | | | | 130 | 190 | 230 | 110 | 150 | 180 | | | | | | | | | |
| | 8 | 250 | 350 | 420 | 230 | 330 | 400 | 220 | 320 | 380 | 160 | 230 | 280 | 150 | 210 | 250 | | | | 110 | 150 | 180 | 85 | 120 | 140 | | | | | | | | | |
| | 9 | 220 | 320 | 380 | 210 | 300 | 360 | 200 | 280 | 340 | 140 | 200 | 240 | 130 | 190 | 230 | | | | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | | | |
| | 10 | 300 | 430 | 520 | 290 | 410 | 490 | 270 | 390 | 470 | 200 | 290 | 350 | 190 | 270 | 320 | | | | 140 | 200 | 240 | 110 | 160 | 190 | | | | | | | | | |
| | 11 | 220 | 320 | 380 | 210 | 300 | 360 | 200 | 280 | 340 | 130 | 190 | 230 | 120 | 170 | 200 | | | | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | | | |
| | 12 | 180 | 260 | 310 | 180 | 250 | 300 | 150 | 220 | 260 | 140 | 200 | 240 | 130 | 180 | 220 | | | | 100 | 140 | 170 | 90 | 130 | 160 | | | | | | | | | |
| | 13.1 | 150 | 220 | 260 | 150 | 210 | 250 | 130 | 190 | 230 | 120 | 170 | 200 | 110 | 150 | 180 | | | | 90 | 130 | 160 | 75 | 110 | 130 | | | | | | | | | |
| | 13.2 | 80 | 110 | 130 | 75 | 105 | 125 | 65 | 95 | 115 | 60 | 85 | 100 | 55 | 75 | 90 | | | | 50 | 70 | 85 | 45 | 65 | 80 | | | | | | | | | |
| M | Geometría | MU | | | MU | | | | | | 2 • MU • CMT | | | | | | | | | 2 • MU • CMT | | | | | | | | | | | | | | |
| | ap [mm] • avance [mm] | 0,20–2 • 0,05–0,20 | | | 0,20–2 • 0,05–0,20 | | | | | | 0,30–4,50 • 0,08–0,35 | | | | | | | | | 0,70–5 • 0,12–0,40 | | | | | | | | | | | | | | |
| | | TTI15 | | | TN8025 • TN6010 | | | | | | TN8025 • TN6010 | | | TN6025 | | | | | | TN8025 | | | TN6025 | | | | | | | | | | | |
| | 14.1 | 280 | 400 | 480 | 180 | 260 | 300 | | | | 150 | 220 | 260 | 140 | 190 | 230 | | | | 140 | 200 | 240 | 110 | 150 | 180 | | | | | | | | | |
| | 14.2 | 250 | 370 | 440 | 140 | 200 | 240 | | | | 130 | 180 | 220 | 110 | 160 | 190 | | | | 110 | 160 | 190 | 85 | 120 | 140 | | | | | | | | | |
| | 14.3 | 190 | 270 | 320 | 110 | 150 | 180 | | | | 100 | 140 | 170 | 85 | 120 | 140 | | | | 85 | 120 | 140 | 65 | 90 | 110 | | | | | | | | | |
| | 14.4 | 140 | 200 | 240 | 90 | 130 | 160 | | | | 75 | 110 | 130 | 70 | 95 | 110 | | | | 70 | 100 | 120 | 55 | 80 | 95 | | | | | | | | | |
| K | Geometría | MU | | | MU | | | | | | MU | | | | | | | | | CMW | | | | | | | | | | | | | | |
| | ap [mm] • avance [mm] | 0,20–2 • 0,05–0,20 | | | 0,20–2 • 0,05–0,20 | | | | | | 0,30–4,50 • 0,08–0,35 | | | | | | | | | 1–8 • 0,10–0,50 | | | | | | | | | | | | | | |
| | | TTI15 | | | TN5105 • TN5120 • TN6010 | | | | | | TN5105 • TN5120 • TN6010 | | | | | | | | | TN5105 • TN5120 | | | | | | | | | | | | | | |
| | 15 | – | – | – | 290 | 410 | 490 | | | | 230 | 330 | 400 | | | | | | | 180 | 260 | 310 | | | | | | | | | | | | |
| | 16 | – | – | – | 230 | 330 | 400 | | | | 180 | 250 | 300 | | | | | | | 140 | 200 | 240 | | | | | | | | | | | | |
| | 17 | 280 | 400 | 480 | 250 | 360 | 430 | | | | 210 | 300 | 360 | | | | | | | 180 | 250 | 300 | | | | | | | | | | | | |
| | 18 | 280 | 350 | 420 | 240 | 340 | 410 | | | | 190 | 270 | 320 | | | | | | | 150 | 210 | 250 | | | | | | | | | | | | |
| | 19 | – | – | – | 340 | 490 | 590 | | | | 290 | 410 | 490 | | | | | | | 240 | 340 | 410 | | | | | | | | | | | | |
| | 20 | – | – | – | 290 | 410 | 490 | | | | 230 | 330 | 400 | | | | | | | 180 | 260 | 310 | | | | | | | | | | | | |
| N | Geometría | _MW • AL1 • AL2 • AL3 | | | | | | _MW • AL1 • AL2 • AL3 | | | | | | MW • AL1 • AL2 • AL3 | | | _MW • AL1 • AL2 • AL3 | | | _MW • AL1 • AL2 • AL3 | | | | | | AL1 • AL2 • AL3 | | | | | | | | |
| | ap [mm] • avance [mm] | 1–4 • 0,10–0,20 | | | | | | 1–4 • 0,10–0,20 | | | | | | 1–4 • 0,10–0,20 | | | 1–4 • 0,10–0,20 | | | 1–4 • 0,10–0,40 | | | | | | 1–4 • 0,10–0,40 | | | | | | | | |
| | | THM • HWK10 • HWK15 • TN6025 | | | | | | HCK10 • TN6010 | | | | | | THM • HWK10 • HWK15 • TN6025 | | | HCK10 • TN6010 | | | THM • HWK10 • HWK15 | | | | | | HCK15 | | | | | | | | |
| | 21 | | | | 800 | 1000 | 3000 | 800 | 2000 | 3000 | | | | 500 | 1000 | 2500 | 500 | 1600 | 2500 | 300 | 1000 | 2000 | | | | 300 | 1500 | 2000 | | | | | | |
| | 22 | | | | 400 | 1000 | 2000 | 400 | 1500 | 2000 | | | | 300 | 1000 | 1800 | 300 | 1400 | 1800 | 300 | 1000 | 1500 | | | | 300 | 1200 | 1500 | | | | | | |
| | 23 | | | | 600 | 1000 | 1500 | 600 | 1200 | 1500 | | | | 500 | 800 | 1300 | 500 | 1000 | 1300 | 200 | 700 | 1200 | | | | 200 | 900 | 1200 | | | | | | |
| | 24 | | | | 600 | 1000 | 1500 | 600 | 1200 | 1500 | | | | 500 | 800 | 1300 | 500 | 1000 | 1300 | 200 | 700 | 1200 | | | | 200 | 900 | 1200 | | | | | | |
| | 25 | | | | 400 | 700 | 1000 | 400 | 800 | 1000 | | | | 300 | 600 | 800 | 300 | 600 | 800 | 200 | 500 | 700 | | | | 200 | 500 | 700 | | | | | | |
| | 26 | | | | 400 | 500 | 600 | 400 | 500 | 600 | | | | 300 | 400 | 500 | 300 | 400 | 500 | 250 | 350 | 400 | | | | 250 | 350 | 400 | | | | | | |
| | 27 | | | | 400 | 500 | 600 | 400 | 500 | 600 | | | | 300 | 400 | 500 | 300 | 400 | 500 | 200 | 300 | 400 | | | | 200 | 300 | 400 | | | | | | |
| | 28 | | | | 200 | 300 | 400 | 200 | 300 | 400 | | | | 150 | 250 | 350 | 150 | 250 | 350 | 100 | 200 | 300 | | | | 100 | 200 | 300 | | | | | | |
| | 29 | | | | 100 | 150 | 200 | 100 | 150 | 200 | | | | 100 | 140 | 180 | 100 | 140 | 180 | 80 | 120 | 150 | | | | 80 | 120 | 150 | | | | | | |
| | 30 | | | | 150 | 200 | 250 | 150 | 200 | 250 | | | | 120 | 180 | 220 | 120 | 180 | 220 | 100 | 150 | 200 | | | | 100 | 150 | 200 | | | | | | |
| S | Geometría | CMT | | | MU | | | | | | CMT | | | MU | | | | | | CMT | | | MU | | | GX | | | | | | | |
| | ap [mm] • avance [mm] | 0,70–3 • 0,12–0,20 | | | 0,30–2 • 0,08–0,20 | | | | | | 0,70–5 • 0,12–0,40 | | | 0,30–4,50 • 0,08–0,35 | | | | | | 0,70–5 • 0,12–0,40 | | | 0,30–4,50 • 0,08–0,35 | | | 0,30–4,50 • 0,08–0,35 | | | | | | | | |
| | | THM | | | TN6025 | | | TN6010 • TN8025 | | | THM | | | TN6025 • TN8025 | | | TN6010 • TN8025 | | | THM | | | TN6025 • TN8025 | | | CW3020 | | | | | | | | |
| | 31 | 35 | 50 | 60 | 49 | 70 | 85 | 55 | 80 | 95 | 32 | 45 | 55 | 46 | 65 | 80 | 49 | 70 | 85 | 26 | 38 | 45 | 42 | 60 | 70 | 170 | 200 | 370 | | | | | | |
| | 32 | 28 | 40 | 48 | 39 | 55 | 65 | 46 | 65 | 80 | 25 | 36 | 43 | 35 | 50 | 60 | 42 | 60 | 70 | 21 | 30 | 36 | 34 | 49 | 60 | 170 | 200 | 370 | | | | | | |
| | 33 | 22 | 32 | 38 | 31 | 44 | 55 | 34 | 48 | 60 | 20 | 29 | 35 | 28 | 40 | 48 | 30 | 43 | 50 | 17 | 24 | 29 | 25 | 36 | 43 | 170 | 220 | 370 | | | | | | |
| | 34 | 14 | 20 | 24 | 18 | 26 | 31 | 21 | 30 | 36 | 13 | 18 | 22 | 16 | 23 | 28 | 19 | 27 | 32 | 11 | 15 | 18 | 16 | 23 | 27 | 200 | 250 | 370 | | | | | | |
| | 35 | 14 | 20 | 24 | 20 | 28 | 34 | 22 | 32 | 38 | 13 | 18 | 22 | 18 | 25 | 30 | 20 | 29 | 35 | 11 | 15 | 18 | 17 | 24 | 29 | 200 | 250 | 370 | | | | | | |
| | 36 | 55 | 80 | 95 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | 42 | 60 | 70 | – | – | – | – | – | – | | | | | | |
| | 37 | 28 | 40 | 48 | 39 | 55 | 65 | 42 | 60 | 70 | 25 | 36 | 43 | 35 | 50 | 60 | 39 | 55 | 65 | 21 | 30 | 36 | 32 | 45 | 55 | – | – | – | | | | | | |



WIDIA

# Plaquitas

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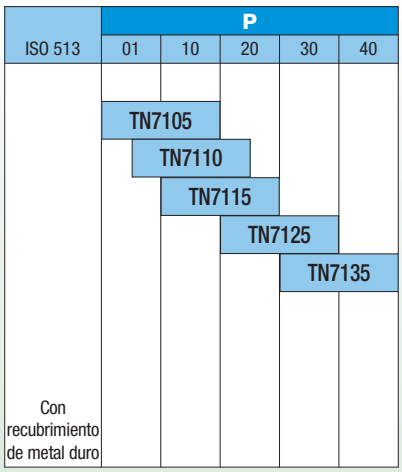
El sistema en tres pasos de selección de plaquitas WIDIA™ facilita la elección y la aplicación de la herramienta más productiva. Las recomendaciones de herramientas se basan en seis grupos de materiales de las piezas de trabajo.

**1 Seleccione la geometría de la plaquita:**
elija la geometría que se adapta mejor a sus necesidades en función de la profundidad de corte y avance.

**2 Seleccione la calidad:**
determine las condiciones del corte y elija la calidad adecuada.

## TN7105–TN7135 para acero




resistencia al desgaste = mayor

**TN7105** — Torneado fino y acabado.

**TN7110** — Torneado ligero y medio en condiciones favorables.

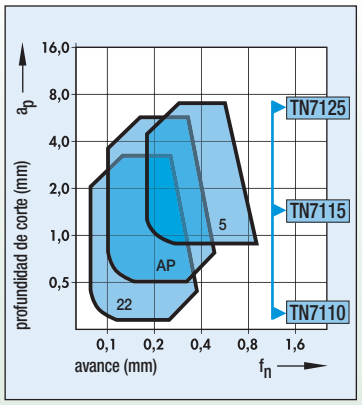
**TN7115** — Desbaste medio y cortes ligeramente interrumpidos.

**TN7125** — Desbaste general, también con cortes interrumpidos.

**TN7135** — Torneado pesado y cortes muy interrumpidos.

tenacidad = más suave

## Recomendaciones iniciales para acero

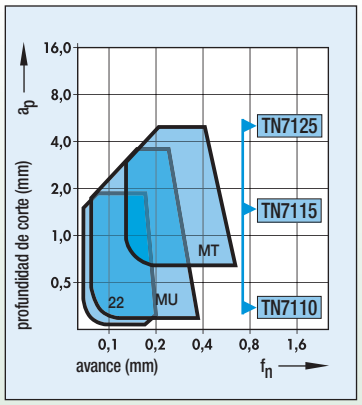



### Plaquitas negativas de doble cara

**Desbaste**
Corte interrumpido con/sin fuerte descascarillado
USE: geometría 5

**Torneado medio**
Corte ligeramente interrumpido con/sin ligero descascarillado
USE: geometría AP

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 22

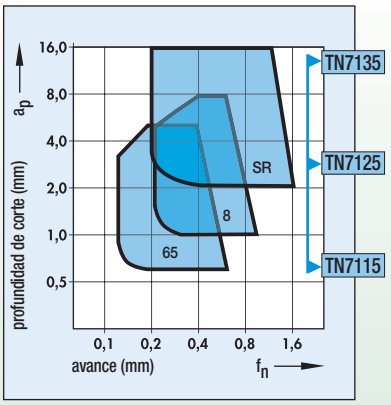



### Plaquitas positivas de una sola cara

**Desbaste**
Corte interrumpido con/sin descascarillado
USE: geometría MT ESTÁNDAR

**Torneado medio**
Mandrinado y torneado general
USE: geometría MU

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 22




### Plaquitas negativas de una sola cara

**Torneado pesado**
Tasas de avance y profundidades de corte altas < 0,8 mm
USE: geometría SR

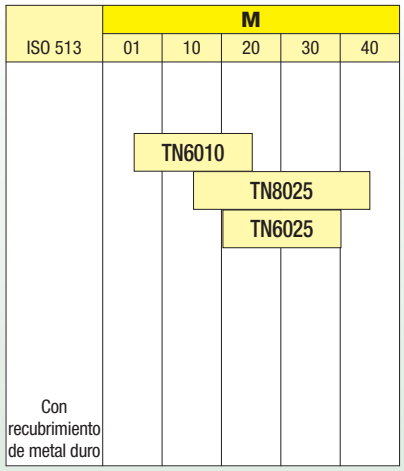
**Desbaste pesado**
Corte interrumpido con/sin gran descascarillado
USE: geometría 8

**Desbaste**
Corte ligeramente interrumpido con descascarillado mínimo
USE: geometría 65

**3 Seleccione la velocidad de corte:**
con la tabla de avances y velocidades, establezca la velocidad de corte y obtendrá el rango y las condiciones iniciales óptimas.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

## TN6010–TN6025 para acero inoxidable




resistencia al desgaste = mayor

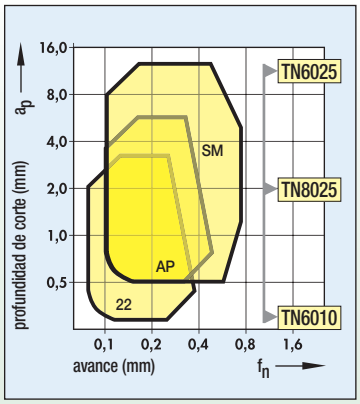
**TN6010** — Torneado fino y acabado.

**TN8025** — Torneado ligero y medio de aceros inoxidables apto para cortes interrumpidos y no interrumpidos.

**TN6025** — Operaciones de mecanizado difíciles.

tenacidad = más suave

## Recomendaciones iniciales para acero inoxidable

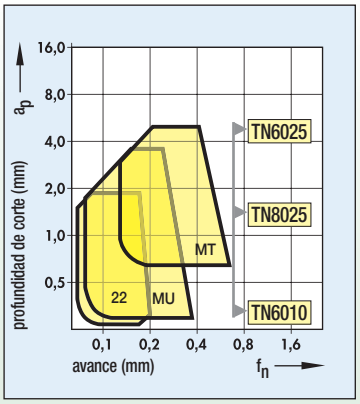



### Plaquitas negativas de doble cara

**Desbaste**
Mecanizado medio y desbaste con ranura de virutas positiva
USE: geometría SM

**Torneado medio**
Corte ligeramente interrumpido con/sin ligero descascarillado
USE: geometría AP

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 22

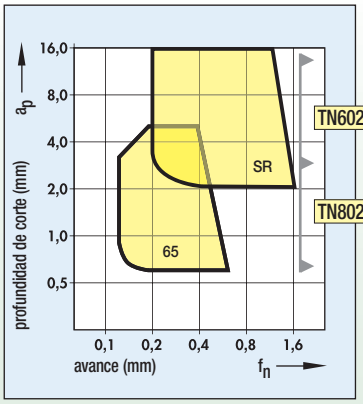



### Plaquitas positivas de una sola cara

**Desbaste**
Corte interrumpido con/sin descascarillado
USE: geometría MT ESTÁNDAR

**Torneado medio**
Mandrinado y torneado general
USE: geometría MU

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 22




### Plaquitas negativas de una sola cara

**Desbaste pesado**
Corte interrumpido con/sin gran descascarillado, así como gran profundidad de corte y altas tasas de avance
USE: geometría SR

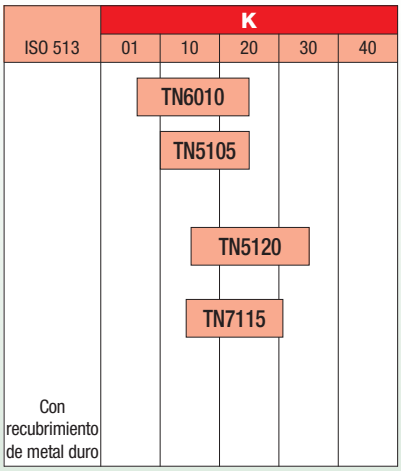
**Desbaste**
Corte ligeramente interrumpido con descascarillado mínimo
USE: geometría 65

El sistema en tres pasos de selección de plaquitas WIDIA™ facilita la elección y la aplicación de la herramienta más productiva. Las recomendaciones de herramientas se basan en seis grupos de materiales de pieza de trabajo.

**1 Seleccione la geometría de la plaquita:**
elija la geometría que se adapta mejor a sus necesidades en función de la profundidad de corte y la tasa de avance.

**2 Seleccione la calidad:**
determine las condiciones del corte y elija la calidad adecuada.

## TN5105–TN5120 para fundición




resistencia al desgaste = mayor

**TN6010** — Torneado fino y acabado.

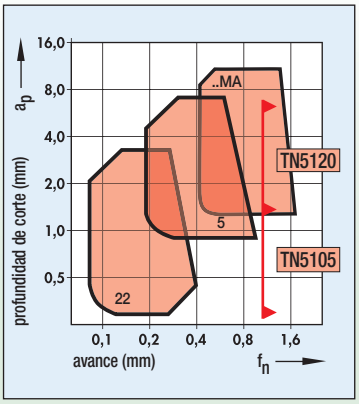
**TN5105** — Ideal para operaciones de acabado de fundición gris.

**TN5120** — Ideal para fundición gris y nodular.

**TN7115** — Calidades de fundición nodular > GGG40.

tenacidad = más suave

## Recomendaciones iniciales para fundición

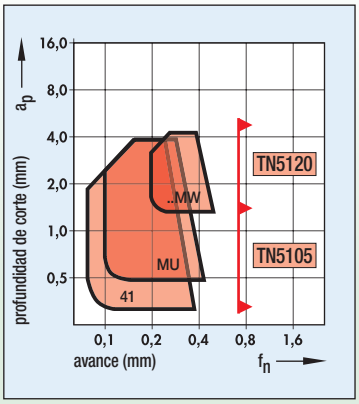



### Plaquitas negativas de doble cara

**Desbaste**
Corte interrumpido con/sin fuerte descascarillado
USE: geometría 5

**Torneado medio**
Corte ligeramente interrumpido con/sin ligero descascarillado
USE: ..geometría MA

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 22




### Plaquitas positivas de una sola cara

**Desbaste**
Corte interrumpido con/sin descascarillado
USE: geometría MW ESTÁNDAR

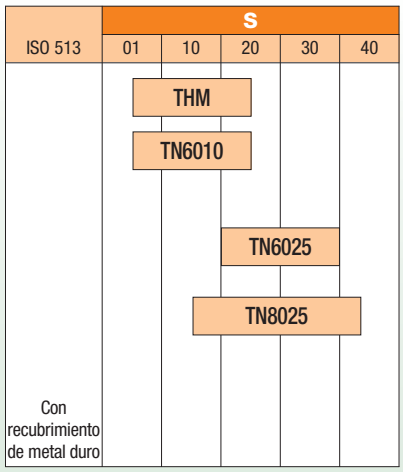
**Torneado medio**
Mandrinado y torneado general
USE: geometría MU

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 41

**3 Seleccione la velocidad de corte:**
con la tabla de avances y velocidades, establezca la velocidad de corte y obtendrá el rango y las condiciones iniciales óptimas.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

## TN6010–TN6025 para aleaciones de alta temperatura




resistencia al desgaste = mayor

**THM** — Torneado fino y acabado.

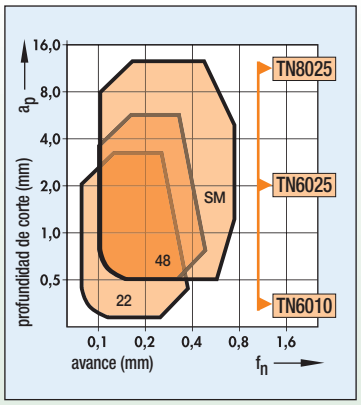
**TN6010** — Para operaciones de torneado ligeras.

**TN6025** — Para operaciones de torneado ligeras y medias.

**TN8025** — Operaciones de desbaste.

tenacidad = más suave

## Recomendaciones iniciales para aleaciones de alta temperatura

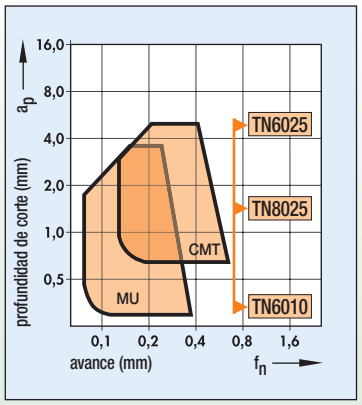



### Plaquitas negativas de doble cara

**Desbaste**
Mecanizado medio y desbaste con ranura de virutas positiva
USE: geometría SM

**Torneado medio**
Corte ligeramente interrumpido con/sin ligero descascarillado
USE: geometría 48

**Acabado**
Corte no interrumpido, sin descascarillado
USE: geometría 22




### Plaquitas positivas de una sola cara

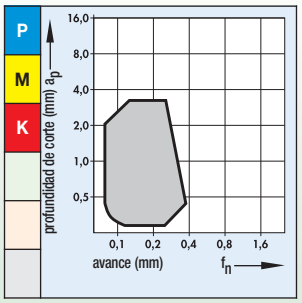
**Desbaste**
Corte interrumpido con/sin descascarillado
USE: geometría CMT ESTÁNDAR

**Torneado medio**
Mandrinado y torneado general
USE: geometría MU

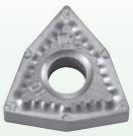
## Plaquitas negativas de doble cara

### 22

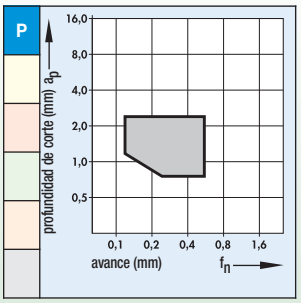
Para el torneado en acabado y la consecución de superficies suaves y precisas. Excelente control de virutas, especialmente a bajas profundidades de corte.




### FL

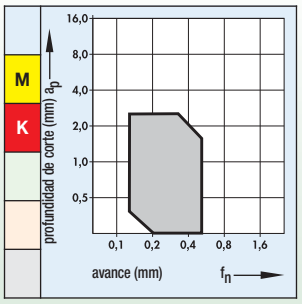


Plaquita de doble cara con ángulo de inclinación ajustado para lograr un buen control de virutas a bajas profundidades de corte.



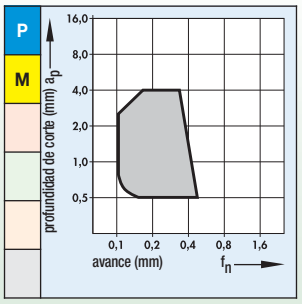

### FW

Geometría de plaquitas wiper para acabado, cuando se necesita un acabado superficial con altos avances. La primera opción en plaquitas wiper para el acabado de alto rendimiento.



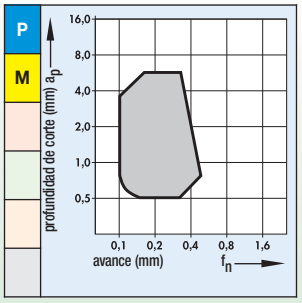

### 4

Geometría de semiacabado para mecanizado de acero de aplicaciones ligeras y medias. Un ángulo de inclinación ajustado genera una reducción de las fuerzas posteriores. Apto para piezas positivas que tienden a vibraciones.



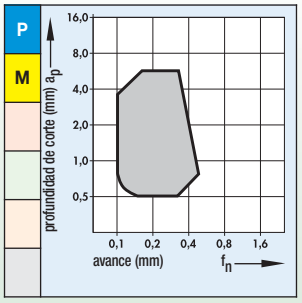

### 48

Para operaciones de torneado de aplicaciones de exigencia media. Rompevirutas de corte suave. Para aplicaciones que produzcan varias secciones de virutas, como el torneado copiado y de perfil. Buena precisión dimensional. Para materiales de acero suave y aceros inoxidables.



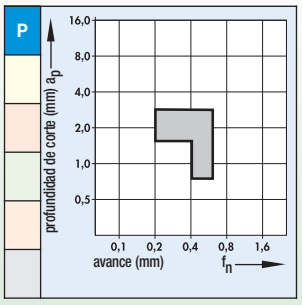

### AP

Para tornear con bajas profundidades de corte y avances medios. Filo de corte estabilizado. Una formación de virutas optimizada y unos filos de corte ondulados aseguran un buen control de rebabas y una adecuada evacuación de virutas. Para aceros, componentes laminados o estirados con costra de fundición o forjada.



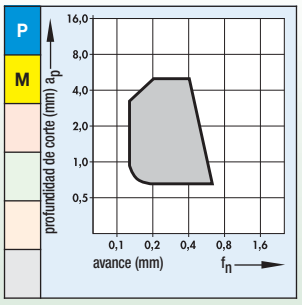

### FR

Plaquita de doble cara con geometría positiva media. Un ángulo de inclinación ajustado reduce las fuerzas de corte y proporciona un buen control de virutas sobre un amplio rango de avance.



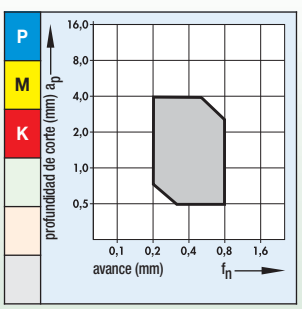

### 49

Para un torneado medio y en desbaste. Control de virutas excelente debido a un elemento de rompevirutas configurado especialmente en el área de las esquinas. Buena formación de virutas con bajas profundidades de corte.



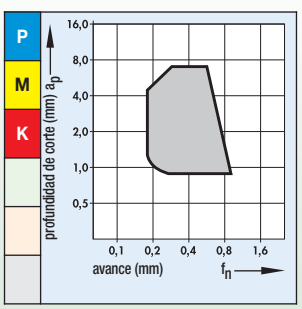

### MW

Geometría de plaquitas wiper para torneado ligero y medio con altos avances. Avance doblemente superior con filos con radios de esquina completos para conseguir el mismo acabado superficial.




### 5

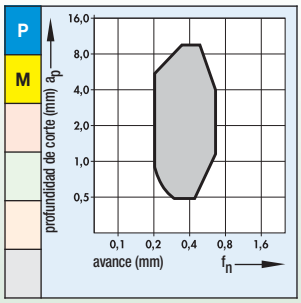
Para un torneado de aplicaciones de exigencia media y en desbaste. Excepcional control de virutas. Gran fuerza en los filos para cortes interrumpidos, costra forjada o cascarilla. Ideal para todas las fundiciones como la gris, la maleable y la nodular.



## Plaquitas negativas de doble cara

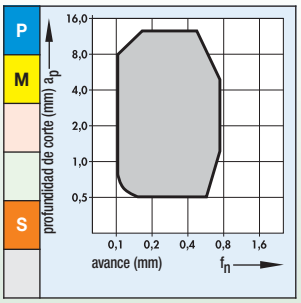
### SL

Para un desbaste ligero y medio de aceros, una aleación alta de titanio de difícil mecanización y materiales de aluminio. Gran fuerza para la deformación pesada de virutas.



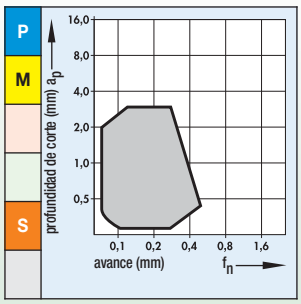

### SM

Para un mecanizado de aplicaciones de exigencia media de materiales de trabajo difíciles, como las aleaciones con base de cromo y níquel. Minimiza la tendencia de materiales a adherirse a la plaquita.



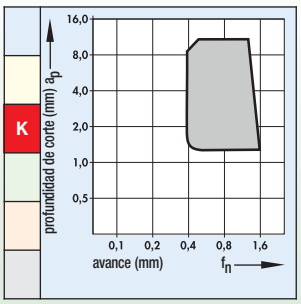

### CT

Diseñadas para un torneado copiado exterior. Mientras que otras geometrías producen virutas largas, la distribución única del corte da como resultado un buen control de virutas.




### ..MA

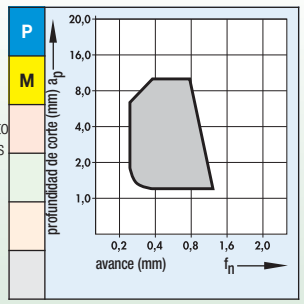
Geometría con parte superior plana para el mecanizado de fundición. Para aplicaciones de acabado y desbaste.



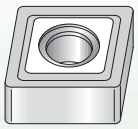

## Plaquitas negativas de una cara

### 65

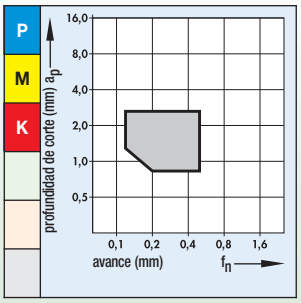
Geometría de desbaste-torneado con control de virutas ampliando el rango de aplicaciones de exigencia media. Un ángulo de desprendimiento positivo reduce las fuerzas de corte, reduciendo las necesidades de energía. Para aceros inoxidables y de baja tensión de rotura.




### ..MG

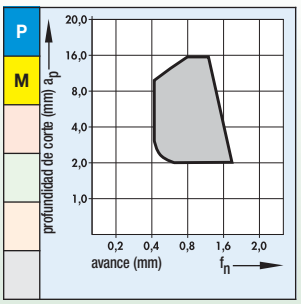


Para mecanizado ligero y desbaste ligero.



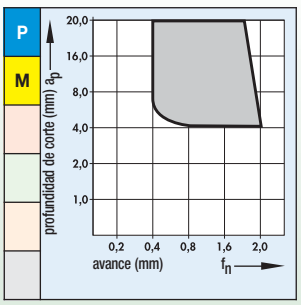

### 8

Filo del corte estable para las mayores secciones de virutas y las tasas de evacuación de metal más altas. Para un corte interrumpido y aplicaciones con una alta carga del filo de corte. Profundidades de corte de hasta 16,0 mm y avances de hasta 1,6 mm.




### SR

Un fuerte filo de corte para las cargas más elevadas en desbaste con profundidades de corte de hasta 22,0 mm y avances de hasta 2,0 mm.

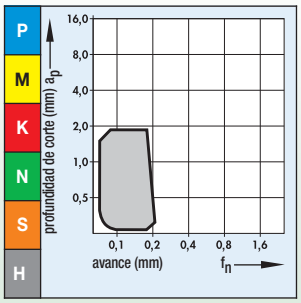



| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

## Plaquitas positivas de una cara

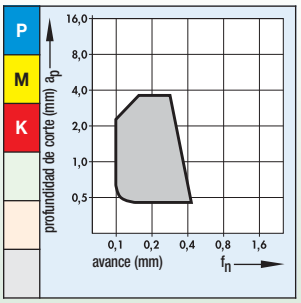
### 2

Filo afilado para un mecanizado de acabado. Buen control de virutas con secciones de virutas extremadamente pequeñas. Gran precisión dimensional y acabados superficiales suaves. Plaquitas con radio de esquina de 0,2 mm rectificado con precisión en todas las caras.



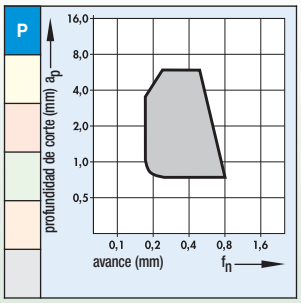

### 41

Ideal para un mecanizado de aplicaciones ligeras y medias. Bajas fuerzas de corte y reducción de los requisitos de potencia gracias a un ángulo de desprendimiento positivo. Buen control de virutas en una amplia gama. También se puede utilizar en fundición de viruta corta.



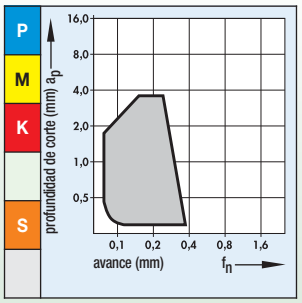

### 67

Proporciona un control de virutas en aplicaciones medias. Un desprendimiento positivo reduce las fuerzas de corte y el consumo de energía. Para aceros inoxidables y de baja tensión de rotura.



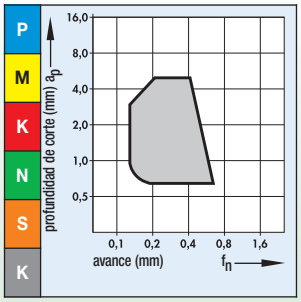

### MU

El torneado medio universal incluye un mecanizado en desbaste con cargas medias de virutas y un mecanizado en acabado con baja carga de virutas.




### MT

Filo de corte estabilizado para secciones de virutas medias. Eficaz en operaciones que exigen una gran tenacidad o incluyen cortes interrumpidos.




| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
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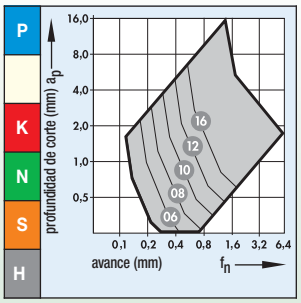
| H | Materiales endurecidos |

## Plaquitas positivas y redondas

### RCMT/RCMX

Para torneado recto, planeado y torneado de perfil. Para profundidades pequeñas de corte y altos avances de hasta 0,1 x D.

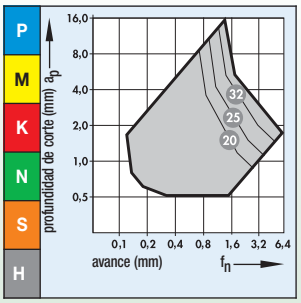



### RCMT43

Para el torneado, planeado y contorneado en desbaste y acabado. Ideal para el mecanizado de aceros de aleación, de carbono e inoxidables. El rango incluye:

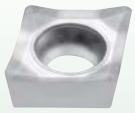
avances:
f ≤ 0,1 x D

profundidades de corte:
ap ≤ 0,4 x D

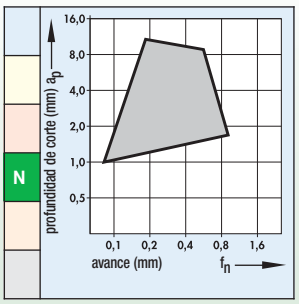



## Plaquitas positivas de una cara para el mecanizado de aluminio

### AL1

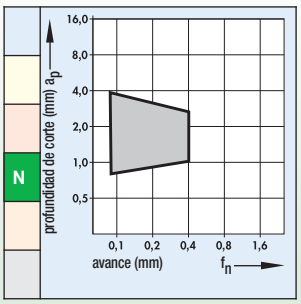


Para el torneado de aluminio de fundición, aleaciones ligeras, metales no férreos, metales de alta fusión, materiales plásticos, fibra de vidrio, materiales plásticos reforzados, placa laminada, carbono y cerámicas finas.



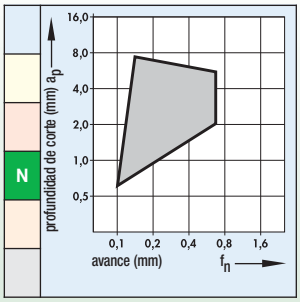

### AL2

Para aleaciones de aluminio difíciles de mecanizar con bajo contenido en silicio, aleaciones forjadas y extrusiones. Consigue resultados óptimos en materiales difíciles de mecanizar.




### AL3

Para el mecanizado rentable de aluminio, metales no férreos y materiales plásticos. Los filos de corte extremadamente afilados dan como resultado unos acabados óptimos de las piezas con bajas fuerzas de corte y virutas cortas. El acabado de acero, acero inoxidable y fundición gris es posible con la calidad con recubrimiento HCK10.




| | |
|---|---|
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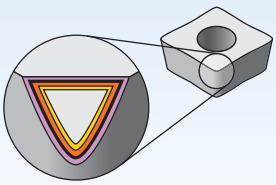
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |



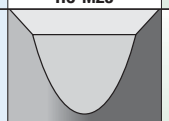
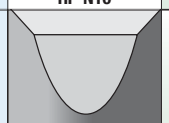
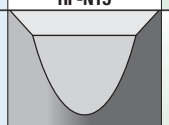
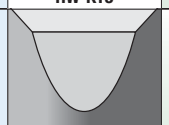
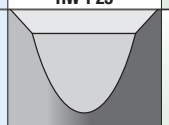
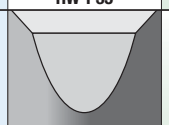
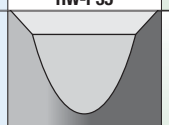
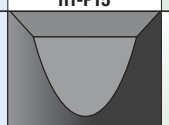
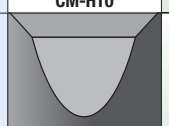
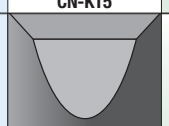
**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

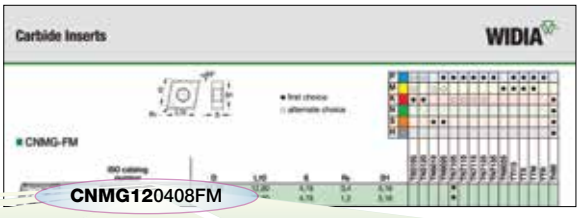
| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HCK10 | HC-N10 | Metal duro recubierto. PVD — TiAlN-$Al_2O_3$ en metal duro de micrograno. Mecanizado ligero y medio. Para aleaciones de aluminio. | N | N | N | | | | | | |
| ¡NOVEDAD! TN5105 | HC-K15 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$. Aumento de la resistencia al desgaste para larga vida de la herramienta a velocidades altas del corte. Aumento de la resistencia del filo contra entalladura de profundidad del corte en cortes interrumpidos. | K | K | K | K | | | | | |
| ¡NOVEDAD! TN5120 | HC-K20 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$. Mecanizado ligero y medio. Para fundiciones. | K | | K | K | K | | | | |
| TN6010 | HC-S10 | Metal duro recubierto. Nanomulticapa de PVD — TiAlN. Mecanizado ligero. Para aceros inoxidables y aleaciones difíciles de mecanizar. | M | M | M | M | | | | | |
| TN6025 | HC-S25 | Metal duro recubierto. Nanomulticapa de PVD — TiAlN. Mecanizado ligero y medio. Para aceros inoxidables y aleaciones difíciles de mecanizar. | M | | | M | M | M | | | |
| ¡NOVEDAD! TN7105 | HC-P05 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Extremadamente resistente al desgaste. Mecanizado ligero. Para aceros y fundición nodular en cortes no interrumpidos. | P | P | | | | | | | |
| ¡NOVEDAD! TN7110 | HC-P10 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Muy resistente al desgaste. Mecanizado ligero y medio. Para aceros. | P | P | P | | | | | | |
| ¡NOVEDAD! TN7115 | HC-P15 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para aceros. | P | | P | P | P | | | | |
| ¡NOVEDAD! TN7125 | HC-P25 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buenas propiedades de tenacidad. Mecanizado medio y pesado. Para aceros. | P | | | P | P | P | | | |
| | | | M | | | M | M | M | | | |

Calidad

| | Recubrimiento | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ¡NOVEDAD! TN7135 | HC-P35 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Demostrado en todas las operaciones de desbaste y desbaste pesado, en seco o con refrigerante, en cortes interrumpidos y no interrumpidos. | P | P | P | P | P | P | P | P | |
| TN8025 | HC-M25 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-ZrCN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para la serie AISI 300 de acero inoxidable austenítico. | M | M | M | M | M | M | | | |
| HWK10 |  HF-N10 | Metal duro sin recubrir. Metal duro de micrograno con estabilidad del filo de corte. Mecanizado ligero. Para metales no ferrosos y materiales no metálicos. | N | N | N | N | N | | | | |
| HWK15 |  HF-N15 | Metal duro sin recubrir. Metal duro de micrograno con alta estabilidad del filo de corte. Mecanizado ligero y medio. Para metales no ferrosos y materiales no metálicos. | N | N | N | N | N | | | | |
| THM |  HW-K15 | Metal duro sin recubrir. Equilibrio extraordinariamente bueno de dureza, resistencia al desgaste, estabilidad del filo y tenacidad. Mecanizado ligero y medio. Para fundición, todos los metales no férreos y materiales no metálicos. Útil en condiciones desfavorables. | K | K | K | K | K | K | K | K | |
| TTM |  HW-P25 | Metal duro sin recubrir. Mecanizado medio. Para aceros y fundición nodular. | P | P | P | P | P | P | P | P | |
| TTR |  HW-P35 | Metal duro sin recubrir. Mecanizado ligero y medio. Para aceros y fundición nodular. Debe usarse en bajas velocidades de corte. Efectivo en condiciones desfavorables. | P | P | P | P | P | P | P | P | |
| TTX |  HW-P35 | Metal duro sin recubrir. Calidad muy resistente al desgaste. Mecanizado ligero. Debe usarse en condiciones favorables. | P | P | P | P | P | P | P | P | |
| TTI15 |  HT-P15 | Cermet. Mecanizado ligero. Resistencia al desgaste extremadamente buena a velocidades de corte más altas. Para aceros y fundición nodular. Recomendado para velocidades de corte elevadas en condiciones favorables. | P | P | P | P | P | P | P | P | |
| CW2015 |  CM-H10 | Cerámica (negra) mixta. Matriz $Al_2O_3$ y TiCN. Buenas propiedades de tenacidad combinadas con buena resistencia al desgaste. Semiacabado y acabado. Para materiales con base de hierro endurecido y fundición gris (acabado). | K | K | K | K | K | K | K | K | |
| CW5025 |  CN-K15 | Cerámica de nitruro de silicio. Extraordinarias propiedades de tenacidad. Desbaste, también en cortes muy interrumpidos. Capaz de un torneado de alto rendimiento. Debe usarse con o sin refrigerante. Para fundición gris. | K | K | K | K | K | K | K | K | |
| ¡NOVEDAD! CW3020 |  C4 | Fibras cerámicas con una matriz de $Al_2O_3$ + SiCw. Las fibras cerámicas SiC integradas en la microestructura proporcionan a este material cerámico una tenacidad excelente para cortar aleaciones y materiales de fundición a alta temperatura, con una alta dureza Brinell. | S | S | S | S | S | S | S | S | |

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




### C — Forma de la plaquita

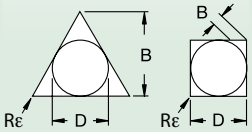
| | | |
|---|---|---|
| H | Hexagonal | 120° |
| O | Octagonal | 135° |
| P | Pentagonal | 108° |
| R | Redonda | — |
| S | Cuadrada | 90° |
| T | Triangular | 60° |
| C<br>D<br>E<br>M<br>V | Romboide | 80°<br>55°<br>75°<br>86°<br>35° |
| W | Trigona | 80° con mayores ángulos de esquina |
| L | Rectangular | 90° |
| A<br>B<br>N/K | Paralelogramo | 85°<br>82°<br>55° |

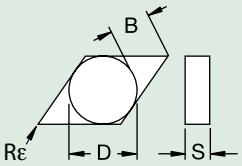
### N — Ángulo de incidencia de la plaquita

| | |
|---|---|
| A | 3° |
| B | 5° |
| C | 7° |
| D | 15° |
| E | 20° |
| F | 25° |
| G | 30° |
| N | 0° |
| P | 11° |
| O | Indicado para otros ángulos de incidencia que requieran una descripción. |

### M — Clase de tolerancia

Las tolerancias se aplican antes de la preparación y el recubrimiento de los filos




D = Diámetro teórico del círculo inscrito en la plaquita
S = Grosor
B = Consulte las cifras que se expresan a continuación

### G — Características de la plaquita

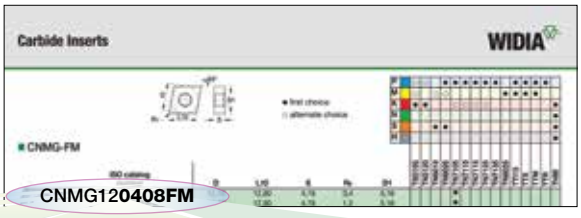
| | |
|---|---|
| N | |
| R | |
| F | |
| A | |
| M | |
| G | |
| W | |
| T | |
| Q | |
| U | |
| B | |
| H | |
| C | |
| J | |
| X | Diseño especial |

### 12 — Plaquita

| | Código para longitud métrica del filo de corte "L10" | | | | | | |
|---|---|---|---|---|---|---|---|
| | "D" | | | | | | |
| mm | C | D | R | S | T | V | W |
| 3,97 | S4 | 04 | 03 | 03 | 06 | — | — |
| 4,76 | 04 | 05 | 04 | 04 | 08 | 08 | S3 |
| 5,56 | 05 | 06 | 05 | 05 | 09 | 09 | 03 |
| 6,00 | — | — | 06 | — | — | — | — |
| 6,35 | 06 | 07 | 06 | 06 | 11 | 11 | 04 |
| 7,94 | 08 | 09 | 07 | 07 | 13 | 13 | 05 |
| 8,00 | — | — | 08 | — | — | — | — |
| 9,52 | 09 | 11 | 09 | 09 | 16 | 16 | 06 |
| 10,00 | — | — | 10 | — | — | — | — |
| 11,11 | 11 | 13 | 11 | 11 | 19 | 19 | 07 |
| 12,00 | — | — | 12 | — | — | — | — |
| 12,70 | 12 | 15 | 12 | 12 | 22 | 22 | 08 |
| 14,29 | 14 | 17 | 14 | 14 | 24 | 24 | 09 |
| 15,88 | 16 | 19 | 15 | 15 | 27 | 27 | 10 |
| 16,00 | — | — | 16 | — | — | — | — |
| 17,46 | 17 | 21 | 17 | 17 | 30 | 30 | 11 |
| 19,05 | 19 | 23 | 19 | 19 | 33 | 33 | 13 |
| 20,00 | — | — | 20 | — | — | — | — |
| 22,22 | 22 | 27 | 22 | 22 | 38 | 38 | 15 |
| 25,00 | — | — | 25 | — | — | — | — |
| 25,40 | 25 | 31 | 25 | 25 | 44 | 44 | 17 |
| 31,75 | 32 | 38 | 31 | 31 | 54 | 54 | 21 |
| 32,00 | — | — | 32 | — | — | — | — |

| clase de tolerancia | tolerancia en "D" | tolerancia en "B" | tolerancia en "S" |
|---|---|---|---|
| C | ±0,025 | ±0,013 | ±0,025 |
| H | ±0,013 | ±0,013 | ±0,025 |
| E | ±0,025 | ±0,025 | ±0,025 |
| G | ±0,025 | ±0,025 | ±0,013 |
| M | Consulte las tablas de la columna de tamaños | | ±0,013 |
| U | Consulte las tablas de la columna de tamaños | | ±0,013 |

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




| 04 | 08 | | | FM |
|---|---|---|---|---|
| Grosor | Radio de esquina "Rε" | Dirección de la plaquita (opcional) | Filo de corte (opcional) | Rompevirutas (opcional) |

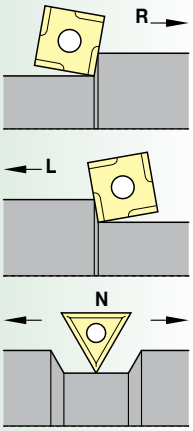
| símbolo | grosor |
|---|---|
| mm | mm |
| – | 0,79 |
| T0 | 1,00 |
| 01 | 1,59 |
| T1 | 1,98 |
| 02 | 2,38 |
| 03 | 3,18 |
| T3 | 3,97 |
| 04 | 4,76 |
| 05 | 5,56 |
| 06 | 6,35 |
| 07 | 7,94 |
| 09 | 9,52 |
| 11 | 11,11 |
| 12 | 12,70 |

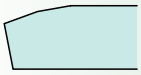
| símbolo | radio de esquina | |
|---|---|---|
| mm | mm | |
| X0 | 0,04 | |
| 01 | 0,1 | |
| 02 | 0,2 | |
| 04 | 0,4 | |
| 08 | 0,8 | |
| 12 | 1,2 | |
| 16 | 1,6 | |
| 20 | 2,0 | |
| 24 | 2,4 | |
| 28 | 2,8 | |
| 32 | 3,2 | |
| 00 | | |
| M0 | round insert | |

**R** = A derechas

**L** = A izquierdas

**N** = Neutro

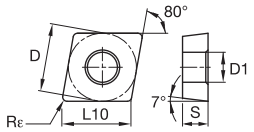



| | | |
|---|---|---|
| **F** | | Afilado |
| **E** | | Redondeado |
| **T** | | Biselado |
| **S** | | Biselado y redondeado |
| **K** |  | Biselado doble |
| **P** | | Biselado doble y redondeado |

| | | |
|---|---|---|
| **2** | = | Filo de corte afilado |
| **3** | = | Desbaste medio |
| **4** | = | Acabado medio |
| **5** | = | Desbaste medio |
| **8** | = | Desbaste pesado |
| **11** | = | Ranura de virutas rectificada "ancho de ranura de virutas de 1,1 mm" |
| **13** | = | Ferroc. ligero |
| **16** | = | Ferroc. medio |
| **18** | = | Ranura de virutas rectificada "ancho de ranura de virutas de 1,8 mm" |
| **22** | = | Acabado |
| **25** | = | Ranura de virutas rectificada "ancho de ranura de virutas de 2,5 mm" |
| **29** | = | Ranura de virutas rectificada "ancho de ranura de virutas de 2,9 mm" |
| **41** | = | Medio ligero |
| **43** | = | Acabado medio |
| **48** | = | Acero medio |
| **49** | = | Inoxidable medio |
| **65** | = | Desbaste |
| **67** | = | Desbaste medio |
| **AP** | = | Forma semifinal |
| **AL1** | = | Universal |
| **AL2** | = | Filo de corte afilado |
| **AL3** | = | Muy positiva |
| **CT** | = | Torneado copiado |
| **EN95** | = | Desbaste pesado |
| **FL** | = | Acabado ligero |
| **FM** | = | Acabado medio |
| **FR** | = | Acabado en desbaste |
| **FW** | = | Wiper de acabado |
| **HP** | = | Desbaste duro para materiales por encima de 950 N/mm² |
| **MU** | = | Medio universal |
| **MW** | = | Wiper medio |
| **RRP** | = | Ferrocarr. positivo |
| **SL** | = | Medio ligero Desbaste |
| **SM** | = | Medio afilado |
| **SP** | = | Desbaste suave para materiales de 950 N/mm² como máximo |
| **SR** | = | Superdesbaste |
| **T** | = | Bisel negativo |

| | ± Tolerancia en "D" | | | |
|---|---|---|---|---|
| | Tolerancia de clase M | | | Tolerancia de clase U |
| "D" | Formas S, T, C, R, & W | Forma D | Forma V | Formas S, T, & C |
| mm | mm | mm | mm | mm |
| 3,97 | 0,05 | – | – | – |
| 4,76 | 0,05 | – | – | 0,008 |
| 5,56 | 0,05 | 0,05 | 0,05 | 0,008 |
| 6,35 | 0,05 | 0,05 | 0,05 | 0,008 |
| 7,94 | 0,05 | 0,05 | 0,05 | 0,008 |
| 9,52 | 0,05 | 0,05 | 0,05 | 0,08 |
| 11,11 | 0,08 | 0,08 | 0,08 | 0,13 |
| 12,70 | 0,08 | 0,08 | 0,08 | 0,13 |
| 14,29 | 0,08 | 0,08 | 0,08 | 0,13 |
| 15,88 | 0,10 | 0,10 | 0,10 | 0,18 |
| 17,46 | 0,10 | 0,10 | 0,10 | 0,18 |
| 19,05 | 0,10 | 0,10 | 0,10 | 0,18 |
| 22,22 | 0,13 | – | – | 0,25 |
| 25,40 | 0,13 | – | – | 0,25 |
| 31,75 | 0,15 | – | – | 0,25 |

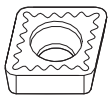
| | ± Tolerancia en "B" | | | |
|---|---|---|---|---|
| | Tolerancia de clase M | | | Tolerancia de clase U |
| "D" | Formas S, T, C, R, & W | Forma D | Forma V | Formas S, T, & C |
| mm | mm | mm | mm | mm |
| 3,97 | 0,08 | – | – | – |
| 4,76 | 0,08 | – | – | 0,13 |
| 5,56 | 0,08 | 0,11 | – | 0,13 |
| 6,35 | 0,08 | 0,11 | – | 0,13 |
| 7,94 | 0,08 | 0,11 | – | 0,13 |
| 9,52 | 0,08 | 0,11 | 0,18 | 0,13 |
| 11,11 | 0,13 | 0,15 | – | – |
| 12,70 | 0,13 | 0,15 | 0,25 | 0,20 |
| 14,29 | 0,13 | 0,15 | – | – |
| 15,88 | 0,15 | 0,18 | – | 0,27 |
| 17,46 | 0,15 | 0,18 | – | 0,27 |
| 19,05 | 0,15 | 0,18 | – | 0,27 |
| 22,22 | 0,15 | – | – | 0,38 |
| 25,40 | 0,18 | – | – | 0,38 |
| 31,75 | 0,20 | – | – | 0,38 |




● primera elección
○ elección alternativa

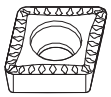
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## CCGT-2



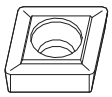
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCGT0602022 | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | | | | | | | | | | ● | | | | | ● |
| CCGT09T3022 | 9,53 | 9,67 | 3,97 | 0,2 | 4,40 | | | | | | | | | | | | | | | ● |

## CCGT-MU



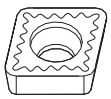
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCGT060202MU | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | | ● | | | | | ● | | | ● | | | | | |

## CCMT

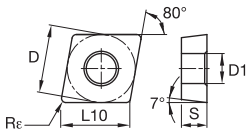


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCMT060202 | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | | ● | | | ● | ● | ● | | ● | ● | | | | ● | ● |
| CCMT060204 | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● |
| CCMT060208 | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | | ● | | | ● | ● | ● | ● | | | | | | | |
| CCMT080304 | 7,94 | 8,06 | 3,18 | 0,4 | 3,40 | | | | | | | | ● | | | | | | | |
| CCMT080308 | 7,94 | 8,06 | 3,18 | 0,8 | 3,40 | | | | | | | | ● | | | | | | | |
| CCMT090304 | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | | | | ● | ● |
| CCMT090308 | 9,53 | 9,67 | 3,18 | 0,8 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | | | | ● | ● |
| CCMT090312 | 9,53 | 9,67 | 3,18 | 1,2 | 4,40 | | | | | | | ● | | | | | | | | |
| CCMT09T304 | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | | ● | | | ● | ● | ● | ● | ● | ● | | | | ● | ● |
| CCMT09T308 | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | | ● | | | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● |
| CCMT09T312 | 9,53 | 9,67 | 3,97 | 1,2 | 4,40 | | ● | | | | | | ● | ● | | | | | ● | |
| CCMT120408 | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | | ● | | | ● | ● | ● | ● | ● | ● | | | | ● | ● |
| CCMT120412 | 12,70 | 12,90 | 4,76 | 1,2 | 5,50 | | ● | | | ● | ● | ● | ● | ● | ● | | | | | |

## CCMT-2



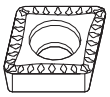
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCMT0602042 | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | | | | | | ● | ● | ● | | ● | ● | | | | ● |
| CCMT0602082 | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | | | | | | | | | | ● | | | | | |
| CCMT0903042 | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | | | | | | | ● | | | | | | | | |
| CCMT09T3042 | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | | | | | | ● | ● | ● | | ● | ● | | | | |




● primera elección
○ elección alternativa

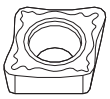
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ CCMT-MU



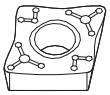
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMT060204MU** | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | | ● | | | | ● | ● | ● | | ● | | | | | |
| **CCMT060208MU** | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | | ● | | | | | ● | ● | | ● | | | | | |
| **CCMT090304MU** | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | ● | ● | | | ● | ● | ● | ● | | ● | | | | | |
| **CCMT090308MU** | 9,53 | 9,67 | 3,18 | 0,8 | 4,40 | ● | ● | | | | ● | ● | ● | | ● | | | | | |
| **CCMT090312MU** | 9,53 | 9,67 | 3,18 | 1,2 | 4,40 | | ● | | | | | | | | ● | | | | | |
| **CCMT09T304MU** | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | | | | |
| **CCMT09T308MU** | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | |
| **CCMT09T312MU** | 9,53 | 9,67 | 3,97 | 1,2 | 4,40 | | ● | ● | ● | | | | | | ● | | | | | |
| **CCMT120404MU** | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | | ● | ● | | | | ● | ● | | ● | | | | | |
| **CCMT120408MU** | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | | ● | ● | ● | | ● | ● | ● | | ● | | | | | |
| **CCMT120412MU** | 12,70 | 12,90 | 4,76 | 1,2 | 5,50 | | ● | ● | ● | | | | | | ● | | | | | |

## ■ CCMT-41



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMT09030441** | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | | | | | | ● | | ● | | | | | | | |
| **CCMT09030841** | 9,53 | 9,67 | 3,18 | 0,8 | 4,40 | | | | | | ● | ● | ● | | | | | | | |
| **CCMT09T30441** | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | | | | | | ● | ● | ● | | | | | | | |
| **CCMT09T30841** | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | | | | | | ● | ● | ● | ● | | | | | | |
| **CCMT09T31241** | 9,53 | 9,67 | 3,97 | 1,2 | 4,40 | | | | | | | ● | | | | | | | | |
| **CCMT12040441** | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | | | | | | ● | ● | ● | | ● | | | | | ● |
| **CCMT12040841** | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | | | | | | ● | ● | ● | ● | ● | | | | | ● |
| **CCMT12041241** | 12,70 | 12,90 | 4,76 | 1,2 | 5,50 | | | | | | | | ● | | | | | | | |

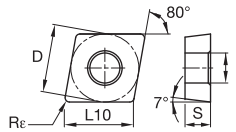
## ■ CCMT-67

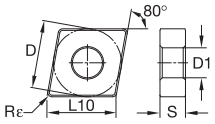


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMT12040867** | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | | | | | | ● | | ● | | | | | | | |

## ■ CCMW

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMW060202** | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | | | | | | | | | | | | | | | ● |
| **CCMW060204** | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | ● | ● | | | | | | | | | | | | | ● |
| **CCMW090302** | 9,53 | 9,67 | 3,18 | 0,2 | 4,40 | | | | | | | | | | | | | | | ● |
| **CCMW090304** | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | ● | ● | | | | | | | | | | | | | ● |
| **CCMW090308** | 9,53 | 9,67 | 3,18 | 0,8 | 4,40 | ● | ● | | | | | | | | | | | | | ● |
| **CCMW09T304** | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | ● | ● | | | | | | | | | | | | | ● |
| **CCMW09T308** | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | ● | ● | | | | | | | | | | | | | ● |
| **CCMW120404** | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | ● | ● | | | | | | | | | | | | | ● |
| **CCMW120408** | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | ● | ● | | | | | | | | | | | | | ● |

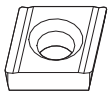



● primera elección
○ elección alternativa

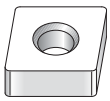
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## CCMX



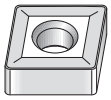
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| CCMX060202L10 | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 |
| CCMX120408L16 | 12,70 | 12,90 | 4,76 | 0,8 | 5,40 |

## CNMA



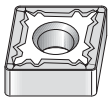
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| CNMA120404 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 |
| CNMA120408 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| CNMA120412 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |
| CNMA120416 | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 |
| CNMA160612 | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 |
| CNMA190612 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 |
| CNMA190616 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |

## CNMG



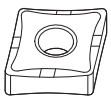
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| CNMG120404 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 |
| CNMG120408 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| CNMG120412 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |
| CNMG160608 | 15,88 | 16,12 | 6,35 | 0,8 | 6,35 |
| CNMG160612 | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 |
| CNMG190612 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 |
| CNMG190616 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |

## CNMG-22

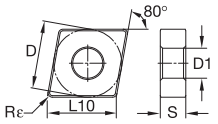


| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| CNMG12040422 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 |
| CNMG12040822 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| CNMG12041222 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |

## CNMG-4



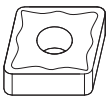
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| CNMG1204044 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 |
| CNMG1204084 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ CNMG-48

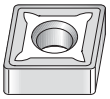


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG12040448 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | | | | | | ● | ● | ● | | ● | | | | | |
| CNMG12040848 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG12041248 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | | | | ● | ● | | | ● | | | | | |

## ■ CNMG-49

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG09030849 | 9,53 | 9,67 | 3,18 | 0,8 | 3,81 | | | | | | ● | ● | | ● | | | | | | |
| CNMG12040849 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | | | ● | ● | ● | ● | ● | ● | | | | | |
| CNMG12041249 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | | | ● | ● | ● | ● | ● | ● | | | | | |

## ■ CNMG-5



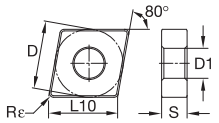
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG1204085 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | ● | | | ● | ● | ● | ● | ● | ● | | | | | |
| CNMG1204125 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | ● | | | ● | ● | ● | ● | ● | ● | | | | | |
| CNMG1204165 | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | | ● | | | | | ● | | ● | ● | | | | | |
| CNMG1606085 | 15,88 | 16,12 | 6,35 | 0,8 | 6,35 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG1606125 | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG1606165 | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG1906085 | 19,05 | 19,34 | 6,35 | 0,8 | 7,93 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG1906125 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG1906165 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| CNMG1906245 | 19,05 | 19,34 | 6,35 | 2,4 | 7,93 | | ● | | | | | | | | ● | | | | | |

## ■ CNMG-AP

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG120408AP | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | ● | ● | | ● | ● | ● | | ● | | | | | |
| CNMG120412AP | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | ● | ● | ● | ● | | | | ● | | | | | |

## ■ CNMG-FL

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG120404FL | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | | | | | ● | | | | | | | | | | |
| CNMG120408FL | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | | | ● | | | | | | | | | | |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

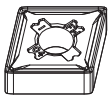
## CNMG-FM

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMG120404FM** | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | | | | | ● | | | | | | | | | | |
| **CNMG120412FM** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | | | ● | | | | | | | | | | |

## CNMG-FR

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMG120408FR** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | | | ● | | | | | | | | | | |
| **CNMG120412FR** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | | | ● | | | | | | | | | | |

## CNMG-FW



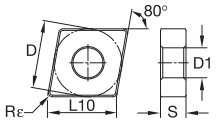
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMG120404FW** | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | ● | | | | | | | | | ● | | | | | |
| **CNMG120408FW** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | ● | | | | | | | | | ● | | | | | |
| **CNMG120412FW** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | ● | | | | | | | | | ● | | | | | |

## CNMG-MW

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMG120408MW** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | ● | | | | | | ● | | | ● | | | | | |
| **CNMG120412MW** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | ● | | | | | | ● | | | ● | | | | | |

## CNMG-SL

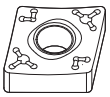
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMG120408SL** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | | | | ● | ● | ● | | ● | | | | | |
| **CNMG120412SL** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | | | | | | | | ● | | | | | |
| **CNMG120416SL** | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | | | | | | ● | | | | ● | | | | | |
| **CNMG160608SL** | 15,88 | 16,12 | 6,35 | 0,8 | 6,35 | | | | | | ● | ● | ● | | ● | | | | | |
| **CNMG160612SL** | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 | | | | | | ● | ● | ● | | ● | | | | | |
| **CNMG160616SL** | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 | | | | | | | ● | | | ● | | | | | |
| **CNMG190612SL** | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 | | | | | | | ● | ● | | ● | | | | | |
| **CNMG190616SL** | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 | | | | | | | ● | | | ● | | | | | |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## CNMM-65



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **CNMM12040865** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| **CNMM12041265** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |
| **CNMM12041665** | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 |
| **CNMM16060865** | 15,88 | 16,12 | 6,35 | 0,8 | 6,35 |
| **CNMM16061265** | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 |
| **CNMM16061665** | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 |
| **CNMM19061265** | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 |
| **CNMM19061665** | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |
| **CNMM19062465** | 19,05 | 19,34 | 6,35 | 2,4 | 7,93 |

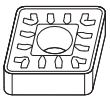
| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMM12040865** | | | | | | ● | ● | ● | ● | ● | | | | | | |
| **CNMM12041265** | | | | | | ● | ● | ● | ● | ● | | | | | | |
| **CNMM12041665** | | | | | | | | | ● | ● | | | | | | |
| **CNMM16060865** | | | | | | | | ● | ● | ● | | | | | | |
| **CNMM16061265** | | | | | | ● | ● | ● | ● | ● | | | | | | |
| **CNMM16061665** | | | | | | | | ● | | ● | | | | | | |
| **CNMM19061265** | | | | | | ● | ● | ● | ● | ● | | | | | | |
| **CNMM19061665** | | | | | | | ● | ● | ● | ● | | | | | | |
| **CNMM19062465** | | | | | | | ● | | | ● | | | | | | |

## CNMM-8

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **CNMM1204088** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| **CNMM1204128** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |
| **CNMM1606128** | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 |
| **CNMM1606168** | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 |
| **CNMM1906128** | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 |
| **CNMM1906168** | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |
| **CNMM1906248** | 19,05 | 19,34 | 6,35 | 2,4 | 7,93 |
| **CNMM2509248** | 25,40 | 25,79 | 9,53 | 2,4 | 9,12 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMM1204088** | | | | | | | | | | ● | | | | | | |
| **CNMM1204128** | | | | | | | | | ● | ● | | | | | | |
| **CNMM1606128** | | | | | | | | | ● | ● | | | | | | |
| **CNMM1606168** | | | | | | | | ● | | | | | | | | |
| **CNMM1906128** | | | | | | | | | | ● | | | | | | |
| **CNMM1906168** | | | | | | | | ● | ● | ● | | | | | | |
| **CNMM1906248** | | | | | | | | | | ● | | | | | | |
| **CNMM2509248** | | | | | | | | ● | | | | | | | | |

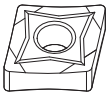
## CNMM-SR



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **CNMM190616SR** | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |
| **CNMM190624SR** | 19,05 | 19,34 | 6,35 | 2,4 | 7,93 |
| **CNMM250916SR** | 25,40 | 25,79 | 9,53 | 1,6 | 9,12 |
| **CNMM250924SR** | 25,40 | 25,79 | 9,53 | .2,4 | 9,12 |

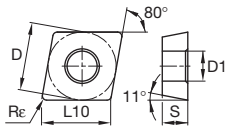
| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMM190616SR** | | | | | | | | ● | ● | | ● | | | | | |
| **CNMM190624SR** | | | | | | | | ● | ● | | ● | | | | | |
| **CNMM250916SR** | | | | | | | | | | | ● | | | | | |
| **CNMM250924SR** | | | | | | | | ● | ● | | ● | | | | | |

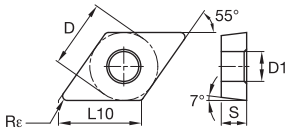
## CNMP-SM



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **CNMP120404SM** | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 |
| **CNMP120408SM** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| **CNMP120412SM** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |
| **CNMP160608SM** | 15,88 | 16,12 | 6,35 | 0,8 | 6,35 |
| **CNMP160612SM** | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 |
| **CNMP190612SM** | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 |
| **CNMP190616SM** | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMP120404SM** | | | ● | | | | | | | | ● | | | | | |
| **CNMP120408SM** | | | ● | ● | | | | | | | ● | | | | | |
| **CNMP120412SM** | | | ● | ● | | | | | | | ● | | | | | |
| **CNMP160608SM** | | | | | | | | | | | ● | | | | | |
| **CNMP160612SM** | | | ● | | | | | | | | ● | | | | | |
| **CNMP190612SM** | | | ● | | | | | | | | | | | | | |
| **CNMP190616SM** | | | | | | | | | | | ● | | | | | |

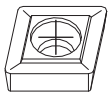



● primera elección
○ elección alternativa

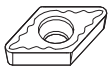
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## CPGT-3



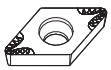
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGT04T1043 | 4,76 | 4,83 | 1,98 | 0,4 | 2,15 | | | | | | | | | ● | | | ● | ● | ● | |

## DCGT-2



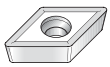
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGT0702022 | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | | | | | | | | | | ● | ● | | | | |
| DCGT11T3022 | 9,53 | 11,63 | 3,97 | 0,2 | 4,40 | | | | | | ● | | | | | | | | | ● |

## DCGT-MU



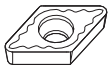
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGT070202MU | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | | | | | | | | | | ● | | | | | |

## DCMT

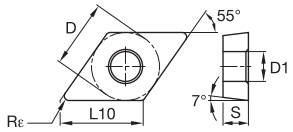


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMT070202 | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | | ● | | | ● | ● | ● | | | | | | | | ● |
| DCMT070204 | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | | ● | | | ● | ● | ● | ● | ● | | | | | | ● |
| DCMT070208 | 6,35 | 7,75 | 2,38 | 0,8 | 2,80 | | ● | | | ● | ● | ● | ● | ● | | | | | | ● |
| DCMT11T304 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | | ● | | | ● | ● | ● | ● | ● | ● | ● | | | ● | ● |
| DCMT11T308 | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | | ● | | | ● | ● | ● | ● | ● | ● | ● | | | ● | ● |
| DCMT11T312 | 9,53 | 11,63 | 3,97 | 1,2 | 4,40 | | ● | | | | | ● | | | | | | | ● | ● |
| DCMT150404 | 12,70 | 15,50 | 4,76 | 0,4 | 5,50 | | ● | | | | ● | ● | ● | ● | ● | | | | | ● |
| DCMT150408 | 12,70 | 15,50 | 4,76 | 0,8 | 5,50 | | ● | | | | ● | ● | ● | ● | ● | | | ● | ● | ● |
| DCMT150412 | 12,70 | 15,50 | 4,76 | 1,2 | 5,50 | | ● | | | | ● | | | | | | | | ● | ● |
| DCMT150416 | 12,70 | 15,50 | 4,76 | 1,6 | 5,50 | | ● | | | | ● | ● | ● | ● | | | | | | ● |

## DCMT-2



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMT0702042 | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | | | | | | ● | ● | ● | | ● | | | | | |
| DCMT0702082 | 6,35 | 7,75 | 2,38 | 0,8 | 2,80 | | | | | | | | | | ● | | | | | |
| DCMT11T3042 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | | | | | | | ● | | | ● | ● | | | | ● |
| DCMT11T3082 | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | | | | | | ● | ● | ● | | ● | ● | | | | |



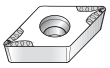

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ DCMT-41

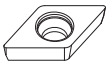
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCMT11T30441** | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | | | | | | ● | ● | ● | | ● | ● | | | | ● |
| **DCMT11T30841** | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | | | | | | ● | ● | ● | ● | ● | ● | | | | ● |
| **DCMT11T31241** | 9,53 | 11,63 | 3,97 | 1,2 | 4,40 | | | | | | ● | | ● | | ● | | | | | |
| **DCMT15040441** | 12,70 | 15,50 | 4,76 | 0,4 | 5,50 | | | | | | ● | ● | ● | | | | | | | ● |
| **DCMT15040841** | 12,70 | 15,50 | 4,76 | 0,8 | 5,50 | | | | | | ● | | ● | ● | | | | | | |

## ■ DCMT-MU



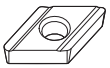
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCMT070204MU** | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | | ● | | | | | ● | ● | | ● | | | | | |
| **DCMT070208MU** | 6,35 | 7,75 | 2,38 | 0,8 | 2,80 | | ● | | | | | ● | ● | | ● | | | | | |
| **DCMT11T304MU** | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | | | | |
| **DCMT11T308MU** | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | |
| **DCMT11T312MU** | 9,53 | 11,63 | 3,97 | 1,2 | 4,40 | | ● | ● | ● | | | ● | | | ● | | | | | |
| **DCMT150404MU** | 12,70 | 15,50 | 4,76 | 0,4 | 5,50 | | | ● | | | | | | | ● | | | | | |
| **DCMT150408MU** | 12,70 | 15,50 | 4,76 | 0,8 | 5,50 | ● | ● | ● | ● | | ● | ● | ● | | ● | | | | | |
| **DCMT150412MU** | 12,70 | 15,50 | 4,76 | 1,2 | 5,50 | ● | ● | ● | ● | | | | ● | | ● | | | | | |

## ■ DCMW



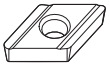
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCMW070204** | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | ● | ● | | | | | | | | | | | | | ● |
| **DCMW11T304** | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | ● | ● | | | | | | | | | | | | | ● |
| **DCMW150408** | 12,70 | 15,50 | 4,76 | 0,8 | 5,50 | ● | ● | | | | | | | | | | | | | ● |

## ■ DCMX-18



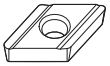
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCMX11T302L18** | 9,53 | 11,63 | 3,97 | 0,2 | 4,30 | | | | | | | | | | | | | | | ● |
| **DCMX11T302R18** | 9,53 | 11,63 | 3,97 | 0,2 | 4,30 | | | | | | ● | | | | | | | | | ● |
| **DCMX11T304L18** | 9,53 | 11,63 | 3,97 | 0,4 | 4,30 | | | | | | | | | ● | | | | | | ● |
| **DCMX11T304R18** | 9,53 | 11,63 | 3,97 | 0,4 | 4,30 | | | | | | | | | ● | | | | | | ● |
| **DCMX11T308R18** | 9,53 | 11,63 | 3,97 | 0,8 | 4,30 | | | | | | | | | ● | | | | | | |

## ■ DCMX-25

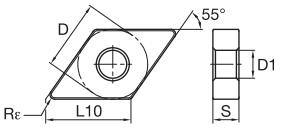


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCMX150404R25** | 12,70 | 15,50 | 4,76 | 0,4 | 5,40 | | | | | | | | | ● | | | | | | |

## ■ DCMX-29



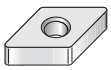
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DCMX150408R29** | 12,70 | 15,50 | 4,76 | 0,8 | 5,40 | | | | | | | | | ● | | | | | | |




● primera elección
○ elección alternativa

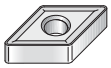
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## DNMA



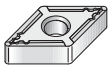
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMA150408** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **DNMA150412** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **DNMA150608** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **DNMA150612** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | ● | ● | | | | | | | | | | | | | |

## DNMG



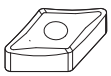
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG150408** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | | ● | | | | | | | | | | | | | |
| **DNMG150412** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | | ● | | | | | | | | | | | | | |
| **DNMG150604** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | ● | ● | | | ● | ● | ● | ● | ● | | | | | | |
| **DNMG150608** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | ● | ● | | | | ● | ● | | ● | | | | | | |
| **DNMG150612** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | ● | | | | | ● | | ● | | | | | | |

## DNMG-22

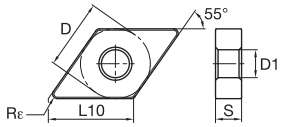


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG11040422** | 9,53 | 11,63 | 4,76 | 0,4 | 3,81 | ● | ● | | | ● | ● | ● | ● | | ● | ● | | | | |
| **DNMG11040822** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | ● | ● | | | ● | ● | ● | ● | | ● | ● | | | | |
| **DNMG11041222** | 9,53 | 11,63 | 4,76 | 1,2 | 3,81 | | | | | | | | | | ● | | | | | |
| **DNMG15040422** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | ● | | | | | | ● | | | | | | | | |
| **DNMG15040822** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **DNMG15041222** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **DNMG15060422** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | ● | ● | ● | | ● | ● | ● | ● | | ● | ● | | | | |
| **DNMG15060822** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | | | | |
| **DNMG15061222** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | ● | ● | ● | ● | | ● | | | | ● | | | | | |

## DNMG-4



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG1506044** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | | | | | | ● | | ● | | | ● | | | | |
| **DNMG1506084** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | | | | | ● | | ● | ● | | ● | | | | |



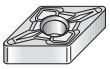

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## DNMG-48

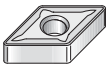
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG11040448** | 9,53 | 11,63 | 4,76 | 0,4 | 3,81 | | | | | | | | | | ● | | | | | |
| **DNMG11040848** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | | | | | | | | | | ● | | | | | |
| **DNMG11041248** | 9,53 | 11,63 | 4,76 | 1,2 | 3,81 | | | | | | | | | | ● | | | | | |
| **DNMG15040848** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | | | | | | | | | | ● | | | | | |
| **DNMG15060448** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | | | | | | | | | | ● | | | | | |
| **DNMG15060848** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | | | | | | ● | | | ● | | | | | |
| **DNMG15061248** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | | | | | | | | | ● | | | | | |
| **DNMG15061648** | 12,70 | 15,50 | 6,35 | 1,6 | 5,16 | | | | | | | | | | ● | | | | | |

## DNMG-49



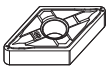
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG11040849** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | | | | | | ● | ● | ● | ● | ● | | | | | |
| **DNMG11041249** | 9,53 | 11,63 | 4,76 | 1,2 | 3,81 | | | | | | | | ● | | | | | | | |
| **DNMG15040849** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | | | | | | | ● | ● | | | | | | | |
| **DNMG15060849** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | | | | ● | ● | ● | ● | ● | ● | | | | | |
| **DNMG15061249** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | | | | ● | ● | ● | ● | | ● | | | | | |
| **DNMG15061649** | 12,70 | 15,50 | 6,35 | 1,6 | 5,16 | | | | | | | ● | ● | | | | | | | |

## DNMG-5

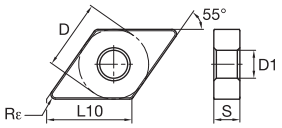


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG1104085** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | | ● | | | | | | | | | | | | | |
| **DNMG1504085** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | | ● | | | | | | | | ● | | | | | |
| **DNMG1504125** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | | ● | | | | | | | | | | | | | |
| **DNMG1506085** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| **DNMG1506125** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | ● | | | ● | ● | ● | ● | ● | ● | | | | | |
| **DNMG1506165** | 12,70 | 15,50 | 6,35 | 1,6 | 5,16 | | ● | | | | ● | ● | ● | ● | ● | | | | | |

## DNMG-AP



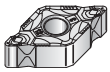
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG150408AP** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | | | | | | | | | | ● | | | | | |
| **DNMG150412AP** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | | | | | | | | | | ● | | | | | |
| **DNMG150608AP** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | | ● | ● | | ● | ● | ● | | ● | | | | | |
| **DNMG150612AP** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | | ● | ● | | ● | | | | ● | | | | | |




● primera elección
○ elección alternativa

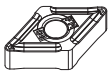
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## DNMG-CT



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| DNMG150404CT | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 |
| DNMG150408CT | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 |
| DNMG150604CT | 12,70 | 15,50 | 6,35 | 0,3 | 5,16 |
| DNMG150608CT | 12,70 | 15,50 | 6,35 | 0,7 | 5,16 |
| DNMG150612CT | 12,70 | 15,50 | 6,35 | 1,1 | 5,16 |

## DNMG-FM

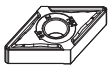


| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| DNMG110408FM | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 |

## DNMG-FW

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| DNMG150404FW | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 |
| DNMG150408FW | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 |
| DNMG150604FW | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 |
| DNMG150608FW | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 |

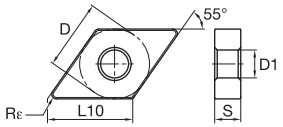
## DNMG-MW



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| DNMG150408MW | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 |
| DNMG150412MW | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 |
| DNMG150608MW | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 |
| DNMG150612MW | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 |

## DNMG-SL

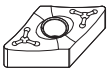
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| DNMG150608SL | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 |
| DNMG150612SL | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 |




● primera elección
○ elección alternativa

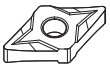
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ DNMM-65

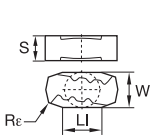


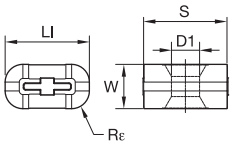
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMM15060865** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | | | | | ● | ● | ● | ● | ● | | | | | |
| **DNMM15061265** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | | | | | ● | ● | ● | ● | ● | | | | | |
| **DNMM15061665** | 12,70 | 15,50 | 6,35 | 1,6 | 5,16 | | | | | | ● | | ● | | ● | | | | | |

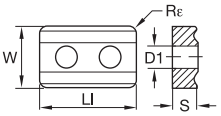
## ■ DNMP-SM



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMP150404SM** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | | | ● | | | | | | | ● | | | | | |
| **DNMP150408SM** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | | | ● | | | | | | | ● | | | | | |
| **DNMP150412SM** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | | | | | | | | | | ● | | | | | |
| **DNMP150604SM** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | | | ● | | | | | | | ● | | | | | |
| **DNMP150608SM** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | | ● | ● | | | | | | ● | | | | | |
| **DNMP150612SM** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | | ● | ● | | | | | | ● | | | | | |



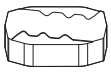




● primera elección
○ elección alternativa

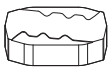
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## LNMX-HP



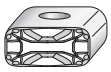
| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNMX181220HP** | 18,00 | 37,05 | 12,00 | 0,4 | — |

## LNMX-SP



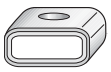
| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNMX181220SP** | 18,00 | 37,05 | 12,50 | 0,4 | — |

## LNUX-13



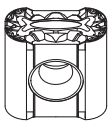
| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNUX19194013** | 10,00 | 19,05 | 19,05 | 4,0 | 6,35 |
| **LNUX30194013** | 12,00 | 30,00 | 19,05 | 4,0 | 6,35 |

## LNUX-16



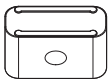
| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNUX19194016** | 10,00 | 19,05 | 19,05 | 4,0 | 6,35 |
| **LNUX30194016** | 12,00 | 30,00 | 19,05 | 4,0 | 6,35 |

## LNUX-RRP



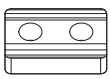
| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNUX191940RRP** | 10,00 | 19,00 | 19,05 | 4,0 | 6,35 |

## LNUX-T

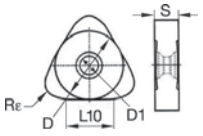


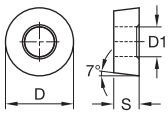
| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNUX191940T** | 10,00 | 19,05 | 19,05 | 4,0 | 6,35 |
| **LNUX301940T** | 12,00 | 30,00 | 19,05 | 4,0 | 6,35 |

## LNUX-EN95



| Número de catálogo ISO | W | LI | S | Rε | D1 |
|---|---|---|---|---|---|
| **LNUX400924EN95** | 25,40 | 40,00 | 9,53 | 2,4 | 9,12 |



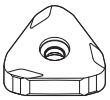

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ NNGJ

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| NNGJ281020 | 28,58 | 22,00 | 10,00 | 5,0 | 7,00 |

## ■ NNGJ-1D



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| NNGJ2810201D | 28,58 | 22,00 | 10,00 | 5,0 | 7,00 |

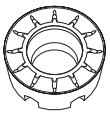
## ■ NNUJ-11

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| NNUJ22082011 | 22,00 | 16,16 | 8,00 | 1,0 | 7,00 |

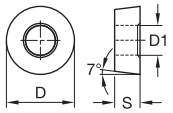
## ■ RCMT

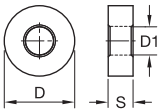
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| RCMT0602M0 | 6,00 | – | 2,38 | – | 2,80 |
| RCMT0803M0 | 8,00 | – | 3,18 | – | 3,40 |
| RCMT10T3M0 | 10,00 | – | 3,97 | – | 4,40 |
| RCMT1204M0 | 12,00 | – | 4,76 | – | 4,40 |
| RCMT1606M0 | 16,00 | – | 6,35 | – | 5,50 |

## ■ RCMT-43



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| RCMT0602M043 | 6,00 | – | 2,38 | – | 2,80 |
| RCMT0803M043 | 8,00 | – | 3,18 | – | 3,40 |
| RCMT10T3M043 | 10,00 | – | 3,97 | – | 4,40 |
| RCMT1204M043 | 12,00 | – | 4,76 | – | 4,40 |
| RCMT1606M043 | 16,00 | – | 6,35 | – | 5,50 |



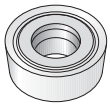

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## RCMT-T

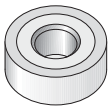
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RCMT1606M0T** | 16,00 | – | 6,35 | – | 5,50 | | | | | | | | ● | | | | | | ● | ● |

## RCMX

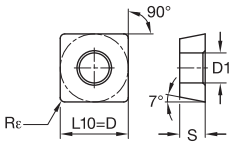


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RCMX2006M0T** | 20,00 | – | 6,35 | – | 6,50 | | ● | | | ● | ● | ● | ● | ● | | | | | | |
| **RCMX2507M0T** | 25,00 | – | 7,94 | – | 7,40 | | ● | | | | ● | ● | ● | ● | | | | | ● | |
| **RCMX3209M0T** | 32,00 | – | 9,53 | – | 9,50 | | | | | | | ● | | | | | | | | |

## RNMG



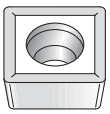
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RNMG120400** | 12,70 | – | 4,76 | – | 5,16 | | ● | | | | ● | | | | | | | | | |




● primera elección
○ elección alternativa

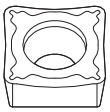
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ SCMT



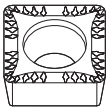
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMT090304** | 9,53 | 9,53 | 3,18 | 0,4 | 4,40 | | | | | | ● | ● | | ● | | | | | ● | ● |
| **SCMT090308** | 9,53 | 9,53 | 3,18 | 0,8 | 4,40 | | | | | ● | ● | ● | | ● | | | | | ● | ● |
| **SCMT09T304** | 9,53 | 9,53 | 3,97 | 0,4 | 4,40 | | ● | | | | ● | | ● | ● | | | | | ● | ● |
| **SCMT09T308** | 9,53 | 9,53 | 3,97 | 0,8 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | | | ● | ● | ● |
| **SCMT120408** | 12,70 | 12,70 | 4,76 | 0,8 | 5,50 | | ● | | | ● | ● | ● | ● | ● | ● | | | ● | ● | ● |
| **SCMT120412** | 12,70 | 12,70 | 4,76 | 1,2 | 5,50 | | ● | | | | ● | ● | ● | ● | ● | ● | | ● | ● | ● |
| **SCMT120416** | 12,70 | 12,70 | 4,76 | 1,6 | 5,50 | | ● | | | | | | | ● | ● | | | | | |
| **SCMT150512** | 15,88 | 15,88 | 5,56 | 1,2 | 5,50 | | | | | | | | | ● | | | | ● | ● | ● |

## ■ SCMT-41



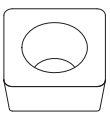
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMT09T30441** | 9,53 | 9,53 | 3,97 | 0,4 | 4,40 | | | | | | ● | | ● | | | | | | | |
| **SCMT09T30841** | 9,53 | 9,53 | 3,97 | 0,8 | 4,40 | | | | | | ● | ● | ● | | | | | | | |

## ■ SCMT-MU

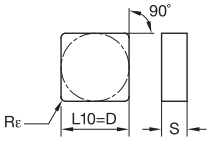


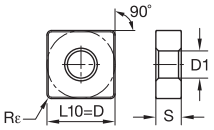
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMT090304MU** | 9,53 | 9,53 | 3,18 | 0,4 | 4,40 | ● | ● | | | ● | ● | ● | ● | | ● | | | | | |
| **SCMT090308MU** | 9,53 | 9,53 | 3,18 | 0,8 | 4,40 | ● | ● | | | ● | ● | ● | | ● | ● | | | | | |
| **SCMT09T304MU** | 9,53 | 9,53 | 3,97 | 0,4 | 4,40 | ● | ● | ● | ● | | ● | ● | ● | | ● | | | | | |
| **SCMT09T308MU** | 9,53 | 9,53 | 3,97 | 0,8 | 4,40 | ● | ● | ● | ● | | ● | ● | ● | ● | ● | | | | | |
| **SCMT120408MU** | 12,70 | 12,70 | 4,76 | 0,8 | 5,50 | | ● | ● | ● | | | | ● | | ● | | | | | |
| **SCMT120412MU** | 12,70 | 12,70 | 4,76 | 1,2 | 5,50 | | ● | ● | ● | | | | | | ● | | | | | |
| **SCMT120416MU** | 12,70 | 12,70 | 4,76 | 1,6 | 5,50 | | ● | | ● | | | | | | ● | | | | | |

## ■ SCMW



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMW090304** | 9,53 | 9,53 | 3,18 | 0,4 | 4,40 | ● | ● | | | | | | | | | | | | | ● |
| **SCMW09T308** | 9,53 | 9,53 | 3,97 | 0,8 | 4,40 | | ● | | | | | | | | | | | | | |
| **SCMW120408** | 12,70 | 12,70 | 4,76 | 0,8 | 5,50 | ● | ● | | | | | | | | | | | ● | | ● |



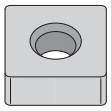

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## SNGN

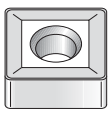
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNGN120412 | 12,70 | 12,70 | 4,76 | 1,2 | — | | | | | | ● | | | | | | | | | |

## SNMA



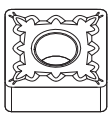
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMA120408 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | ● | ● | | | | | | | | | | | | | ● |
| SNMA120412 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | ● | ● | | | | | | | | | | | | | |
| SNMA190612 | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | ● | | | | | | | | | | | | | |
| SNMA190616 | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | ● | | | | | | | | | | | | | ● |

## SNMG



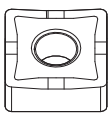
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG090308 | 9,53 | 9,53 | 3,18 | 0,8 | 3,81 | | | | | | ● | ● | ● | ● | | | | | | |
| SNMG120404 | 12,70 | 12,70 | 4,76 | 0,4 | 5,16 | | ● | | | | | ● | | ● | | | | | | |
| SNMG120408 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | ● | ● | | | | ● | ● | ● | ● | | | | ● | ● | |
| SNMG120412 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | ● | ● | | | | | | | ● | | | | | | |
| SNMG150612 | 15,88 | 15,88 | 6,35 | 1,2 | 6,35 | | ● | | | | | | | ● | | | | | | |
| SNMG190612 | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | | | | | | | | ● | | | | ● | | |
| SNMG190616 | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | ● | | | | | | | ● | | | | | | |

## SNMG-22

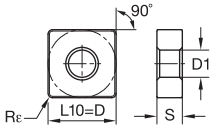


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG09030422 | 9,53 | 9,53 | 3,18 | 0,4 | 3,81 | ● | ● | | | | ● | | | | | | | | | |
| SNMG09030822 | 9,53 | 9,53 | 3,18 | 0,8 | 3,81 | ● | ● | | | ● | ● | ● | ● | | | | | | | |
| SNMG12040422 | 12,70 | 12,70 | 4,76 | 0,4 | 5,16 | ● | ● | ● | | | ● | ● | | | ● | | | | | |
| SNMG12040822 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | ● | ● | ● | ● | | ● | | ● | | ● | | | | | |
| SNMG12041222 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | ● | ● | ● | ● | | ● | | ● | | ● | | | | | |
| SNMG12041622 | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | | | | ● | | | | | | ● | | | | | |

## SNMG-4



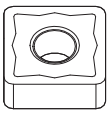
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG1204084 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | | | | | ● | ● | | | ● | | | | |
| SNMG1204124 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | | | | | | ● | | | | | | |




● primera elección
○ elección alternativa

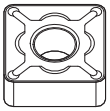
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ SNMG-48



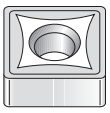
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG12040448 | 12,70 | 12,70 | 4,76 | 0,4 | 5,16 | | | | | | | | | | ● | | | | | |
| SNMG12040848 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | | | | | ● | ● | | ● | | | | | |
| SNMG12041248 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | | | | | | | ● | | | | | |

## ■ SNMG-49



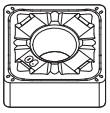
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG12040849 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | | | | ● | ● | ● | ● | ● | | | | | |
| SNMG12041249 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | | ● | ● | ● | ● | ● | ● | | | | | |
| SNMG12041649 | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | | | | | | | ● | | | | | | | | |

## ■ SNMG-5

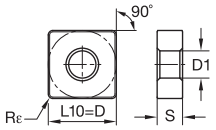


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG1204085 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| SNMG1204125 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | ● | | | | ● | ● | ● | | ● | | | | | |
| SNMG1204165 | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | | ● | | | | | | | | ● | | | | | |
| SNMG1506085 | 15,88 | 15,88 | 6,35 | 0,8 | 6,35 | | ● | | | | | ● | ● | | ● | | | | | |
| SNMG1506125 | 15,88 | 15,88 | 6,35 | 1,2 | 6,35 | | ● | | | | ● | ● | ● | | ● | | | | | |
| SNMG1506165 | 15,88 | 15,88 | 6,35 | 1,6 | 6,35 | | ● | | | | | | ● | | ● | | | | | |
| SNMG1506245 | 15,88 | 15,88 | 6,35 | 2,4 | 6,35 | | ● | | | | | | | | ● | | | | | |
| SNMG1906085 | 19,05 | 19,05 | 6,35 | 0,8 | 7,93 | | ● | | | | ● | | ● | ● | ● | | | | | |
| SNMG1906125 | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| SNMG1906165 | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | ● | | | | ● | ● | ● | ● | ● | | | | | |

## ■ SNMG-AP



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG120408AP | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | ● | ● | | | ● | ● | | ● | | | | | |
| SNMG120412AP | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | ● | ● | | | | | | ● | | | | | |



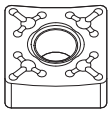

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## SNMG-SL

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNMG120408SL** | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | | | | | | | | ● | | | | | |
| **SNMG120412SL** | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | | | | | | | ● | | | | | |
| **SNMG120416SL** | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | | | | | | | | | | ● | | | | | |
| **SNMG150608SL** | 15,88 | 15,88 | 6,35 | 0,8 | 6,35 | | | | | | | | | | ● | | | | | |
| **SNMG150612SL** | 15,88 | 15,88 | 6,35 | 1,2 | 6,35 | | | | | | | ● | | | ● | | | | | |
| **SNMG150616SL** | 15,88 | 15,88 | 6,35 | 1,6 | 6,35 | | | | | | | | | | ● | | | | | |
| **SNMG190612SL** | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | | | | | | | ● | | ● | | | | | |
| **SNMG190616SL** | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | | | | ● | | | | ● | | | | | |

## SNMM-65

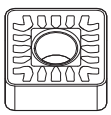


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNMM12040865** | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | | | | | ● | ● | ● | ● | | | | | |
| **SNMM12041265** | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | | | ● | | ● | ● | ● | | | | | |
| **SNMM12041665** | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | | | | | | | | | | ● | | | | | |
| **SNMM15061665** | 15,88 | 15,88 | 6,35 | 1,6 | 6,35 | | | | | | | | ● | | | | | | | |
| **SNMM19061265** | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | | | | | | ● | ● | ● | ● | | | | | |
| **SNMM19061665** | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | | | | | ● | | ● | ● | | | | | |
| **SNMM19062465** | 19,05 | 19,05 | 6,35 | 2,4 | 7,93 | | | | | | | | | | ● | | | | | |

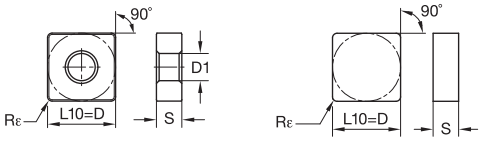
## SNMM-8

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNMM1204128** | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | | | | | ● | | | | | | | |
| **SNMM1506128** | 15,88 | 15,88 | 6,35 | 1,2 | 6,35 | | | | | | | | ● | ● | | | | | | |
| **SNMM1906128** | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | | | | | | | | ● | | | | | | |
| **SNMM1906168** | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | | | | | ● | ● | ● | | | | | | |
| **SNMM1906248** | 19,05 | 19,05 | 6,35 | 2,4 | 7,93 | | | | | | | | | ● | | | | | | |
| **SNMM2507248** | 25,40 | 25,40 | 7,94 | 2,4 | 9,12 | | | | | | ● | ● | ● | ● | | | | | | |

## SNMM-SR



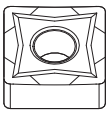
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNMM190616SR** | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | | | | | ● | ● | | ● | | | | | |
| **SNMM190624SR** | 19,05 | 19,05 | 6,35 | 2,4 | 7,93 | | | | | | | | | | ● | | | | | |
| **SNMM250916SR** | 25,40 | 25,40 | 9,53 | 1,6 | 9,12 | | | | | | | | ● | | ● | | | | | |
| **SNMM250924SR** | 25,40 | 25,40 | 9,53 | 2,4 | 9,12 | | | | | | | ● | ● | | ● | | | | | |




● primera elección
○ elección alternativa

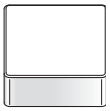
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ SNMP-SM

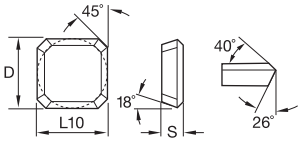


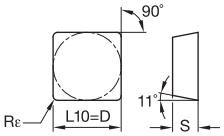
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNMP120408SM** | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | ● | ● | | | | | | ● | | | | | |
| **SNMP120412SM** | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | ● | ● | | | | | | ● | | | | | |
| **SNMP150608SM** | 15,88 | 15,88 | 6,35 | 0,8 | 6,35 | | | | ● | | | | | | ● | | | | | |
| **SNMP150612SM** | 15,88 | 15,88 | 6,35 | 1,2 | 6,35 | | | | ● | | | | | | ● | | | | | |
| **SNMP150616SM** | 15,88 | 15,88 | 6,35 | 1,6 | 6,35 | | | | ● | | | | | | ● | | | | | |
| **SNMP190616SM** | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | | | | | | | | ● | | | | | |

## ■ SNUN



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNUN090308** | 9,53 | 9,53 | 3,18 | 0,8 | – | | | | | | | | | | | | | | | ● |
| **SNUN120408** | 12,70 | 12,70 | 4,76 | 0,8 | – | | ● | | | | | | | | | | | ● | | ● |
| **SNUN120412** | 12,70 | 12,70 | 4,76 | 1,2 | – | | ● | | | | | | | | | | | ● | ● | ● |
| **SNUN150412** | 15,88 | 15,88 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | | |
| **SNUN190412** | 19,05 | 19,05 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | | |

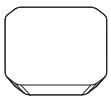



● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## SOUN

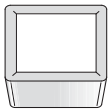


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOUN1904ZZT2 | 19,05 | 19,05 | 4,76 | – | – | | | | | | | | | | | | | | ● | |
| SOUN1904ZZT3 | 19,05 | 19,05 | 4,76 | – | – | | | | | | | | | | | | | | ● | |
| SOUN2506ZZT2 | 25,40 | 25,40 | 6,35 | – | – | | | | | | | | | | | | | | ● | |
| SOUN2506ZZT3 | 25,40 | 25,40 | 6,35 | – | – | | | | | | | | | | | | | | ● | |

## SPGN

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPGN090304 | 9,53 | 9,53 | 3,18 | 0,4 | – | | | | | | | | | | | | | ● | | ● |
| SPGN090308 | 9,53 | 9,53 | 3,18 | 0,8 | – | | ● | | | | | | | | | | | ● | | ● |
| SPGN120304 | 12,70 | 12,70 | 3,18 | 0,4 | – | | | | | | | | | | | | | ● | | |
| SPGN120308 | 12,70 | 12,70 | 3,18 | 0,8 | – | | ● | | | | | | | | | | | ● | | ● |
| SPGN120312 | 12,70 | 12,70 | 3,18 | 1,2 | – | | ● | | | | | | | | | | | ● | | |
| SPGN190412 | 19,05 | 19,05 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | | |

## SPMR



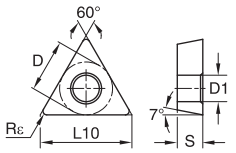
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPMR090308 | 9,53 | 9,53 | 3,18 | 0,8 | – | | ● | | | | ● | | | ● | | | | | | |
| SPMR120304 | 12,70 | 12,70 | 3,18 | 0,4 | – | | ● | | | | ● | ● | | ● | | | | | | |
| SPMR120308 | 12,70 | 12,70 | 3,18 | 0,8 | – | | ● | | | | | | | | | | | ● | | |
| SPMR120312 | 12,70 | 12,70 | 3,18 | 1,2 | – | | ● | | | | | ● | | ● | | | | | | |

## SPUN

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPUN090304 | 9,53 | 9,53 | 3,18 | 0,4 | – | | | | | | | | | | | | | ● | | |
| SPUN090308 | 9,53 | 9,53 | 3,18 | 0,8 | – | | | | | | | | | | | | | ● | | ● |
| SPUN120304 | 12,70 | 12,70 | 3,18 | 0,4 | – | | | | | | ● | ● | | | | | ● | ● | | ● |
| SPUN120308 | 12,70 | 12,70 | 3,18 | 0,8 | – | | ● | | | | ● | ● | | | | | | ● | ● | ● |
| SPUN120312 | 12,70 | 12,70 | 3,18 | 1,2 | – | | ● | | | | | | | | | | | ● | | ● |
| SPUN120412 | 12,70 | 12,70 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | | ● |
| SPUN150412 | 15,88 | 15,88 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | ● | ● |
| SPUN190412 | 19,05 | 19,05 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | ● | ● |

## SPUN-T

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPUN150412T | 15,88 | 15,88 | 4,76 | 1,2 | – | | | | | | | | | | | | | ● | | |
| SPUN190416T | 19,05 | 19,05 | 4,76 | 1,6 | – | | | | | | | | | | | | | ● | | |
| SPUN250620T | 25,40 | 25,40 | 6,35 | 2,0 | – | | | | | | | ● | | | | | | ● | ● | |



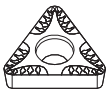

● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## TCGT-2

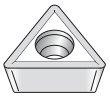
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCGT1102022 | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | | | | | | | | | | ● | | | | | |

## TCGT-MU



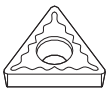
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCGT110202MU | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | | ● | | | | | ● | | | ● | | | | | |

## TCMT



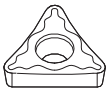
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCMT110202 | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | | | | | | ● | ● | | ● | | | | | | ● |
| TCMT110204 | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | | ● | | | ● | ● | ● | ● | ● | | ● | | | ● | ● |
| TCMT110208 | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | | ● | | | | ● | ● | ● | ● | | ● | | | | ● |
| TCMT16T304 | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | | | ● | ● | ● |
| TCMT16T308 | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | | | ● | ● | ● |
| TCMT16T312 | 9,53 | 16,50 | 3,97 | 1,2 | 4,40 | | ● | | | | ● | | ● | ● | | | | | | |
| TCMT220408 | 12,70 | 22,00 | 4,76 | 0,8 | 5,50 | | | | | | ● | ● | ● | ● | | | | ● | | ● |
| TCMT220412 | 12,70 | 22,00 | 4,76 | 1,2 | 5,50 | | ● | | | | | ● | ● | ● | | | | | | ● |

## TCMT-2

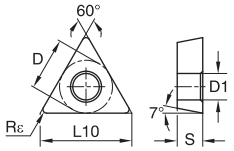


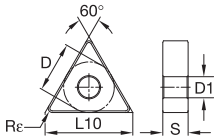
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCMT1102042 | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | | | | | | | ● | | | ● | ● | | | | |
| TCMT1102082 | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | | | | | | | | | | ● | | | | | |
| TCMT16T3042 | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | | | | | | | ● | | | | ● | | | | |

## TCMT-41



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCMT16T30441 | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | | | | | | | ● | ● | ● | | ● | | | | ● |
| TCMT16T30841 | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | | | | | | | ● | ● | | | | | | | |

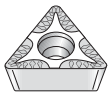



● primera elección
○ elección alternativa

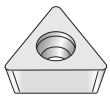
| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | | | | |
| M | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | | | | |
| K | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | | | | ● |
| N | | | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | | | ● |

## TCMT-MU



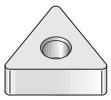
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCMT110204MU** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | | ● | | | | ● | ● | ● | | ● | | | | | |
| **TCMT110208MU** | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | | ● | | | | | | ● | | ● | | | | | |
| **TCMT16T304MU** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | | | | |
| **TCMT16T308MU** | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | ● | ● | ● | ● | | ● | ● | ● | ● | ● | | | | | |
| **TCMT16T312MU** | 9,53 | 16,50 | 3,97 | 1,2 | 4,40 | | | ● | ● | | | | | | ● | | | | | |
| **TCMT220408MU** | 12,70 | 22,00 | 4,76 | 0,8 | 5,50 | | ● | | | | | | ● | | ● | | | | | |
| **TCMT220412MU** | 12,70 | 22,00 | 4,76 | 1,2 | 5,50 | | ● | | | | | | | | ● | | | | | |

## TCMW



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCMW110204** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | ● | ● | | | | | | | | | | | ● | | ● |
| **TCMW16T304** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | ● | ● | | | | | | | | | | | ● | | ● |

## TNMA

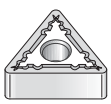


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMA160408** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | ● | ● | | | | | | | | | | | | | ● |
| **TNMA160412** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | ● | ● | | | | | | | | | | | | | |
| **TNMA220408** | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **TNMA220412** | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | ● | ● | | | | | | | | | | | | | |
| **TNMA220416** | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | ● | ● | | | | | | | | | | | | | |

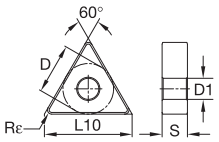
## TNMG

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMG160404** | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | ● | | | | ● | ● | ● | ● | | | | ● | | |
| **TNMG160408** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | | | ● | ● | ● | ● | ● | | | ● | ● | | |
| **TNMG160412** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | ● | | | | | ● | | | | | | | | |
| **TNMG220404** | 12,70 | 22,00 | 4,76 | 0,4 | 5,16 | | | | | | ● | ● | | ● | | | | ● | | |
| **TNMG220408** | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | ● | | | | ● | ● | | ● | | | | ● | ● | |
| **TNMG220412** | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | ● | | | | | | | ● | | | | | | |
| **TNMG220416** | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | ● | | | | | | | | | | | | | |

## TNMG-22



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMG11030422** | 6,35 | 11,00 | 3,18 | 0,4 | 2,26 | ● | ● | | | | | | | | | | | | | |
| **TNMG11030822** | 6,35 | 11,00 | 3,18 | 0,8 | 2,26 | ● | ● | | | | | | | | | | | | | |
| **TNMG16040422** | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | ● | ● | ● | | ● | ● | ● | ● | | ● | ● | | | | |
| **TNMG16040822** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | | | | |
| **TNMG16041222** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | ● | ● | ● | ● | | | | | | ● | | | | | |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ TNMG-4

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG1604044 | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | | | | | | | ● | | | | | | | |
| TNMG1604084 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | | | ● | | ● | | | | | | | |

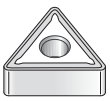
## ■ TNMG-48

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG16040448 | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | | | | | ● | ● | ● | | ● | | | | | |
| TNMG16040848 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | | | ● | | ● | | ● | | | | | |
| TNMG16041248 | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | | | | | | | | | ● | | | | | |
| TNMG16041648 | 9,53 | 16,50 | 4,76 | 1,6 | 3,81 | | | | | | | | | | ● | | | | | |
| TNMG22040448 | 12,70 | 22,00 | 4,76 | 0,4 | 5,16 | | | | | | | | ● | | | | | | | |
| TNMG22040848 | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | | | | | | | ● | | | | | | | |

## ■ TNMG-49

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG16040849 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | | ● | ● | ● | ● | ● | ● | | | | | |
| TNMG16041249 | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | | | | ● | ● | ● | ● | | | | | | | |
| TNMG22040849 | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | | | | | ● | ● | ● | ● | | | | | | |
| TNMG22041249 | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | | | | | ● | ● | ● | | | | | | | |
| TNMG22041649 | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | | | | | ● | ● | | | | | | | | |

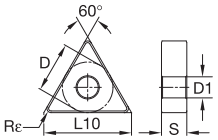
## ■ TNMG-5



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG1604085 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | | | ● | | ● | ● | ● | ● | | | | | |
| TNMG1604125 | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | ● | | | ● | | ● | ● | ● | ● | | | | | |
| TNMG1604165 | 9,53 | 16,50 | 4,76 | 1,6 | 3,81 | | | | | | | | | | ● | | | | | |
| TNMG2204085 | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | ● | | | | ● | ● | ● | ● | ● | | | | | |
| TNMG2204125 | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | ● | | | | | ● | ● | | ● | | | | | |
| TNMG2204165 | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | ● | | | | | | | | ● | | | | | |
| TNMG2706085 | 15,88 | 27,50 | 6,35 | 0,8 | 6,35 | | | | | | | | | ● | | | | | | |
| TNMG2706125 | 15,88 | 27,50 | 6,35 | 1,2 | 6,35 | | | | | | ● | | ● | ● | | | | | | |
| TNMG2706165 | 15,88 | 27,50 | 6,35 | 1,6 | 6,35 | | | | | | | | ● | | | | | | | |
| TNMG2706245 | 15,88 | 27,50 | 6,35 | 2,4 | 6,35 | | | | | | | | | ● | | | | | | |

## ■ TNMG-AP

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG160408AP | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | ● | ● | ● | | ● | ● | | ● | | | | | |
| TNMG160412AP | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | | ● | ● | | | | | | ● | | | | | |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## TNMG-FL

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMG160404FL** | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | | | | ● | | | | | | | | | | |
| **TNMG160408FL** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | | ● | | | | | | | | | | |

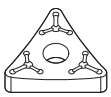
## TNMG-FM

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMG160404FM** | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | | | | ● | | | | | | | | | | |
| **TNMG160408FM** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | | ● | | | | | | | | | | |

## TNMG-FR

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMG160412FR** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | | | | ● | | | | | | | | | | |

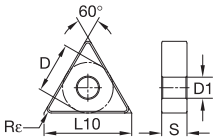
## TNMM-65

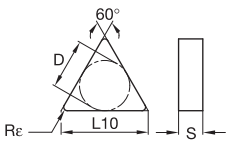


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMM16040865** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | | | | ● | ● | ● | ● | | | | | |
| **TNMM16041265** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | | | | | | | | | ● | | | | | |
| **TNMM16041665** | 9,53 | 16,50 | 4,76 | 1,6 | 3,81 | | | | | | | | | | ● | | | | | |
| **TNMM22040865** | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | | | | | | ● | ● | ● | ● | | | | | |
| **TNMM22041265** | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | | | | | | | ● | ● | ● | | | | | |
| **TNMM22041665** | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | | | | | | | | ● | ● | | | | | |

## TNMM-8

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMM1604128** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | | | | | | | | | ● | | | | | |
| **TNMM2204088** | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | | | | | | | ● | | ● | | | | | |
| **TNMM2204128** | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | | | | | | | ● | | | | | | | |
| **TNMM2204168** | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | | | | | | | ● | ● | | | | | | |
| **TNMM2706128** | 15,88 | 27,50 | 6,35 | 1,2 | 6,35 | | | | | | | | | ● | | | | | | |
| **TNMM2706248** | 15,88 | 27,50 | 6,35 | 2,4 | 6,35 | | | | | | | | ● | | | | | | | |




● primera elección
○ elección alternativa

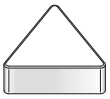
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## TNMP-SM

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **TNMP160404SM** | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 |
| **TNMP160408SM** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 |
| **TNMP160412SM** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 |
| **TNMP220404SM** | 12,70 | 22,00 | 4,76 | 0,4 | 5,16 |
| **TNMP220408SM** | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 |
| **TNMP220412SM** | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 |

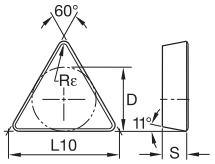
| Número de catálogo ISO | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNMP160404SM** | | | ● | | | | | | | ● | | | | | |
| **TNMP160408SM** | | | ● | ● | | | | | | ● | | | | | |
| **TNMP160412SM** | | | ● | ● | | | | | | ● | | | | | |
| **TNMP220404SM** | | | ● | | | | | | | ● | | | | | |
| **TNMP220408SM** | | | ● | ● | | | | | | ● | | | | | |
| **TNMP220412SM** | | | ● | ● | | | | | | ● | | | | | |

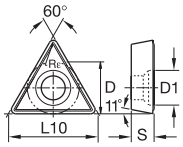
## TNUN



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **TNUN160308** | 9,53 | 16,50 | 3,18 | 0,8 | — |
| **TNUN160312** | 9,53 | 16,50 | 3,18 | 1,2 | — |
| **TNUN160408** | 9,53 | 16,50 | 4,76 | 0,8 | — |
| **TNUN160412** | 9,53 | 16,50 | 4,76 | 1,2 | — |
| **TNUN220416** | 12,70 | 22,00 | 4,76 | 1,6 | — |

| Número de catálogo ISO | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TNUN160308** | | | | | | | | | | | | | ● | | |
| **TNUN160312** | | | | | | | | | | | | | ● | | |
| **TNUN160408** | | ● | | | | | | | | | | | ● | | ● |
| **TNUN160412** | | | | | | | | | | | | | | | ● |
| **TNUN220416** | | | | | | | | | | | | | ● | | |

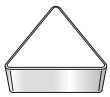



● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## TPGN

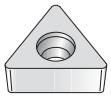


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGN110204** | 6,35 | 11,00 | 2,38 | 0,4 | – | | | | | | | | | | | | | ● | | |
| **TPGN110208** | 6,35 | 11,00 | 2,38 | 0,8 | – | | | | | | | | | | | | | ● | | |
| **TPGN110304** | 6,35 | 11,00 | 3,18 | 0,4 | – | | | | | | | | | | | | | ● | | ● |
| **TPGN110308** | 6,35 | 11,00 | 3,18 | 0,8 | – | | ● | | | | | | | | | | | | | ● |
| **TPGN160304** | 9,53 | 16,50 | 3,18 | 0,4 | – | | | | | | | | | | | ● | | ● | | ● |
| **TPGN160308** | 9,53 | 16,50 | 3,18 | 0,8 | – | | ● | | | | | | | | | ● | | ● | | ● |
| **TPGN160312** | 9,53 | 16,50 | 3,18 | 1,2 | – | | | | | | | | | | | | | | | ● |

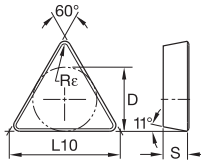
## TPGR

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGR160308** | 9,53 | 16,50 | 3,18 | 0,8 | – | | | | | | | | | ● | | | | | | |

## TPGA



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGA110204** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | | | | | | | | | | | | | | | ● |
| **TPGA110208** | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | | | | | | | | | | | | | | | ● |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ TPMR

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| TPMR110304 | 6,35 | 11,00 | 3,18 | 0,4 | – |
| TPMR110308 | 6,35 | 11,00 | 3,18 | 0,8 | – |
| TPMR160304 | 9,53 | 16,50 | 3,18 | 0,4 | – |
| TPMR160308 | 9,53 | 16,50 | 3,18 | 0,8 | – |
| TPMR160312 | 9,53 | 16,50 | 3,18 | 1,2 | – |

| | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPMR110304 | | | | | | ● | ● | | ● | | | | | ● | |
| TPMR110308 | | ● | | | ● | ● | ● | | ● | | | | | ● | |
| TPMR160304 | | ● | | | | ● | ● | | ● | | | | ● | ● | |
| TPMR160308 | | ● | | | ● | ● | ● | | ● | | | | | ● | ● |
| TPMR160312 | | ● | | | | | ● | | ● | | | | | ● | |

## ■ TPUN

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| TPUN110304 | 6,35 | 11,00 | 3,18 | 0,4 | – |
| TPUN110308 | 6,35 | 11,00 | 3,18 | 0,8 | – |
| TPUN160304 | 9,53 | 16,50 | 3,18 | 0,4 | – |
| TPUN160308 | 9,53 | 16,50 | 3,18 | 0,8 | – |
| TPUN160312 | 9,53 | 16,50 | 3,18 | 1,2 | – |
| TPUN220408 | 12,70 | 22,00 | 4,76 | 0,8 | – |
| TPUN220412 | 12,70 | 22,00 | 4,76 | 1,2 | – |
| TPUN220416 | 12,70 | 22,00 | 4,76 | 1,6 | – |

| | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPUN110304 | | | | | | ● | | | ● | | | | ● | | ● |
| TPUN110308 | | | | | | ● | ● | | | | | | ● | | ● |
| TPUN160304 | | ● | | | | ● | ● | ● | | | | | ● | | ● |
| TPUN160308 | | ● | | | | ● | ● | ● | | | | | ● | ● | ● |
| TPUN160312 | | ● | | | | | | ● | | | | | ● | ● | ● |
| TPUN220408 | | | | | | ● | ● | ● | ● | | | | ● | | |
| TPUN220412 | | ● | | | | | | ● | ● | | | | ● | ● | ● |
| TPUN220416 | | | | | | | | | | | | | ● | | |

## ■ TPUN-T

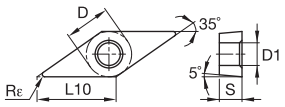
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| TPUN270620T | 15,88 | 27,50 | 6,35 | 2,0 | – |

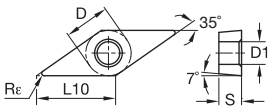
| | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPUN270620T | | | | | | | | | | | | | ● | | |

## ■ TPUR

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| TPUR160308L | 9,53 | 16,50 | 3,18 | 0,8 | – |
| TPUR160308R | 9,53 | 16,50 | 3,18 | 0,8 | – |

| | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPUR160308L | | | | | | | | | | | | | ● | | |
| TPUR160308R | | | | | | | | | | | | | ● | | |

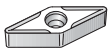



● primera elección
○ elección alternativa

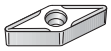
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## VBMT

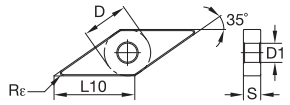


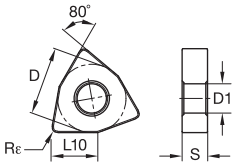
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBMT160404** | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | ● | | | | ● |
| **VBMT160408** | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | ● | | | | ● |
| **VBMT160412** | 9,53 | 16,61 | 4,76 | 1,2 | 4,40 | | ● | | | ● | ● | ● | ● | ● | | | | | | ● |

## VCMT



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VCMT16T308** | 9,53 | 16,61 | 3,97 | 0,8 | 4,40 | | ● | | | | | | | | | | | | | |

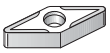



● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ VNMG



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| VNMG12T308 | 7,14 | 12,45 | 3,97 | 0,8 | 3,65 |

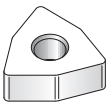
## ■ VNMG-22

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| VNMG16040422 | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 |
| VNMG16040822 | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 |

## ■ VNMP-SM

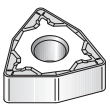
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| VNMP160404SM | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 |
| VNMP160408SM | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 |

## ■ WNMA



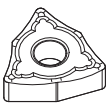
| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMA080408 | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 |
| WNMA080412 | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 |

## ■ WNMG-22

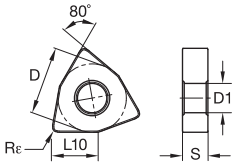


| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG06040422 | 9,53 | 6,52 | 4,76 | 0,4 | 3,81 |
| WNMG06040822 | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 |

## ■ WNMG-4



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG0804044 | 12,70 | 8,69 | 4,76 | 0,4 | 5,16 |
| WNMG0804084 | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 |
| WNMG0804124 | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 |




● primera elección
○ elección alternativa

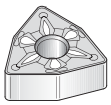
| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ WNMG-48

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG06040448 | 9,53 | 6,52 | 4,76 | 0,4 | 3,81 |
| WNMG06040848 | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 |
| WNMG06041248 | 9,53 | 6,52 | 4,76 | 1,2 | 3,81 |
| WNMG08040448 | 12,70 | 8,69 | 4,76 | 0,4 | 5,16 |
| WNMG08040848 | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 |
| WNMG08041248 | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 |
| WNMG08041648 | 12,70 | 8,69 | 4,76 | 1,6 | 5,16 |

| Número de catálogo ISO | TN8025 |
|---|---|
| WNMG06040448 | ● |
| WNMG06040848 | ● |
| WNMG06041248 | ● |
| WNMG08040448 | ● |
| WNMG08040848 | ● |
| WNMG08041248 | ● |
| WNMG08041648 | ● |

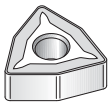
## ■ WNMG-49



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG06040849 | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 |
| WNMG08040849 | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 |
| WNMG08041249 | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 |
| WNMG08041649 | 12,70 | 8,69 | 4,76 | 1,6 | 5,16 |

| Número de catálogo ISO | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 |
|---|---|---|---|---|---|---|
| WNMG06040849 | ● | ● | ● | ● | ● | |
| WNMG08040849 | ● | ● | ● | ● | ● | ● |
| WNMG08041249 | ● | ● | ● | ● | ● | ● |
| WNMG08041649 | | ● | | | | |

## ■ WNMG-5



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG0604085 | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 |
| WNMG0604125 | 9,53 | 6,52 | 4,76 | 1,2 | 3,81 |
| WNMG0804085 | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 |
| WNMG0804125 | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 |
| WNMG0804165 | 12,70 | 8,69 | 4,76 | 1,6 | 5,16 |

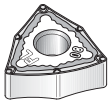
| Número de catálogo ISO | TN5120 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 |
|---|---|---|---|---|---|---|---|
| WNMG0604085 | | ● | | | | | ● |
| WNMG0604125 | | ● | | | | | ● |
| WNMG0804085 | ● | ● | ● | ● | ● | ● | ● |
| WNMG0804125 | ● | ● | ● | ● | ● | ● | ● |
| WNMG0804165 | ● | | ● | | | | ● |

## ■ WNMG-AP

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG080408AP | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 |
| WNMG080412AP | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 |

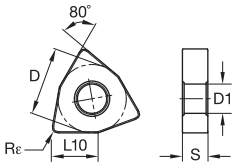
| Número de catálogo ISO | TN6010 | TN6025 | TN7115 | TN7125 | TN8025 |
|---|---|---|---|---|---|
| WNMG080408AP | ● | ● | ● | ● | ● |
| WNMG080412AP | ● | ● | ● | | ● |

## ■ WNMG-FL



| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| WNMG060404FL | 9,53 | 6,52 | 4,76 | 0,4 | 3,81 |

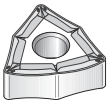
| Número de catálogo ISO | TN7105 |
|---|---|
| WNMG060404FL | ● |




● primera elección
○ elección alternativa

| | | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | |
| M | | ○ | | ○ | ○ | | | | | | ● | ● | ● | ● | | |
| K | | ● | ● | | | ○ | ○ | ○ | ○ | | | | | | | ● |
| N | | | | | | | | | | | | | | | | ● |
| S | | | | ● | ● | | | | | | | | | | | ● |
| H | | | | | | | | | | | | | | | | ● |

## ■ WNMG-FR

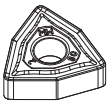


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG060408FR** | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 | | | | | ● | | | | | | | | | | |
| **WNMG060412FR** | 9,53 | 6,52 | 4,76 | 1,2 | 3,81 | | | | | ● | | | | | | | | | | |

## ■ WNMG-FW

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG080404FW** | 12,70 | 8,69 | 4,76 | 0,4 | 5,16 | ● | | | | | | | | | ● | | | | | |
| **WNMG080408FW** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | ● | | | | | | | | | ● | | | | | |
| **WNMG080412FW** | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 | ● | | | | | | | | | ● | | | | | |

## ■ WNMG-MW



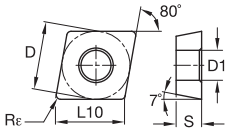
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG080408MW** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | ● | | | | | | ● | | | ● | | | | | |
| **WNMG080412MW** | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 | ● | | | | | | | | | ● | | | | | |

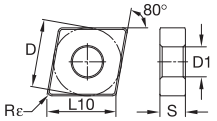
## ■ WNMG-SL

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG080408SL** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | | | | | | | ● | ● | | ● | | | | | |
| **WNMG080412SL** | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 | | | | | | ● | ● | | | ● | | | | | |

## ■ WNMP-SM

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN5105 | TN5120 | TN6010 | TN6025 | TN7105 | TN7110 | TN7115 | TN7125 | TN7135 | TN8025 | TTI15 | TTX | TTM | TTR | THM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMP080408SM** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | | | ● | | | | | | | | | | | | |
| **WNMP080412SM** | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 | | | ● | | | | | | | | | | | | |



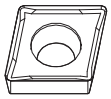

● primera elección
○ elección alternativa

| | |
|---|---|
| P | |
| M | |
| K | |
| N | ● ● ● |
| S | |
| H | |

## CCGT-AL1

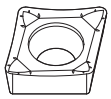
| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| CCGT060202AL1 | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | ● | ● | |
| CCGT060204AL1 | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | ● | ● | |
| CCGT09T302AL1 | 9,53 | 9,67 | 3,97 | 0,2 | 4,40 | | ● | |
| CCGT09T304AL1 | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | ● | ● | |
| CCGT09T308AL1 | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | ● | ● | |
| CCGT120402AL1 | 12,70 | 12,90 | 4,76 | 0,2 | 5,50 | | ● | |
| CCGT120404AL1 | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | ● | ● | |
| CCGT120408AL1 | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | ● | ● | |

## CCGT-AL2



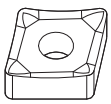
| Número de catálogo ISO | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| CCGT060202AL2 | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | | | ● |
| CCGT060204AL2 | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | | | ● |
| CCGT09T304AL2 | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | | | ● |
| CCGT09T308AL2 | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | | | ● |

## CCGT-AL3

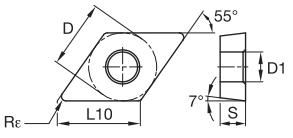


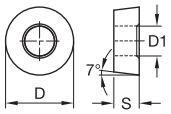
| Número de catálogo ISO | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| CCGT060202AL3 | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | ● | | ● |
| CCGT060204AL3 | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | ● | | ● |
| CCGT09T302AL3 | 9,53 | 9,67 | 3,97 | 0,2 | 4,40 | | | ● |
| CCGT09T304AL3 | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | ● | | ● |
| CCGT09T308AL3 | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | | | ● |
| CCGT120402AL3 | 12,70 | 12,90 | 4,76 | 0,2 | 5,50 | | | ● |
| CCGT120404AL3 | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | ● | | ● |
| CCGT120408AL3 | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | ● | | ● |

## CNGM-AL1



| Número de catálogo ISO | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| CNGM190612AL1 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 | | ● | |



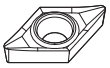




● primera elección
○ elección alternativa

| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | | | |
| N | ● | ● | ● |
| S | | | |
| H | | | |

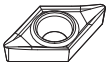


## DCGT-AL1



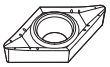
| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| DCGT070202AL1 | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | ● | ● | |
| DCGT070204AL1 | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | ● | ● | |
| DCGT11T302AL1 | 9,53 | 11,63 | 3,97 | 0,2 | 4,40 | ● | ● | |
| DCGT11T304AL1 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | ● | ● | |
| DCGT11T308AL1 | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | ● | ● | |

## DCGT-AL2



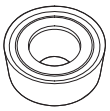
| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| DCGT070204AL2 | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | | | ● |
| DCGT11T304AL2 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | | | ● |
| DCGT11T308AL2 | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | | | ● |

## DCGT-AL3

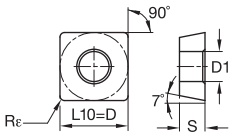


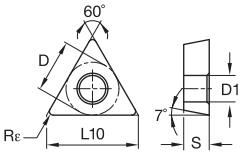
| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| DCGT070202AL3 | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | ● | | ● |
| DCGT070204AL3 | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | ● | | ● |
| DCGT11T302AL3 | 9,53 | 11,63 | 3,97 | 0,2 | 4,40 | | | ● |
| DCGT11T304AL3 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | ● | | ● |
| DCGT11T308AL3 | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | ● | | ● |

## RCGT-AL1



| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| RCGT0803M0AL1 | 8,00 | – | 3,18 | – | 3,40 | ● | ● | |
| RCGT1003M0AL1 | 10,00 | – | 3,18 | – | 4,40 | | ● | |

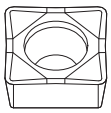



● primera elección
○ elección alternativa

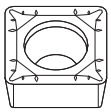
| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | | | |
| N | ● | ● | ● |
| S | | | |
| H | | | |

## SCGT-AL1



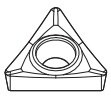
| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| SCGT09T304AL1 | 9,53 | 9,53 | 3,97 | 0,4 | 4,40 | | ● | |
| SCGT09T308AL1 | 9,53 | 9,53 | 3,97 | 0,8 | 4,40 | | ● | |
| SCGT120408AL1 | 12,70 | 12,70 | 4,76 | 0,8 | 5,50 | | ● | |

## SCGT-AL3

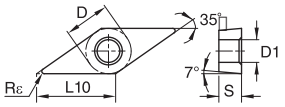


| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| SCGT120408AL3 | 12,70 | 12,70 | 4,76 | 0,8 | 5,50 | | | ● |

## TCGT-AL1



| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| TCGT110202AL1 | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | | ● | |
| TCGT110204AL1 | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | | ● | |
| TCGT16T302AL1 | 9,53 | 16,50 | 3,97 | 0,2 | 4,40 | | ● | |
| TCGT16T304AL1 | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | | ● | |
| TCGT16T308AL1 | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | | ● | |



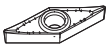

● primera elección
○ elección alternativa

| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | | | |
| N | ● | ● | ● |
| S | | | |
| H | | | |

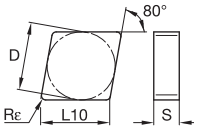
## ■ VCGT-AL1

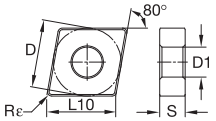
| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| **VCGT110302AL1** | 6,35 | 11,07 | 3,18 | 0,2 | 2,80 | ● | ● | |
| **VCGT110304AL1** | 6,35 | 11,07 | 3,18 | 0,4 | 2,80 | | ● | |
| **VCGT110308AL1** | 6,35 | 11,07 | 3,18 | 0,8 | 2,80 | | ● | |
| **VCGT160404AL1** | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | ● | ● | |
| **VCGT160408AL1** | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | ● | ● | |
| **VCGT160412AL1** | 9,53 | 16,61 | 4,76 | 1,2 | 4,40 | | ● | |
| **VCGT220530AL1** | 12,70 | 22,14 | 5,56 | 3,0 | 5,50 | | ● | |

## ■ VCGT-AL3



| Número de catálogo ISO | D | L10 | S | Rε | D1 | HCK10 | HWK10 | HWK15 |
|---|---|---|---|---|---|---|---|---|
| **VCGT110302AL3** | 6,35 | 11,07 | 3,18 | 0,2 | 2,80 | | | ● |
| **VCGT110304AL3** | 6,35 | 11,07 | 3,18 | 0,4 | 2,80 | | | ● |
| **VCGT160404AL3** | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | ● | | ● |
| **VCGT160408AL3** | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | ● | | ● |
| **VCGT160412AL3** | 9,53 | 16,61 | 4,76 | 1,2 | 4,40 | ● | | ● |
| **VCGT220530AL3** | 12,70 | 22,14 | 5,56 | 3,0 | 5,50 | ● | | ● |

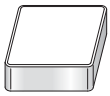



● primera elección
○ elección alternativa

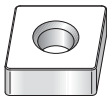
| | |
|---|---|
| P | |
| M | |
| K | ● |
| N | |
| S | ● |
| H | ● |

## CNGN



| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNGN120404T02020 | 12,70 | 12,90 | 4,76 | 0,4 | – | ● | | |
| CNGN120408T01020 | 12,70 | 12,90 | 4,76 | 0,8 | – | | ● | |
| CNGN120408T02020 | 12,70 | 12,90 | 4,76 | 0,8 | – | ● | | ● |
| CNGN120412T01020 | 12,70 | 12,90 | 4,76 | 1,2 | – | | ● | |
| CNGN120412T02020 | 12,70 | 12,90 | 4,76 | 1,2 | – | ● | | ● |
| CNGN120416T01020 | 12,70 | 12,90 | 4,76 | 1,6 | – | | ● | |
| CNGN120416T02020 | 12,70 | 12,90 | 4,76 | 1,6 | – | ● | | ● |
| CNGN120712T01020 | 12,70 | 12,90 | 7,94 | 1,2 | – | | ● | |
| CNGN120712T02020 | 12,70 | 12,90 | 7,94 | 1,2 | – | ● | | ● |
| CNGN120716T01020 | 12,70 | 12,90 | 7,94 | 1,6 | – | | ● | |
| CNGN120716T02020 | 12,70 | 12,90 | 7,94 | 1,6 | – | | | ● |
| CNGN160716T02020 | 15,88 | 16,12 | 7,94 | 1,6 | – | ● | | |

## CNGA

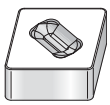


| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNGA120404T02020 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | ● | | |
| CNGA120408T02020 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | ● | | ● |
| CNGA120412T02020 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | ● | | ● |
| CNGA120416T02020 | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | | | ● |
| CNGA160612T02020 | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 | ● | | ● |
| CNGA160616T02020 | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 | | | ● |
| CNGA190612T02020 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 | ● | | ● |
| CNGA190616T02020 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 | ● | | ● |

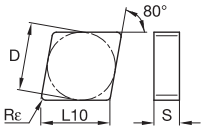
## CNGA-FW

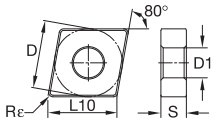
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNGA120408T01020FW | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | ● |
| CNGA120412T01020FW | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | ● |
| CNGA120416T01020FW | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | | | ● |

## CNGX



| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNGX120708T02020 | 12,70 | 12,90 | 7,94 | 0,8 | – | | | ● |
| CNGX120712T02020 | 12,70 | 12,90 | 7,94 | 1,2 | – | | | ● |
| CNGX120716T02020 | 12,70 | 12,90 | 7,94 | 1,6 | – | | | ● |
| CNGX160716T02020 | 15,88 | 16,12 | 7,94 | 1,6 | – | | | ● |




● primera elección
○ elección alternativa

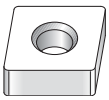
| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | ● | | ● |
| N | | | |
| S | | ● | |
| H | ● | | |



## CNGX-FW

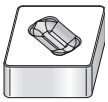
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNGX120712T01020FW | 12,70 | 12,90 | 7,94 | 1,2 | – | | | ● |

## CNMA

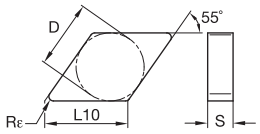


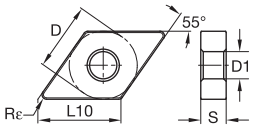
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNMA120408T02020 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | ● |
| CNMA120412T02020 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | ● |
| CNMA120416T02020 | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | | | ● |
| CNMA160612T02020 | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 | | | ● |
| CNMA160616T02020 | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 | | | ● |

## CNMX



| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| CNMX120712T02020 | 12,70 | 12,90 | 7,94 | 1,2 | – | | | ● |
| CNMX120716T02020 | 12,70 | 12,90 | 7,94 | 1,6 | – | | | ● |

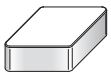



● primera elección
○ elección alternativa

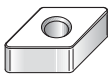
| | CW2015 | CW3020 | CW5025 |
|---|---|---|---|
| P | | | |
| M | | | |
| K | ● | | ● |
| N | | | |
| S | | ● | |
| H | ● | | |

## ■ DNGN



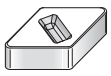
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| DNGN150704T02020 | 12,70 | 15,50 | 7,94 | 0,4 | – | ● | | |
| DNGN150708T01020 | 12,70 | 15,50 | 7,94 | 0,8 | – | | ● | |
| DNGN150708T02020 | 12,70 | 15,50 | 7,94 | 0,8 | – | ● | | |
| DNGN150712T01020 | 12,70 | 15,50 | 7,94 | 1,2 | – | | ● | |
| DNGN150712T02020 | 12,70 | 15,50 | 7,94 | 1,2 | – | ● | | |
| DNGN150716T01020 | 12,70 | 15,50 | 7,94 | 1,6 | – | | ● | |
| DNGN150716T02020 | 12,70 | 15,50 | 7,94 | 1,6 | – | ● | | |

## ■ DNGA



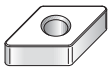
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| DNGA150404T02020 | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | ● | | |
| DNGA150408T02020 | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | ● | | ● |
| DNGA150412T02020 | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | ● | | ● |
| DNGA150604T02020 | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | ● | | |
| DNGA150608T02020 | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | ● | | |
| DNGA150612T02020 | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | ● | | ● |

## ■ DNGX



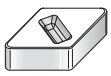
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| DNGX120712T02020 | 10,00 | 12,21 | 7,94 | 1,2 | – | | | ● |
| DNGX120716T02020 | 10,00 | 12,21 | 7,94 | 1,6 | – | | | ● |
| DNGX150708T02020 | 12,70 | 15,50 | 7,94 | 0,8 | – | | | ● |
| DNGX150712T02020 | 12,70 | 15,50 | 7,94 | 1,2 | – | | | ● |
| DNGX150716T02020 | 12,70 | 15,50 | 7,94 | 1,6 | – | | | ● |

## ■ DNMA

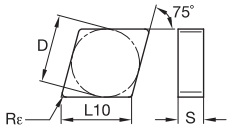


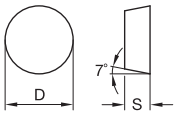
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| DNMA150412T02020 | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | | | ● |

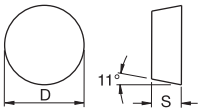
## ■ DNMX



| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| DNMX150716T02020 | 12,70 | 15,50 | 7,94 | 1,6 | – | | | ● |



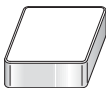




● primera elección
○ elección alternativa

| | | | | |
|---|---|---|---|---|
| P | | | | |
| M | | | | |
| K | ● | | | ● |
| N | | | | |
| S | | | ● | |
| H | ● | | | |

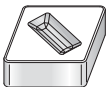


## ■ ENGN



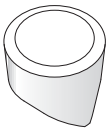
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| ENGN130704T02020 | 12,70 | 13,15 | 7,94 | 0,4 | – | ● | | |
| ENGN130708T02020 | 12,70 | 13,15 | 7,94 | 0,8 | – | ● | | |
| ENGN130712T02020 | 12,70 | 13,15 | 7,94 | 1,2 | – | ● | | |
| ENGN130716T02020 | 12,70 | 13,15 | 7,94 | 1,6 | – | ● | | |

## ■ ENGX



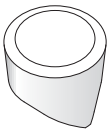
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| ENGX130716T02020 | 12,70 | 13,15 | 7,94 | 1,6 | – | | | ● |

## ■ RCGX

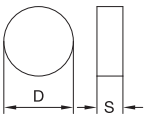


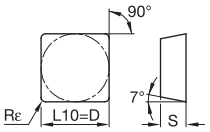
| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| RCGX060400T01020 | 6,35 | – | 4,76 | – | – | | ● | |
| RCGX090700T01020 | 9,53 | – | 7,92 | – | – | ● | ● | |
| RCGX090700T02020 | 9,53 | – | 7,92 | – | – | ● | | |
| RCGX090700T07015 | 9,53 | – | 7,92 | – | – | ● | | |
| RCGX090700T20015 | 9,53 | – | 7,92 | – | – | ● | | |
| RCGX120700T01020 | 12,70 | – | 7,92 | – | – | | ● | |
| RCGX120700T02020 | 12,70 | – | 7,92 | – | – | ● | | |
| RCGX120700T20015 | 12,70 | – | 7,92 | – | – | ● | | |

## ■ RPGX



| Número de catálogo ISO | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| RPGX060400T01020 | 6,35 | – | 4,78 | – | – | | ● | |
| RPGX090700T01020 | 9,53 | – | 7,92 | – | – | | ● | |
| RPGX120700T01020 | 12,70 | – | 7,92 | – | – | | ● | |



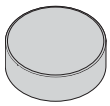

● primera elección
○ elección alternativa

| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | ● | | ● |
| N | | | |
| S | | ● | |
| H | ● | | |

## ■ RNGN

| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| RNGN090300T01020 | 9,53 | – | 3,18 | – | – | | ● | |
| RNGN090400T02020 | 9,53 | – | 4,76 | – | – | ● | | |
| RNGN120400T01020 | 12,70 | – | 4,76 | – | – | | ● | |
| RNGN120400T02020 | 12,70 | – | 4,76 | – | – | ● | | ● |
| RNGN120700T01020 | 12,70 | – | 7,94 | – | – | | ● | |
| RNGN120700T02020 | 12,70 | – | 7,94 | – | – | ● | | ● |
| RNGN120700T10015 | 12,70 | – | 7,94 | – | – | ● | | |
| RNGN120700T15015 | 12,70 | – | 7,94 | – | – | | ● | |
| RNGN120700T20015 | 12,70 | – | 7,94 | – | – | ● | | |
| RNGN150700T02020 | 15,88 | – | 7,94 | – | – | ● | | ● |

## ■ RNMN



| Número de catálogo | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| RNMN120700T02020 | 12,70 | – | 7,94 | – | – | | | ● |

## ■ SCGN

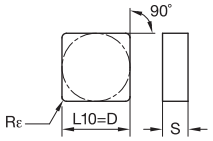
| Número de catálogo | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| SCGN090412T00520 | 9,53 | 9,53 | 4,76 | 1,2 | – | | | ● |

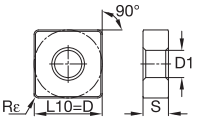
## ■ SCGN-FW

| Número de catálogo | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| SCGN090408EFW | 9,53 | 9,53 | 4,76 | 0,8 | – | | | ● |

## ■ SCUN

| Número de catálogo | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| SCUN120412T00520 | 12,70 | 12,70 | 4,76 | 1,2 | – | ● | | |



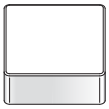




● primera elección
○ elección alternativa

| | | | | |
|---|---|---|---|---|
| P | | | | |
| M | | | | |
| K | ● | | | ● |
| N | | | | |
| S | | | ● | |
| H | ● | | | |

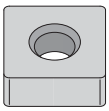


## SNGN

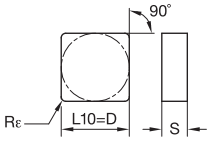


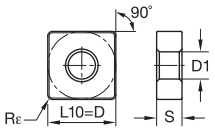
| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **SNGN090308T02020** | 9,53 | 9,53 | 3,18 | 0,8 | – | ● | | |
| **SNGN090412T00515** | 9,53 | 9,53 | 4,76 | 1,2 | – | ● | | |
| **SNGN120408T00520** | 12,70 | 12,70 | 4,76 | 0,8 | – | ● | | |
| **SNGN120408T02020** | 12,70 | 12,70 | 4,76 | 0,8 | – | ● | | ● |
| **SNGN120412T01020** | 12,70 | 12,70 | 4,76 | 1,2 | – | | ● | |
| **SNGN120412T02020** | 12,70 | 12,70 | 4,76 | 1,2 | – | ● | | ● |
| **SNGN120416T01020** | 12,70 | 12,70 | 4,76 | 1,6 | – | | ● | |
| **SNGN120416T02020** | 12,70 | 12,70 | 4,76 | 1,6 | – | ● | | ● |
| **SNGN120704T02020** | 12,70 | 12,70 | 7,94 | 0,4 | – | ● | | |
| **SNGN120708T02020** | 12,70 | 12,70 | 7,94 | 0,8 | – | ● | | |
| **SNGN120712T00520** | 12,70 | 12,70 | 7,94 | 1,2 | – | ● | | |
| **SNGN120712T01020** | 12,70 | 12,70 | 7,94 | 1,2 | – | | ● | |
| **SNGN120712T02020** | 12,70 | 12,70 | 7,94 | 1,2 | – | ● | | ● |
| **SNGN120716T00520** | 12,70 | 12,70 | 7,94 | 1,6 | – | ● | | |
| **SNGN120716T01020** | 12,70 | 12,70 | 7,94 | 1,6 | – | | ● | |
| **SNGN120716T02020** | 12,70 | 12,70 | 7,94 | 1,6 | – | ● | | ● |
| **SNGN120720T02020** | 12,70 | 12,70 | 7,94 | 2,0 | – | ● | | |
| **SNGN120720T10015** | 12,70 | 12,70 | 7,94 | 2,0 | – | ● | | |
| **SNGN150712T02020** | 15,88 | 15,88 | 7,94 | 1,2 | – | ● | | |
| **SNGN150716T02020** | 15,88 | 15,88 | 7,94 | 1,6 | – | ● | | |
| **SNGN190720K20015** | 19,05 | 19,05 | 7,94 | 2,0 | – | ● | | |
| **SNGN190720T20015** | 19,05 | 19,05 | 7,94 | 2,0 | – | ● | | |

## SNGA

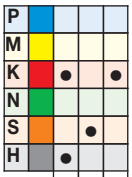


| Número de catálogo | D | L10 | S | Rε | D1 | | | |
|---|---|---|---|---|---|---|---|---|
| **SNGA120408T02020** | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | ● | | ● |
| **SNGA120412T02020** | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | ● | | ● |
| **SNGA120416T02020** | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | ● | | ● |
| **SNGA150612T02020** | 15,88 | 15,88 | 6,35 | 1,2 | 6,35 | | | ● |
| **SNGA150616T02020** | 15,88 | 15,88 | 6,35 | 1,6 | 6,35 | | | ● |




● primera elección
○ elección alternativa




## SNGX

| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| SNGX120708T02020 | 12,70 | 12,70 | 7,94 | 0,8 | – | | | ● |
| SNGX120712T02020 | 12,70 | 12,70 | 7,94 | 1,2 | – | | | ● |
| SNGX120716T02020 | 12,70 | 12,70 | 7,94 | 1,6 | – | | | ● |
| SNGX150716T02020 | 15,88 | 15,88 | 7,94 | 1,6 | – | | | ● |

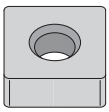
## SNGX-FW

| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| SNGX120712T01020FW | 12,70 | 12,70 | 7,94 | 1,2 | – | | | ● |

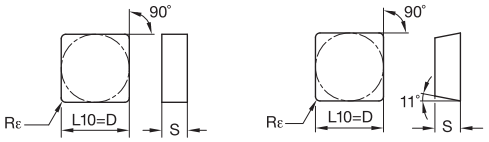
## SNMN

| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| SNMN120412T02020 | 12,70 | 12,70 | 4,76 | 1,2 | – | | | ● |
| SNMN120416T02020 | 12,70 | 12,70 | 4,76 | 1,6 | – | | | ● |

## SNMA



| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| SNMA120412T02020 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | ● |
| SNMA120416T02020 | 12,70 | 12,70 | 4,76 | 1,6 | 5,16 | | | ● |
| SNMA150616T02020 | 15,88 | 15,88 | 6,35 | 1,6 | 6,35 | | | ● |




● primera elección
○ elección alternativa

| | | | | |
|---|---|---|---|---|
| P | | | | |
| M | | | | |
| K | ● | | | ● |
| N | | | | |
| S | | | ● | |
| H | ● | | | |

## ■ SNMX

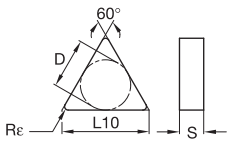
| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **SNMX120712T02020** | 12,70 | 12,70 | 7,94 | 1,2 | – | | | ● |
| **SNMX120716T02020** | 12,70 | 12,70 | 7,94 | 1,6 | – | | | ● |
| **SNMX150716T02020** | 15,88 | 15,88 | 7,94 | 1,6 | – | | | ● |

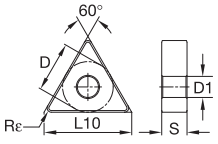
## ■ SPGN

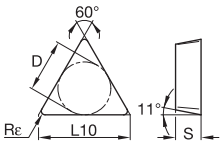
| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **SPGN090308T01020** | 9,53 | 9,53 | 3,18 | 0,8 | – | ● | | |
| **SPGN120304T01020** | 12,70 | 12,70 | 3,18 | 0,4 | – | ● | | |
| **SPGN120308T01020** | 12,70 | 12,70 | 3,18 | 0,8 | – | ● | | |

## ■ SPUN

| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **SPUN120304T00520** | 12,70 | 12,70 | 3,18 | 0,4 | – | ● | | |
| **SPUN120308T00520** | 12,70 | 12,70 | 3,18 | 0,8 | – | ● | | |
| **SPUN120312T00520** | 12,70 | 12,70 | 3,18 | 1,2 | – | ● | | |



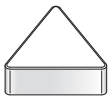




● primera elección
○ elección alternativa

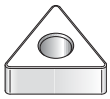
| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | ● | | ● |
| N | | | |
| S | | ● | |
| H | ● | | |

## TNGN



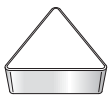
| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **TNGN110308T02020** | 6,35 | 11,00 | 3,18 | 0,8 | – | ● | | |
| **TNGN160404T02020** | 9,53 | 16,50 | 4,76 | 0,4 | – | ● | | |
| **TNGN160408T01020** | 9,53 | 16,50 | 4,76 | 0,8 | – | | ● | |
| **TNGN160408T02020** | 9,53 | 16,50 | 4,76 | 0,8 | – | ● | | ● |
| **TNGN160412T01020** | 9,53 | 16,50 | 4,76 | 1,2 | – | | ● | |
| **TNGN160412T02020** | 9,53 | 16,50 | 4,76 | 1,2 | – | ● | | ● |
| **TNGN160416T02020** | 9,53 | 16,50 | 4,76 | 1,6 | – | ● | | |
| **TNGN160708T02020** | 9,53 | 16,50 | 7,94 | 0,8 | – | ● | | |
| **TNGN160712T02020** | 9,53 | 16,50 | 7,94 | 1,2 | – | ● | | |
| **TNGN220408T02020** | 12,70 | 22,00 | 4,76 | 0,8 | – | ● | | |
| **TNGN220416T02020** | 12,70 | 22,00 | 4,76 | 1,6 | – | | | ● |

## TNGA

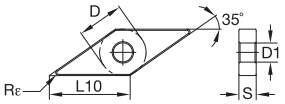


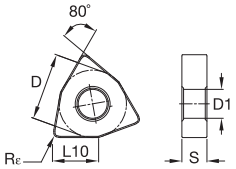
| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **TNGA160408T02020** | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | ● | | ● |
| **TNGA160412T02020** | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | ● | | ● |
| **TNGA160416T02020** | 9,53 | 16,50 | 4,76 | 1,6 | 3,81 | ● | | ● |
| **TNGA220408T02020** | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | ● | | |

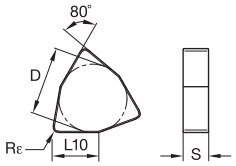
## TPGN



| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **TPGN110304T01020** | 6,35 | 11,00 | 3,18 | 0,4 | – | ● | | |
| **TPGN110308T01020** | 6,35 | 11,00 | 3,18 | 0,8 | – | ● | | |
| **TPGN110312T01020** | 6,35 | 11,00 | 3,18 | 1,2 | – | ● | | |
| **TPGN160304T00520** | 9,53 | 16,50 | 3,18 | 0,4 | – | ● | | |
| **TPGN160304T01020** | 9,53 | 16,50 | 3,18 | 0,4 | – | ● | | |
| **TPGN160308T00520** | 9,53 | 16,50 | 3,18 | 0,8 | – | ● | | |
| **TPGN160308T01020** | 9,53 | 16,50 | 3,18 | 0,8 | – | ● | | |
| **TPGN160308T02020** | 9,53 | 16,50 | 3,18 | 0,8 | – | | | ● |
| **TPGN160312T01020** | 9,53 | 16,50 | 3,18 | 1,2 | – | ● | | |
| **TPGN160312T02020** | 9,53 | 16,50 | 3,18 | 1,2 | – | | | ● |



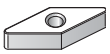




● primera elección
○ elección alternativa

| | | | |
|---|---|---|---|
| P | | | |
| M | | | |
| K | ● | | ● |
| N | | | |
| S | | ● | |
| H | ● | | |

## ■ VNGA



| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **VNGA160404T02020** | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 | ● | | |
| **VNGA160408T02020** | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 | ● | | ● |
| **VNGA160412T02020** | 9,53 | 16,61 | 4,76 | 1,2 | 3,81 | ● | | |
| **VNGA220408T02020** | 12,70 | 22,14 | 4,76 | 0,8 | 5,16 | ● | | |

## ■ WNGA

| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **WNGA080408T02020** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | | | ● |
| **WNGA080412T02020** | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 | | | ● |
| **WNGA080416T02020** | 12,70 | 8,69 | 4,76 | 1,6 | 5,16 | | | ● |

## ■ WNGX

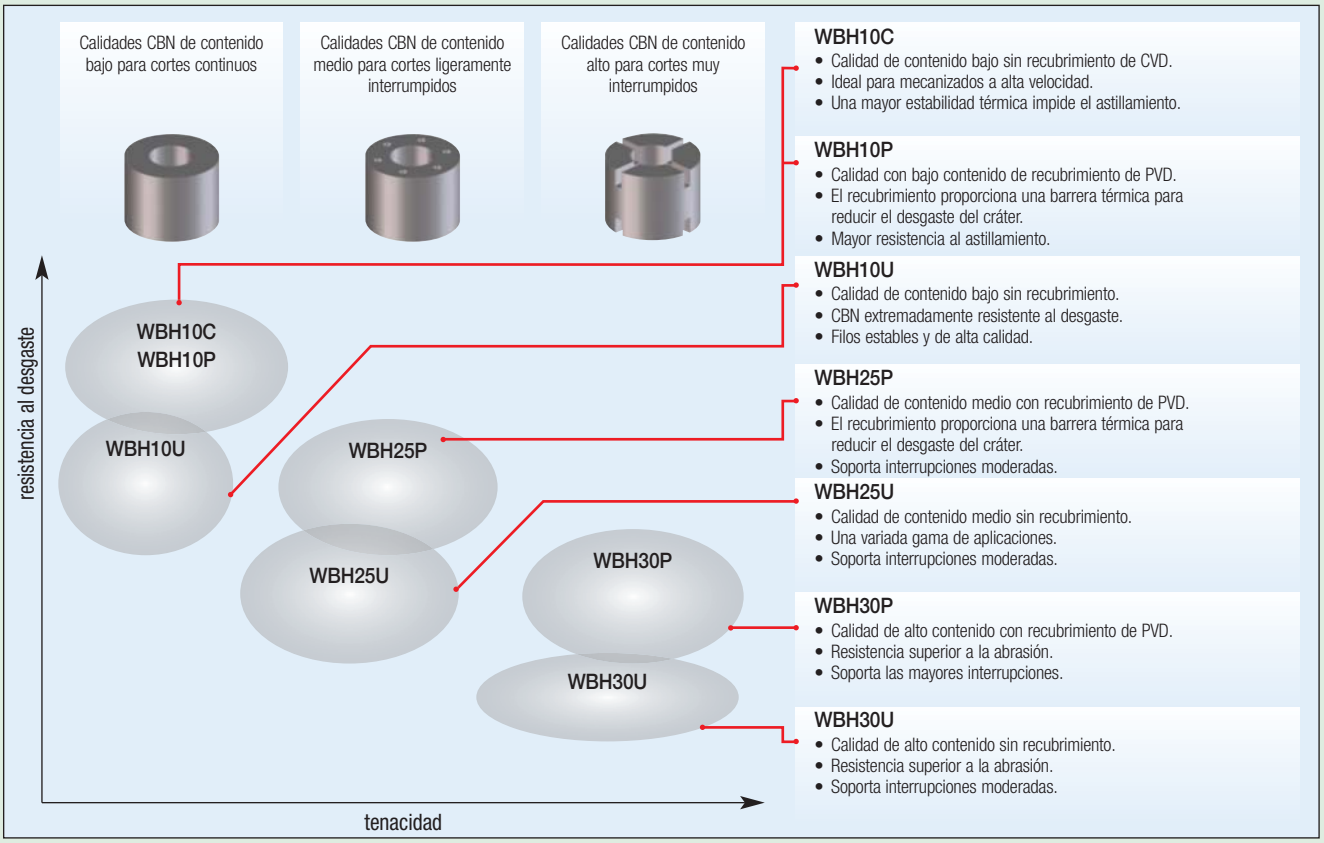
| Número de catálogo | D | L10 | S | Rε | D1 | CW2015 | CW3020 | CW5025 |
|---|---|---|---|---|---|---|---|---|
| **WNGX080712T02020** | 12,70 | 8,69 | 7,94 | 1,2 | – | | | ● |

## Nuevas calidades CBN para torneado duro, metal en polvo y el mecanizado de fundición gris

¡NOVEDAD!

- Calidades con recubrimiento CVD y PVD ya disponibles.
- Una completa gama de calidades CBN para torneado continuo y muy interrumpido.
- Las mejores calidades del sector para el mecanizado de fundición gris.
- Línea completa de calidades para torneado duro.
- Para el mejor rendimiento: están disponibles plaquitas sólidas, con parte superior completa y con punta.

## Calidades de torneado duro




**WBH10C**
- Calidad de contenido bajo sin recubrimiento de CVD.
- Ideal para mecanizados a alta velocidad.
- Una mayor estabilidad térmica impide el astillamiento.

**WBH10P**
- Calidad con bajo contenido de recubrimiento de PVD.
- El recubrimiento proporciona una barrera térmica para reducir el desgaste del cráter.
- Mayor resistencia al astillamiento.

**WBH10U**
- Calidad de contenido bajo sin recubrimiento.
- CBN extremadamente resistente al desgaste.
- Filos estables y de alta calidad.

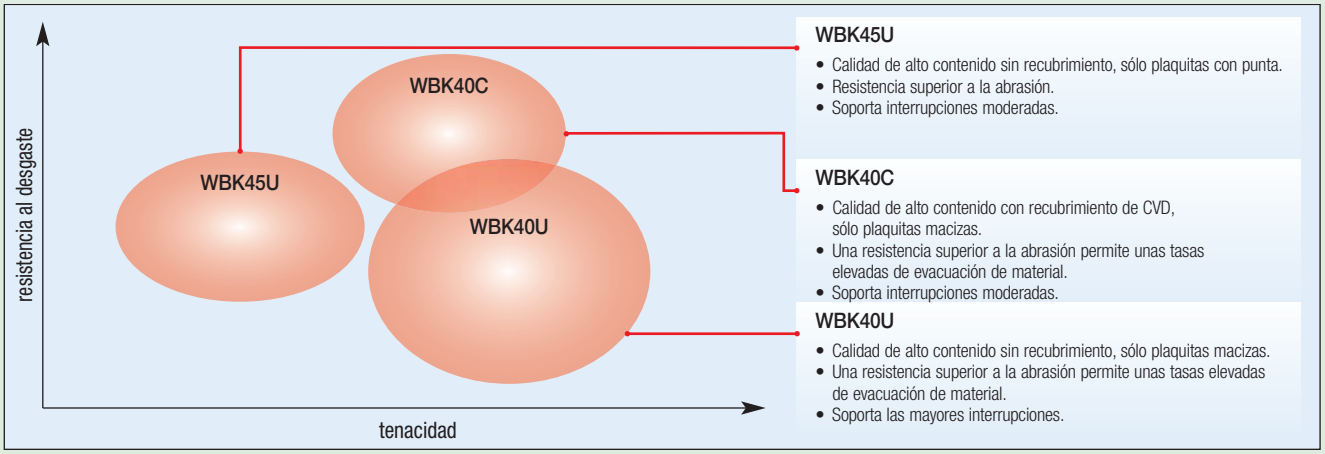
**WBH25P**
- Calidad de contenido medio con recubrimiento de PVD.
- El recubrimiento proporciona una barrera térmica para reducir el desgaste del cráter.
- Soporta interrupciones moderadas.

**WBH25U**
- Calidad de contenido medio sin recubrimiento.
- Una variada gama de aplicaciones.
- Soporta interrupciones moderadas.

**WBH30P**
- Calidad de alto contenido con recubrimiento de PVD.
- Resistencia superior a la abrasión.
- Soporta las mayores interrupciones.

**WBH30U**
- Calidad de alto contenido sin recubrimiento.
- Resistencia superior a la abrasión.
- Soporta interrupciones moderadas.

## Calidades de fundición gris



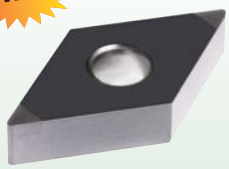

**WBK45U**
- Calidad de alto contenido sin recubrimiento, sólo plaquitas con punta.
- Resistencia superior a la abrasión.
- Soporta interrupciones moderadas.

**WBK40C**
- Calidad de alto contenido con recubrimiento de CVD, sólo plaquitas macizas.
- Una resistencia superior a la abrasión permite unas tasas elevadas de evacuación de material.
- Soporta interrupciones moderadas.

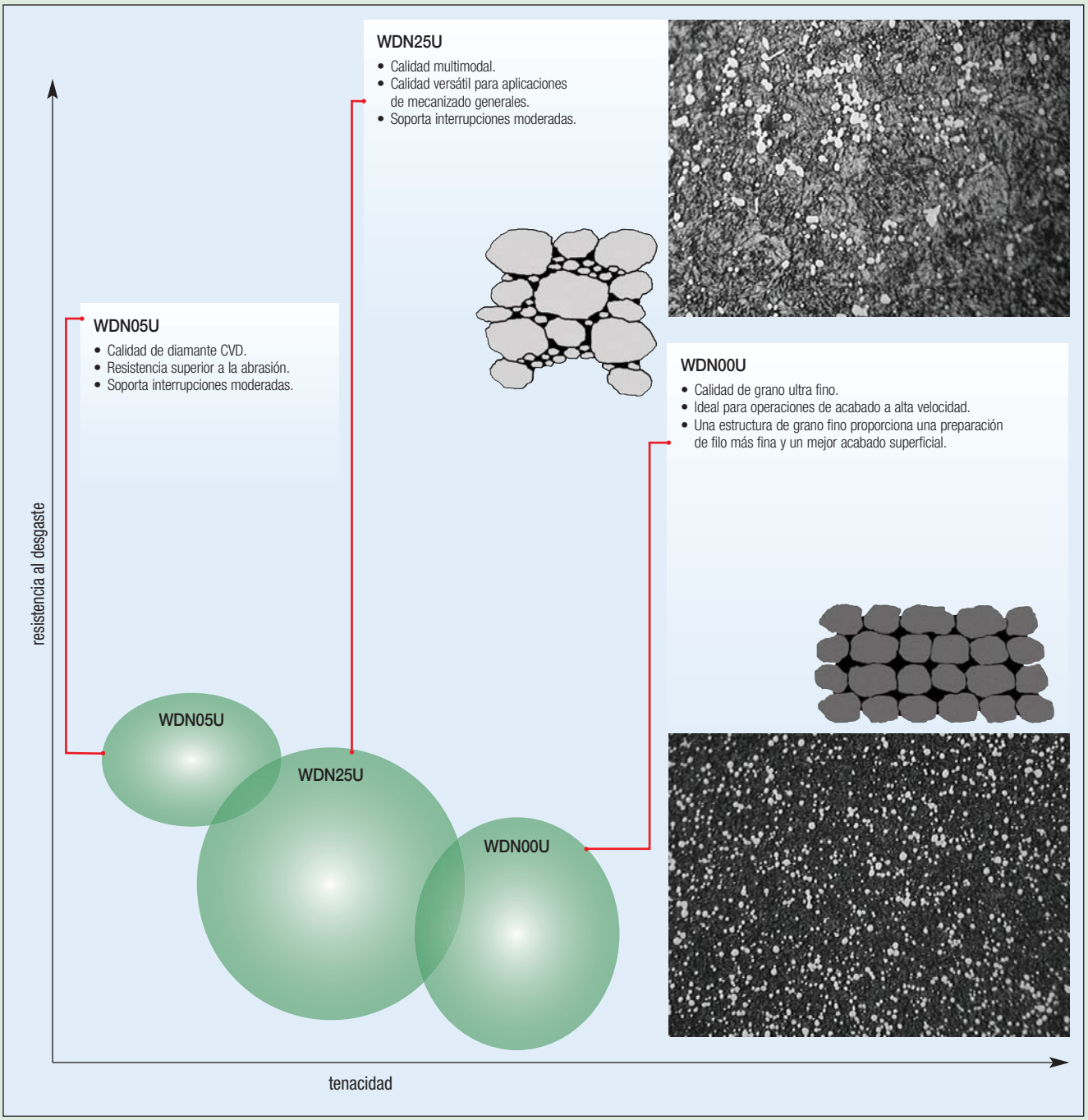
**WBK40U**
- Calidad de alto contenido sin recubrimiento, sólo plaquitas macizas.
- Una resistencia superior a la abrasión permite unas tasas elevadas de evacuación de material.
- Soporta las mayores interrupciones.

## Nuevas calidades PCD para el torneado de materiales no férreos

¡NOVEDAD!



- Tres nuevas calidades PCD (WDN05U, WDN25U y WDN00U) abarcan una amplia gama de aplicaciones.
- Las calidades nuevas proporcionan un rendimiento excelente que aumenta la productividad y recorta los costes de fabricación.
- Alta resistencia a la abrasión y al astillamiento.
- Para el mecanizado de aleación de aluminio, de bajo a alto contenido de silicio, aleaciones de cobre, materiales cerámicos y materiales plásticos.
- Aptas para el mecanizado de materiales muy abrasivos como hierro de grafito compacto (CGI), titanio y compuestos de matriz metálica (MMC).

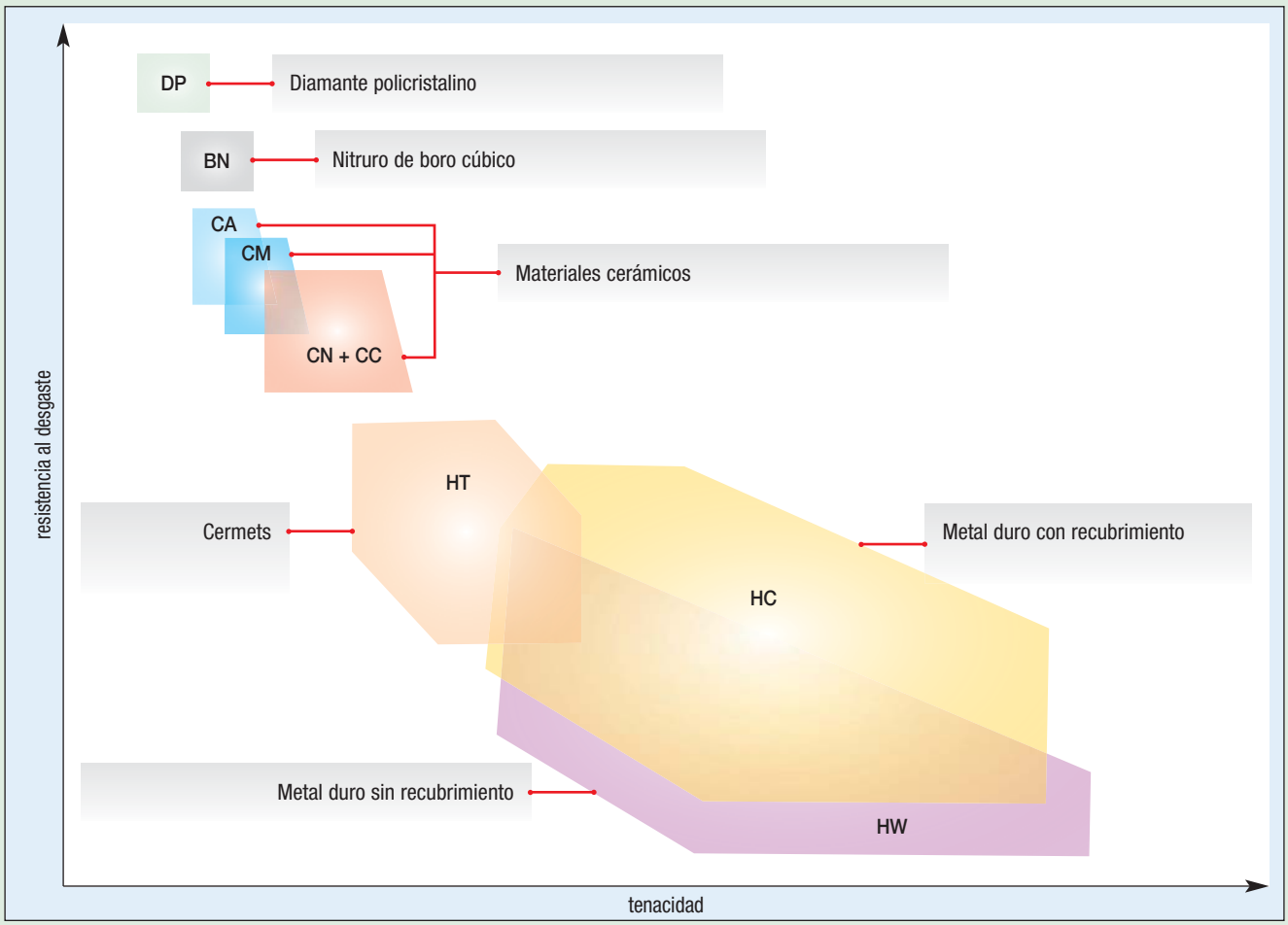


Los materiales de herramienta de corte desarrollados hace más de un siglo están clasificados mediante la combinación de sus características de dureza y resistencia al desgaste.

En la mayoría de aplicaciones de acero y fundición, los metales duros con recubrimiento son los preferidos debido a que proporcionan una duración mucho más larga y/o mayores velocidades de corte, permitiendo así una producción más rentable.

Se utilizan calidades de metal duro sin recubrimiento para operaciones con cortes ligeros que requieran unos filos de corte afilados y unas operaciones con una tenacidad especialmente elevada. También se pueden utilizar en materiales no férreos y no metálicos.

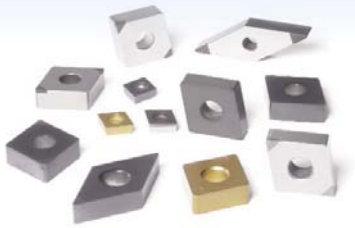
El estándar DIN ISO 513 extendido también incluye materiales de corte de productos cerámicos, los materiales policristalinos superduros de nitruro de boro y diamante, dando como resultado unos símbolos de identificación adicionales para estos grupos de materiales de corte.




| grupo principal | subgrupo (símbolo) | característica |
|---|---|---|
| metal duro | HW | Metal duro de base WC sin recubrimiento |
| | HT | Metal duro de base TiC/TiN sin recubrimiento (cermets) |
| | HC | Metal duro con recubrimiento |
| materiales cerámicos | CA | Materiales cerámicos con óxido de base $Al_2O_3$ |
| | CM | Composite ceramics Materiales cerámicos compuestos $Al_2O_3$ + metal duro |
| | CN | Materiales cerámicos con nitruro de base $Si_3N_4$ |
| | CC | Materiales cerámicos con recubrimiento |
| nitruro de boro cúbico | BL | Nitruro de boro cúbico (CBN) con bajo contenido en CBN |
| | BH | Nitruro de boro cúbico (CBN) con alto contenido en CBN |
| diamante | DP | Diamante policristalino (PCD) |

## Programa de Soluciones personalizadas de rápido seguimiento (FTCS) para plaquitas CBN

La clave del éxito en el uso de plaquitas CBN es la combinación adecuada de calidad y preparación del filo. Con este programa, resulta fácil desarrollar unos diseños que cumplan sus necesidades con el menor tiempo de ataque posible y la mayor rentabilidad.



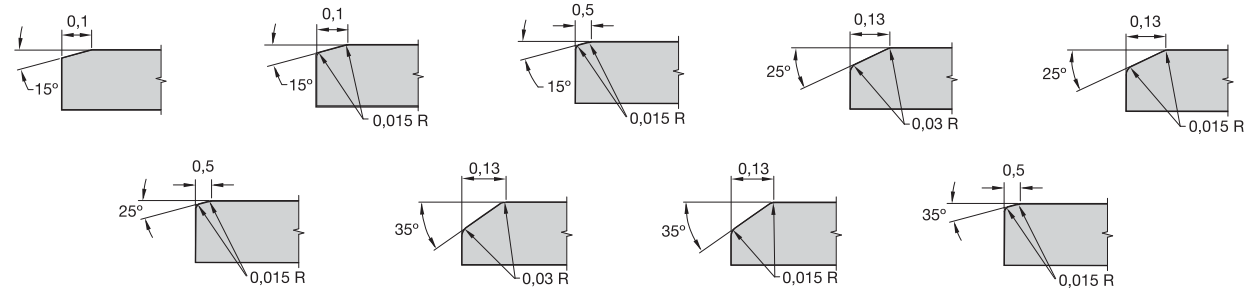
Así funciona:

**1 Elija un tipo y una calidad de esta tabla:**

| tipo | | calidades | | | | | |
|---|---|---|---|---|---|---|---|
| | número de puntas | WBH10U | WBH25U | WBH30U | WBH10P | WBH25P | WBH30P |
| CCGW0602 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| CCGW09T3 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| CNGA1204 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| CNMA1204 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| CPGW0602 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| CPGW09T3 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| | | | | | | | |
| DCGW11T3 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| DNGA1504 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| DNGA1506 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| DNMA1104 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| DPGW11T3 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| | | | | | | | |
| SNGA1204 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| SNMN0903 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| | | | | | | | |
| TCGW1102 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| TNGA1604 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| TPGW1102 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| | | | | | | | |
| VBGW1604 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| VNGA1604 | 2 | ▲ | ▲ | ▲ | ▲ | ▲ | ▲ |
| | | | | | | | |
| | tipo | WBK40U | | | | | |
| RNM0903 | integral | ▲ | | | | | |
| RNM1203 | integral | ▲ | | | | | |
| RNM1204 | integral | ▲ | | | | | |

**2 Decida:** • Radio de la nariz • Ancho de bisel en T • Tamaño del agujero • Plaquita wiper

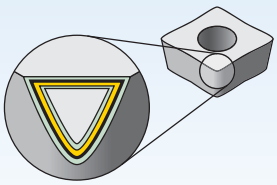
Ejemplos de preparación de filo



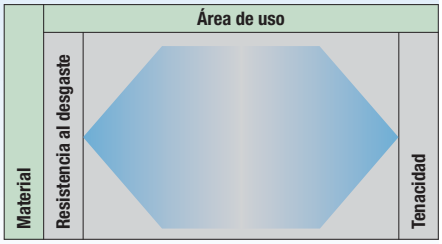

**3 Tiempo de ataque programado:**
Plaquitas sin recubrimiento: 2 semanas + envío.
Plaquitas con recubrimiento de PVD: 3–4 semanas + envío.
Plaquitas con recubrimiento de CVD: No son parte del programa.

**4 Precio:** Póngase en contacto con su distribuidor local autorizado o representante de servicio de atención al cliente.

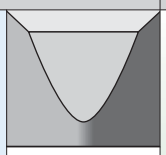
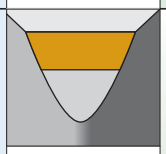
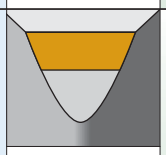
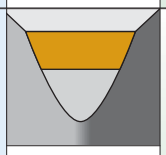
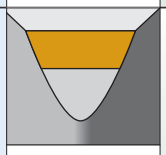
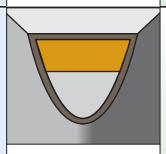
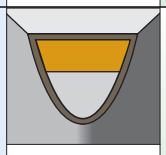
**5 Cantidad:** Límite de 10 piezas por diseño para mantener los tiempos de ataque mencionados anteriormente. Se pueden solicitar cantidades adicionales con tiempos de ataque adicionales.



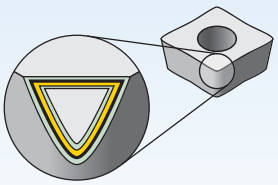
**Menores tiempos del ciclo. Alta capacidad de velocidad y avance. Vida de la herramienta más prolongada. Nuevo recubrimiento multicapa que proporciona una mejor resistencia al desgaste.**



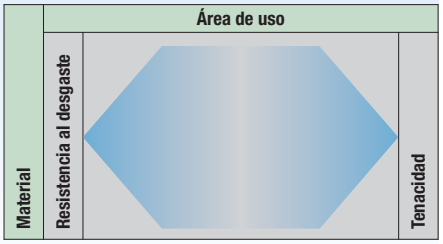

Calidad

| Recubrimiento | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|
| **WBK40U**  **BN-K40** | Un alto contenido de CBN, plaquita CBN sólida con múltiples filos de corte. Se aplica en desbastado y acabado de fundición gris completamente perlítica, hierros en molde, aceros aleados con alto contenido en cromo, metales sinterizados en polvo y cortes pesados en aceros endurecidos (>45 HRC). Para acabado en frío y fundición completamente perlítica. Unas plaquitas sólidas que proporcionan una mejor seguridad y resistencia a los golpes que las plaquitas con punta, al mismo tiempo que permiten cortes con mayor profundidad. | | | | | | | | | |
| **WBK45U**  **BN-K45** | Punta con alto contenido de CBN soldada en una plaquita de metal duro. Se aplica en desbastado y acabado de fundición gris completamente perlítica, hierros en molde, aceros aleados con alto contenido en cromo, metales sinterizados en polvo y cortes pesados en aceros endurecidos (>45 HRC). Para acabado en frío y fundición completamente perlítica. Disponible en una amplia gama de estilos de plaquita, incluyendo geometrías con desprendimiento positivo ideales para aplicaciones de mandrinado. | | | | | | | | | |
| **WBH10U**  **BN-H10** | Punta con bajo contenido de CBN soldada en una plaquita de metal duro. Diseñada para un acabado de precisión en cortes suaves sobre aceros endurecidos (>45 HRC), cuando sea necesario un óptimo acabado superficial. Para aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, fundición carburizada y nitrurada y algunos recubrimientos duros. No aplicar en acero suave o de lo contrario se producirá un rápido desgaste del cráter. | | | | | | | | | |
| **WBH25U**  **BN-H25** | Punta con bajo contenido de CBN soldada en una plaquita de metal duro. Diseñada para un acabado de precisión en cortes suaves sobre aceros endurecidos (>45 HRC), cuando sea necesario un óptimo acabado superficial. Para utilizar en cortes continuos e interrumpidos de aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, fundición carburizada y nitrurada y algunos recubrimientos duros. | | | | | | | | | |
| **WBH30U***  **BN-H30** | Punta con alto contenido de CBN soldada en una plaquita de metal duro. Diseñada para desbaste y acabado en cortes interrumpidos sobre aceros endurecidos (>45 HRC). También se puede aplicar en fundición gris, fundiciones en frío, aceros aleados con alto contenido en cromo y metales sinterizados en polvo. | | | | | | | | | |
| **WBH10P**  **BN-H10** | Una calidad con bajo contenido en CBN y un recubrimiento de PVD-TiAlN para mayor resistencia al desgaste. Diseñada para el mecanizado de precisión de aceros endurecidos (>45 HRC), cuanto más duro el acero, mejor. El recubrimiento de PVD ofrece una mejor resistencia al desgaste y un excelente acabado superficial. Se aplica de forma efectiva en aceros para cojinetes, aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, fundición carburizada y nitrurada y algunos recubrimientos duros. | | | | | | | | | |
| **WBH25P**  **BN-H25** | Un recubrimiento de PVD-TiAlN sobre una punta con bajo contenido de CBN soldada en una plaquita de metal duro. Diseñada para desbaste y acabado de aceros endurecidos (>45 HRC). Para acero de cojinetes, aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, hierros carburizados y nitrurados y algunos recubrimientos duros. | | | | | | | | | |

*Calidad también disponible como solución a medida.



Menores tiempos del ciclo. Alta capacidad de velocidad y avance. Vida de la herramienta más prolongada. Nuevo recubrimiento multicapa que proporciona una mejor resistencia al desgaste.




Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WBH30P | BN-H30 | Un recubrimiento de PVD-TiAlN sobre una punta con bajo contenido de CBN soldada en una plaquita de metal duro. Diseñada para desbaste y acabado en cortes interrumpidos sobre aceros endurecidos (>45 HRC). Se aplica en fundición gris, fundición en frío, aceros aleados con alto contenido en cromo y metales sinterizados en polvo. | K | K | K | | | | | | |
| | | | S | | S | S | | | | | |
| | | | H | | | | H | H | H | | |
| WBH10C | BN-H10 | Una calidad con bajo contenido en CBN con un revestimiento de MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN para proteger contra el desgaste del cráter. Diseñada para el mecanizado de precisión de aceros endurecidos (>48 HRC), se aplica de forma efectiva en aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, fundición carburizada y nitrurada y algunos recubrimientos duros. No utilizar con aceros suaves. | K | K | | | | | | | |
| | | | H | H | H | | | | | | |
| WBH40C | BN-H40 | Alto contenido en CBN, CBN integral multi-filo y un recubrimiento de alúmina CVD — $Al_2O_3$-TiN-TiCN-$Al_2O_3$-TiN. Se aplica en desbaste y semiacabado de fundición gris completamente perlítica, fundición en frío, aceros aleados con alto contenido en cromo, metales sinterizados en polvo y cortes pesados en aceros endurecidos (>45 HRC). Para acabado en frío y fundición completamente perlítica. No aplicar en el acabado de aceros endurecidos. La WBH40C sólida también se puede aplicar de forma efectiva en el desbaste de aceros endurecidos. | K | K | K | K | K | K | | | |
| | | | H | | | | | | H | H | |
| WDN00U* | DP-N10 | Una punta de diamante policristalino (PCD) granulada ultrafino soldada en un sustrato de metal duro. Diseñada para el torneado general de materiales principalmente no férreos. Se aplica sobre una amplia gama de cortes, desde continuos a interrumpidos, allí donde se necesite un acabado superficial superior. Para aleaciones de aluminio con contenido bajo y medio en silicio, materiales no metálicos, cobre, bronce y aleaciones con base de zinc. El tamaño de las partículas de diamante granulado ultrafino permite unos acabados superficiales superiores al mismo tiempo que asegura la mejor resistencia a los choques mecánicos de cualquier herramienta de corte con PCD. | N | N | N | N | | | | | |
| | | | S | S | | | | | | | |
| WDN05U* | DP-N05 | Una herramienta con una hoja de diamante CVD puro soldada directamente en un sustrato de metal duro. El material de herramienta más resistente a la abrasión de la industria para materiales no férreos y no metálicos. Ideal cuando se busca una resistencia a la abrasión. Soporta interrupciones moderadas. | N | N | N | | | | | | |
| WDN25U | DP-N25 | Una calidad PCD multimodal con una variedad de tamaños de grano soldados en un sustrato de metal duro. Diseñada para resistir abrasiones extremas; buena resistencia del filo para aplicaciones exigentes. Una opción ideal para aleaciones de aluminio con alto contenido en silicio, materiales bimetálicos (AL/GCI), MMC, plásticos reforzados con fibra de carbono y otros materiales abrasivos no metálicos. | N | | N | N | N | | | | |

*Calidad también disponible como solución a medida.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

| DIN ISO 513 | VDI 3323 | Corte continuo | | | | | | | | | | | | Corte ligeramente interrumpido | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | ap [mm] | | | | | | | | | | | | | | | | | | |
| | avance [mm] | | | | | | | | | | | | | | | | | | |
| P | 1 | | | | | | | | | | | | | | | | | | |
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| | 12 | | | | | | | | | | | | | | | | | | |
| | 13.1 | | | | | | | | | | | | | | | | | | |
| | 13.2 | | | | | | | | | | | | | | | | | | |
| | ap [mm] | | | | | | | | | | | | | | | | | | |
| | avance [mm] | | | | | | | | | | | | | | | | | | |
| M | 14.1 | | | | | | | | | | | | | | | | | | |
| | 14.2 | | | | | | | | | | | | | | | | | | |
| | 14.3 | | | | | | | | | | | | | | | | | | |
| | 14.4 | | | | | | | | | | | | | | | | | | |
| | ap [mm] | 0,20 | — | 2,00 | 0,20 | — | 1,50 | 1,30 | — | 10,00 | 1,00 | — | 8,00 | 0,20 | — | 2,00 | 0,15 | — | 1,50 |
| | avance [mm] | 0,10 | — | 0,40 | 0,10 | — | 0,30 | 0,25 | — | 1,00 | 0,20 | — | 0,80 | 0,10 | — | 0,30 | 0,08 | — | 0,25 |
| | | WBK40U/WBK45U | | | WBK40U/WBK45U | | | WBK40C | | | WBK40C | | | WBK40U/WBK45U | | | WBK40U/WBK45U | | |
| | 15 | 400 | **700** | 1100 | — | — | — | 500 | **700** | 1200 | — | — | — | 400 | **700** | 1100 | — | — | — |
| | 16 | 400 | **700** | 1100 | — | — | — | 500 | **700** | 1200 | — | — | — | 400 | **700** | 1100 | — | — | — |
| K | 17 | — | — | — | 280 | **400** | 600 | — | — | — | 280 | **400** | 700 | — | — | — | 280 | **400** | 600 |
| | 18 | — | — | — | 280 | **400** | 600 | — | — | — | 280 | **400** | 700 | — | — | — | 280 | **400** | 600 |
| | 19 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | 20 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | ap [mm] | 0,20 | — | 2,00 | 0,10 | — | 1,00 | 0,20 | — | 2,00 | 0,10 | — | 1,00 | 0,20 | — | 2,00 | 0,20 | — | 2,00 |
| | avance [mm] | 0,05 | — | 0,41 | 0,06 | — | 0,20 | 0,10 | — | 0,25 | 0,06 | — | 0,20 | 0,10 | — | 0,25 | 0,10 | — | 0,25 |
| | | WDN25U | | | WDN05U | | | WDN25U | | | WDN05U | | | WDN00U | | | WDN25U | | |
| | 21 | 500 | **750** | 2500 | — | — | — | — | — | — | — | — | — | 500 | **750** | 2500 | — | — | — |
| | 22 | 500 | **750** | 2500 | — | — | — | — | — | — | — | — | — | 500 | **750** | 2500 | — | — | — |
| | 23 | — | — | — | 400 | **580** | 1100 | — | — | — | — | — | — | — | — | — | 300 | **520** | 980 |
| | 24 | — | — | — | 400 | **580** | 1100 | — | — | — | — | — | — | — | — | — | 300 | **520** | 980 |
| N | 25 | — | — | — | 400 | **580** | 1100 | — | — | — | — | — | — | — | — | — | 300 | **520** | 980 |
| | 26 | — | — | — | — | — | — | 250 | **500** | 800 | — | — | — | — | — | — | — | — | — |
| | 27 | — | — | — | — | — | — | 250 | **500** | 800 | — | — | — | — | — | — | — | — | — |
| | 28 | — | — | — | — | — | — | 250 | **500** | 800 | — | — | — | — | — | — | — | — | — |
| | 29 | — | — | — | — | — | — | — | — | — | 400 | **460** | 850 | — | — | — | — | — | — |
| | 30 | — | — | — | — | — | — | — | — | — | 400 | **460** | 850 | — | — | — | — | — | — |
| | ap [mm] | | | | | | | | | | | | | | | | | | |
| | avance [mm] | | | | | | | | | | | | | | | | | | |
| S | 31 | | | | | | | | | | | | | | | | | | |
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| | 36 | | | | | | | | | | | | | | | | | | |
| | 37 | | | | | | | | | | | | | | | | | | |
| | ap [mm] | 0,10 | — | 0,50 | 0,10 | — | 0,50 | | | | | | | 0,10 | — | 0,50 | 0,10 | — | 0,50 |
| | avance [mm] | 0,06 | — | 0,25 | 0,06 | — | 0,25 | | | | | | | 0,05 | — | 0,20 | 0,05 | — | 0,20 |
| | | WBH10U | | | WBH10P | | | | | | | | | WBH25U | | | WBH25P | | |
| | 38.1 | 50 | **140** | 230 | 75 | **150** | 260 | | | | | | | 50 | **110** | 200 | 50 | **120** | 230 |
| H | 38.2 | 50 | **140** | 230 | 75 | **150** | 260 | | | | | | | 50 | **110** | 200 | 50 | **120** | 230 |
| | 39.1 | 50 | **140** | 230 | 75 | **150** | 260 | | | | | | | 50 | **110** | 200 | 50 | **120** | 230 |
| | 39.2 | 50 | **140** | 230 | 75 | **150** | 260 | | | | | | | 50 | **110** | 200 | 50 | **120** | 230 |

| Corte ligeramente interrumpido | | | Corte muy interrumpido | | | | | | | | | | | | | VDI 3323 | DIN ISO 513 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Velocidad de corte • vc m/min | | | | | | | | | | | | | | | | Grupo de materiales | |
| mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | | |
| | | | | | | | | | | | | | | | | ap [mm] avance [mm] | |
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| | | | | | | | | | | | | | | | | 13.1 | |
| | | | | | | | | | | | | | | | | 13.2 | |
| | | | | | | | | | | | | | | | | ap [mm] avance [mm] | |
| | | | | | | | | | | | | | | | | 14.1 | M |
| | | | | | | | | | | | | | | | | 14.2 | |
| | | | | | | | | | | | | | | | | 14.3 | |
| | | | | | | | | | | | | | | | | 14.4 | |
| 1,30 | — | 10,00 | 1,00 | — | 8,00 | 0,10 | — | 2,00 | 0,10 | — | 1,50 | | | | | ap [mm] | |
| 0,25 | — | 1,00 | 0,20 | — | 0,80 | 0,08 | — | 0,40 | 0,08 | — | 0,20 | | | | | avance [mm] | |
| WBK40C | | | WBK40C | | | WBK40U/WBK45U | | | WBK40U/WBK45U | | | | | | | | |
| 500 | **700** | 1200 | — | — | — | 400 | **700** | 1100 | — | — | — | | | | | 15 | |
| 500 | **700** | 1200 | — | — | — | 400 | **700** | 1100 | — | — | — | | | | | 16 | |
| — | — | — | 280 | **400** | 700 | — | — | — | 280 | **400** | 600 | | | | | 17 | K |
| — | — | — | 280 | **400** | 700 | — | — | — | 280 | **400** | 600 | | | | | 18 | |
| — | — | — | — | — | — | — | — | — | — | — | — | | | | | 19 | |
| — | — | — | — | — | — | — | — | — | — | — | — | | | | | 20 | |
| 0,10 | — | 1,00 | 0,20 | — | 2,00 | 0,20 | — | 2,00 | 0,20 | — | 2,00 | 0,10 | — | 1,00 | 0,20 | — | 2,00 | ap [mm] | |
| 0,06 | — | 0,20 | 0,10 | — | 0,30 | 0,10 | — | 0,25 | 0,10 | — | 0,25 | 0,06 | — | 0,20 | 0,10 | — | 0,30 | avance [mm] | |
| WDN05U | | | WDN00U | | | WDN00U | | | WDN25U | | | WDN00U | | | WDN00U | | | | |
| — | — | — | — | — | — | 500 | **750** | 2500 | — | — | — | — | — | — | — | — | — | 21 | |
| — | — | — | — | — | — | 500 | **750** | 2500 | — | — | — | — | — | — | — | — | — | 22 | |
| — | — | — | — | — | — | — | — | — | 300 | **520** | 980 | — | — | — | — | — | — | 23 | |
| — | — | — | — | — | — | — | — | — | 300 | **520** | 980 | — | — | — | — | — | — | 24 | |
| — | — | — | — | — | — | — | — | — | 300 | **520** | 980 | — | — | — | — | — | — | 25 | N |
| 300 | **520** | 1000 | — | — | — | — | — | — | — | — | — | 300 | **520** | 1000 | — | — | — | 26 | |
| 300 | **520** | 1000 | — | — | — | — | — | — | — | — | — | 300 | **520** | 1000 | — | — | — | 27 | |
| 300 | **520** | 1000 | — | — | — | — | — | — | — | — | — | 300 | **520** | 1000 | — | — | — | 28 | |
| — | — | — | 350 | **365** | 750 | — | — | — | — | — | — | — | — | — | 350 | **365** | 750 | 29 | |
| — | — | — | 350 | **365** | 750 | — | — | — | — | — | — | — | — | — | 350 | **365** | 750 | 30 | |
| | | | | | | | | | | | | | | | | ap [mm] avance [mm] | |
| | | | | | | | | | | | | | | | | 31 | |
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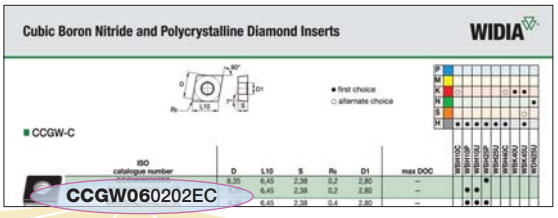
| | | | | | | | | | | | | | | | | 36 | |
| | | | | | | | | | | | | | | | | 37 | |
| 0,10 | — | 0,50 | 0,10 | — | 0,50 | 0,08 | — | 0,40 | 0,08 | — | 0,40 | | | | | ap [mm] | |
| 0,05 | — | 0,20 | 0,05 | — | 0,20 | 0,05 | — | 0,20 | 0,05 | — | 0,20 | | | | | avance [mm] | |
| WBH25U | | | WBH25P | | | WBH30U | | | WBH30P | | | | | | | | |
| 50 | **110** | 200 | 50 | **120** | 230 | 45 | **90** | 170 | 50 | **105** | 200 | | | | | 38.1 | |
| 50 | **110** | 200 | 50 | **120** | 230 | 45 | **90** | 170 | 50 | **105** | 200 | | | | | 38.2 | H |
| 50 | **110** | 200 | 50 | **120** | 230 | 45 | **90** | 170 | 50 | **105** | 200 | | | | | 39.1 | |
| 50 | **110** | 200 | 50 | **120** | 230 | 45 | **90** | 170 | 50 | **105** | 200 | | | | | 39.2 | |

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




## C — Forma de la plaquita

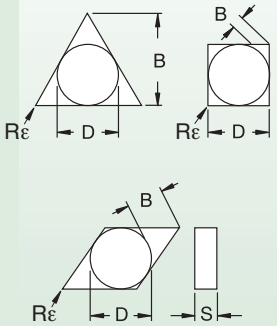
| | | |
|---|---|---|
| H | 120° | |
| O | 135° | |
| P | 108° | |
| R | — | |
| S | 90° | |
| T | 60° | |
| C<br>D<br>E<br>M<br>V | 80°<br>55°<br>75°<br>86°<br>35° | |
| W | 80° con mayores ángulos de esquina | |
| L | 90° | |
| A<br>B<br>N/K | 85°<br>82°<br>55° | |

## C — Ángulo de incidencia de la plaquita

| | | |
|---|---|---|
| A | 3° | |
| B | 5° | |
| C | 7° | |
| D | 15° | |
| E | 20° | |
| F | 25° | |
| G | 30° | |
| N | 0° | |
| P | 11° | |
| O | Para otros ángulos de incidencia que requieran una descripción. | |

## G — Clase de tolerancia

**Las tolerancias se aplican antes de la preparación y el recubrimiento de los filos**




D: Diámetro teórico del círculo inscrito en la plaquita
S: Grosor
B: Consulte las cifras que se expresan a continuación

## W — Características de la plaquita

| | |
|---|---|
| N | |
| R | |
| F | |
| A | |
| M | |
| G | |
| W | |
| T | |
| Q | |
| U | |
| B | |
| H | |
| C | |
| J | |
| X | Diseño especial |

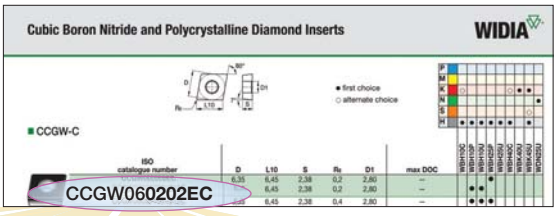
## 06 — Plaquita

| "D" | Código para longitud métrica del filo de corte "L10" | | | | | | |
|---|---|---|---|---|---|---|---|
| mm | C | D | R | S | T | V | W |
| 3,97 | S4 | 04 | 03 | 03 | 06 | — | — |
| 4,76 | 04 | 05 | 04 | 04 | 08 | 08 | S3 |
| 5,56 | 05 | 06 | 05 | 05 | 09 | 09 | 03 |
| 6,00 | — | — | 06 | — | — | — | — |
| 6,35 | 06 | 07 | 06 | 06 | 11 | 11 | 04 |
| 7,94 | 08 | 09 | 07 | 07 | 13 | 13 | 05 |
| 8,00 | — | — | 08 | — | — | — | — |
| 9,52 | 09 | 11 | 09 | 09 | 16 | 16 | 06 |
| 10,00 | — | — | 10 | — | — | — | — |
| 11,11 | 11 | 13 | 11 | 11 | 19 | 19 | 07 |
| 12,00 | — | — | 12 | — | — | — | — |
| 12,70 | 12 | 15 | 12 | 12 | 22 | 22 | 08 |
| 14,29 | 14 | 17 | 14 | 14 | 24 | 24 | 09 |
| 15,88 | 16 | 19 | 15 | 15 | 27 | 27 | 10 |
| 16,00 | — | — | 16 | — | — | — | — |
| 17,46 | 17 | 21 | 17 | 17 | 30 | 30 | 11 |
| 19,05 | 19 | 23 | 19 | 19 | 33 | 33 | 13 |
| 20,00 | — | — | 20 | — | — | — | — |
| 22,22 | 22 | 27 | 22 | 22 | 38 | 38 | 15 |
| 25,00 | — | — | 25 | — | — | — | — |
| 25,40 | 25 | 31 | 25 | 25 | 44 | 44 | 17 |
| 31,75 | 32 | 38 | 31 | 31 | 54 | 54 | 21 |
| 32,00 | — | — | 32 | — | — | — | — |

| Clase de tolerancia* | tolerancia en "D" | tolerancia en "B" | tolerancia en "S" |
|---|---|---|---|
| C | ±0,025 | ±0,013 | ±0,025 |
| H | ±0,013 | ±0,013 | ±0,025 |
| E | ±0,025 | ±0,025 | ±0,025 |
| G | ±0,025 | ±0,025 | ±0,013 |
| M | Consulte las tablas de la columna de tamaños | | ±0,013 |
| U | Consulte las tablas de la columna de tamaños | | ±0,013 |

*Las tolerancias se aplican antes de la preparación y el recubrimiento de los filos.

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## 02 — Grosor

| símbolo mm | grosor mm |
|---|---|
| — | 0,79 |
| T0 | 1,00 |
| 01 | 11,59 |
| T1 | 1,98 |
| 02 | 2,38 |
| 03 | 3,18 |
| T3 | 3,97 |
| 04 | 4,76 |
| 05 | 5,56 |
| 06 | 6,35 |
| 07 | 7,94 |
| 09 | 9,52 |
| 11 | 11,11 |
| 12 | 12,70 |

## 02 — Radio de esquina "Rε"

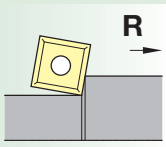
| símbolo mm | radio de esquina mm |
|---|---|
| X0 | .04 |
| 01 | 0,1 |
| 02 | 0,2 |
| 04 | 0,4 |
| 08 | 0,8 |
| 12 | 1,2 |
| 16 | 1,6 |
| 20 | 2,0 |
| 24 | 2,4 |
| 28 | 2,8 |
| 32 | 3,2 |
| 00 | plaquita redonda |
| M0 | |

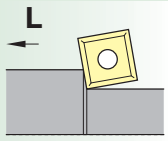
## Dirección de la plaquita *(opcional)*

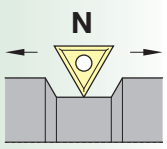
**R** = A derechas

**L** = A izquierdas

**N** = Neutro




## E — Filo de corte

**F*** Afilado

**E*** Redondeado

**T** Biselado

**S*** Biselado y redondeado

**K** Biselado doble

**P** Biselado doble y redondeado

*También disponible en estilo Wiper.

## Ancho de bisel en T *(opcional)*

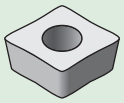
| símbolo ISO | tamaño mm |
|---|---|
| 010 | 0,01 |
| 020 | 0,02 |

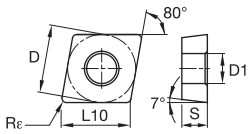
## Ángulo de bisel en T *(opcional)*

| símbolo | tamaño |
|---|---|
| 10 | 10° |
| 15 | 15° |
| 20 | 20° |
| 25 | 25° |
| 30 | 30° |

## C — Punta Tipo *(opcional)*

| símbolo | uso |
|---|---|
| C | superior completo |
| M | mini-punta |
| MT | multi-punta |
| ST | punta única |






● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

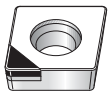
## ■ CCGW-C

| | Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C) | CCGW060202EC | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | – | | | | ● | | | | | |
| | CCGW060202S01015C | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | – | | ● | ● | | | | | | |
| | CCGW060204S01015C | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | – | | ● | ● | ● | | | | | |
| | CCGW09T304S01015C | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | – | | | | ● | | | | | |
| | CCGW09T308EC | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | – | | | | | | | | ● | |
| | CCGW09T308S01015C | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | – | | | | ● | | | | | |

## ■ CCGW-EMT

| | Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (MT) | CCGW09T304EMT | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | ● | | | | | | | | |

## ■ CCGW-FST

| | Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  (ST) | CCGW060204FST | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 2,40 | | | | | | | | | ● |
| | CCGW09T304FST | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 2,40 | | | | | | | | | ● |
| | CCGW09T308FST | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,65 | | | | | | | | | ● |

## ■ CCGW-FWC

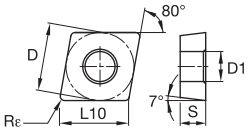
| | Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C) | CCGW060202EFWC | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | – | | | | ● | | | | | |
| | CCGW060204EFWC | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | – | | | | ● | | | | | |
| | CCGW09T304EFWC | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | – | | | | ● | | | | | |
| | CCGW09T308EFWC | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | – | | | | ● | | | | | |

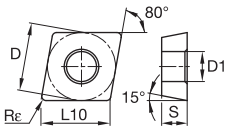
## ■ CCGW-FWM

| | Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (M) | CCGW060202EFWM | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | 1,60 | | | | ● | | | | | |
| | CCGW060204EFWM | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 1,60 | | | | ● | | | | | |
| | CCGW09T304EFWM | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | | | | ● | | | | | |
| | CCGW09T308EFWM | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | | | | ● | | | | | |

## ■ CCGW-FWMT

| | Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (MT) | CCGW09T304S01015FWMT | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | ● | | ● | | | | | | |
| | CCGW09T308S01015FWMT | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | | | ● | | | | | | |




● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ CCGW-M

(M)

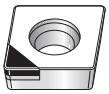
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCGW060202EM | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | 1,60 | | | | ● | | | | | |
| CCGW060204S01015M | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 1,60 | ● | | | ● | | | | | |
| CCGW09T304S01015M | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | | | | ● | | | | | |
| CCGW09T308S01015M | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | | | | ● | | | | | |

## ■ CCGW-MT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCGW09T304S01015MT | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | | ● | ● | | | | | | |
| CCGW09T308S01015MT | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | ● | ● | ● | | | | | | |
| CCGW120404S01015MT | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | 1,60 | | | | | | | | ● | |
| CCGW120408S01015MT | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | 1,12 | | | | | | | | ● | |

## ■ CCMW-FST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCMW060204FST | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 2,40 | | | | | | | | | ● |
| CCMW060208FST | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | 1,65 | | | | | | | | | ● |
| CCMW09T304FST | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 2,40 | | | | | | | | | ● |
| CCMW09T308FST | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | | | | | | | | ● | ● |

## ■ CCMW-ST

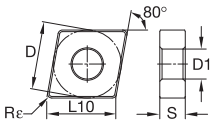
(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CCMW060204S01020ST | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 1,60 | | | | | ● | | | | |
| CCMW090304S01020ST | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | 1,60 | | | | | | | | ● | |
| CCMW120408S01020ST | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | 1,12 | | | | | ● | | | | |

## ■ CDHB-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CDHBS4T002FST | 3,97 | 4,03 | 1,02 | 0,1 | 2,13 | 1,32 | | | | | | | | | ● |
| CDHBS4T004FST | 3,97 | 4,03 | 1,02 | 0,2 | 2,13 | 1,32 | | | | | | | | | ● |




● primera elección
○ elección alternativa

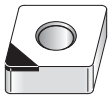
| | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

## ■ CNGA-EMT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNGA120408EMT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,60 | ● | | | ● | | | | | |
| CNGA120412EMT | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | 1,12 | | | | ● | | | | | |

## ■ CNGA-FST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNGA120404FST | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 2,40 | | | | | | | | | ● |
| CNGA120408FST | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,65 | | | | | | | | | ● |

## ■ CNGA-FW/MW MT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNGA120404EFWMT | 12,70 | 12,90 | 4,76 | 0,4 | 5,15 | 1,60 | | | | ● | ● | | | | |
| CNGA120404S01025FWMT | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 1,60 | | ● | ● | | | | | | |
| CNGA120408EFWMT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | | | ● | ● | | | | |
| CNGA120408S01020FWMT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | ● | | | | | | | | |
| CNGA120408S01025FWMT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | ● | ● | | | | | | |
| CNGA120412EFWMT | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | 0,86 | | | | ● | ● | | | | |
| CNGA120416S02015MWMT | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | 0,64 | | | | | | | | ● | |

## ■ CNGA-MT

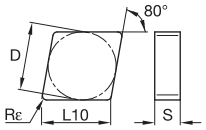
(MT)

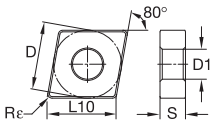
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNGA120404S01020MT | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 1,60 | ● | | | | | | | | |
| CNGA120404S01025MT | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 1,60 | | ● | ● | ● | ● | | | | |
| CNGA120408S01020MT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | ● | | | | | | | ● | |
| CNGA120408S01025MT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | ● | ● | ● | ● | | | | |
| CNGA120408S02020MT | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | | | | | | | ● | |
| CNGA120412S01025MT | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | 0,86 | | ● | ● | ● | ● | | | | |
| CNGA120412T02020MT | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | 0,86 | | | | | | | | ● | |
| CNGA120416S01020MT | 12,70 | 12,90 | 4,76 | 1,6 | 5,16 | 0,63 | | | | | | | | ● | |

## ■ CNGA-ST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNGA120404S01025ST | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 1,60 | | | | | ● | | | | |
| CNGA120408S01025ST | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | | | | ● | | | | |
| CNGA120412S01025ST | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | 0,86 | | | | | ● | | | | |



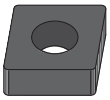

● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ CNMN

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMN090308S02020** | 9,53 | 9,67 | 3,18 | 0,8 | – | – | | | | | | | ● | | |
| **CNMN090312S02020** | 9,53 | 9,67 | 3,18 | 1,2 | – | – | | | | | | | ● | | |
| **CNMN120408S02020** | 12,70 | 12,90 | 4,76 | 0,8 | – | – | | | | | | | ● | | |
| **CNMN120412S02020** | 12,70 | 12,90 | 4,76 | 1,2 | – | – | | | | | | | ● | | |

## ■ CNMA



| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMA120408S01025** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | – | | | | | ● | | | | |
| **CNMA120408S02020** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | – | | | | | | | ● | | |
| **CNMA120412S02020** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | – | | | | | | | ● | | |

## ■ CNMA-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMA120408FST** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | | | | ● | | | | |

## ■ CNMA-MT

(MTV)

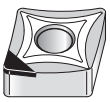
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMA120408S01020MTV** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | | | | ● | | | ● | |

## ■ CNMA-ST

(ST)

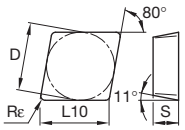
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMA120404S01020ST** | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 1,60 | | | | | ● | | | | |
| **CNMA120408S01020ST** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,12 | | | | | ● | | | ● | |
| **CNMA120412S01020ST** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | 0,86 | | | | | ● | | | | |

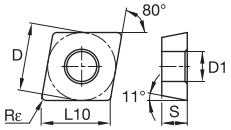
## ■ CNMS-FST



(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CNMS120404FST** | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | 2,40 | | | | | | | | | ● |
| **CNMS120408FST** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | 1,65 | | | | | | | | | ● |




● primera elección
○ elección alternativa

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

## CPGN

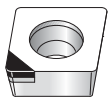
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGN120304F | 12,70 | 12,90 | 3,18 | 0,4 | — | 1,60 | | | | | | | | | ● |
| CPGN120308F | 12,70 | 12,90 | 3,18 | 0,8 | — | 1,12 | | | | | | | | | ● |

## CPGW-C

(C)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGW060202EC | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | — | | | | ● | | | | | |
| CPGW060202S01015C | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | — | | ● | ● | | | | | | |
| CPGW060204S01015C | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | — | | ● | ● | ● | | | | ● | |
| CPGW060208EC | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | — | | | | | | | | ● | |
| CPGW060208S01015C | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | — | | | | ● | | | | | |
| CPGW09T304EC | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | — | | | | | | | | ● | |
| CPGW09T304S01015C | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | — | | | | ● | | | | | |
| CPGW09T308EC | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | — | | | | | | | | ● | |
| CPGW09T308S01015C | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | — | | | | ● | | | | ● | |

## CPGW-FST


(ST)

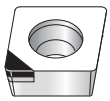
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGW060202FST | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | 1,65 | | | | | | | | | ● |
| CPGW060204FST | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 1,65 | | | | | | | | | ● |
| CPGW060208FST | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | 1,65 | | | | | | | | | ● |
| CPGW09T304FST | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 2,40 | | | | | | | | | ● |
| CPGW09T308FST | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,65 | | | | | | | | | ● |
| CPGW120404FST | 12,70 | 12,90 | 4,76 | 0,4 | 5,50 | 2,40 | | | | | | | | | ● |
| CPGW120408FST | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | 1,65 | | | | | | | | | ● |

## CPGW-FWMT

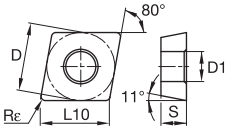
(MT)

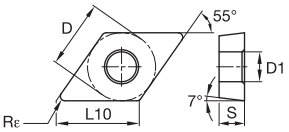
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGW09T304S01015FWMT | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | | | ● | | | | | | |
| CPGW09T308S01015FWMT | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | | | ● | | | | | | |

## CPGW-FWST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGW060204FWST | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 2,40 | | | | | | | | | ● |
| CPGW09T308FWST | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,65 | | | | | | | | | ● |
| CPGW120408FWST | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | 1,65 | | | | | | | | | ● |

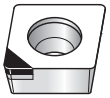



● primera elección
○ elección alternativa

| | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

## ■ CPGW-M


(M)

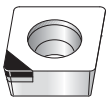
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGW060202EM | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | 1,60 | | | | ● | | | | | |
| CPGW060204EM | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 1,60 | ● | | | | | | | | |
| CPGW060204S01015M | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 1,60 | ● | | | ● | | | | | |
| CPGW060208S01015M | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | 1,12 | | | | ● | | | | | |
| CPGW09T304S01015M | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | | | | ● | | | | | |
| CPGW09T308S01015M | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | | | | ● | | | | | |

## ■ CPGW-MT

(MT)

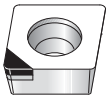
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGW09T304S01015MT | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 1,60 | ● | ● | ● | | | | | | |
| CPGW09T308S01015MT | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,12 | ● | ● | ● | | | | | | |

## ■ CPMW-FST


(ST)

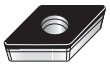
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPMW050202FST | 5,56 | 5,65 | 2,38 | 0,2 | 2,50 | 2,40 | | | | | | | | | ● |
| CPMW050204FST | 5,56 | 5,65 | 2,38 | 0,4 | 2,50 | 1,60 | | | | | ● | | | | ● |
| CPMW060202FST | 6,35 | 6,45 | 2,38 | 0,2 | 2,80 | 1,60 | | | | | ● | | | | |
| CPMW060204FST | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | 2,40 | | | | | | | | | ● |
| CPMW09T308FST | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | 1,65 | | | | | | | | | ● |

## ■ CPMW-FWST


(ST)

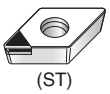
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPMW09T304FWST | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | 2,40 | | | | | | | | | ● |

## ■ DCGW-C

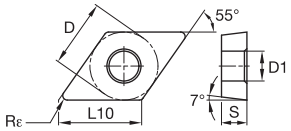

(C)

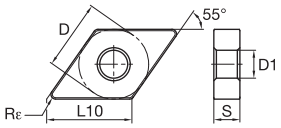
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGW070202EC | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | – | | | | ● | | | | | |
| DCGW070202S01015C | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | – | | ● | ● | | | | | | |
| DCGW070204S01015C | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | – | | ● | ● | ● | | | | | |

## ■ DCGW-FST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGW070204FST | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | 2,50 | | | | | | | | | ● |
| DCGW11T304FST | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 2,50 | | | | | | | | | ● |

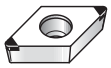



● primera elección
○ elección alternativa

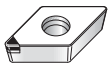
| | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

## ■ DCGW-FWMT


(MT)

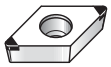
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGW11T308S01015FWMT | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 1,50 | ● | | | | | | | | |

## ■ DCGW-M


(M)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGW070202EM | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | 1,80 | | | | ● | | | | | |
| DCGW070204S01015M | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | 1,70 | | | | ● | | | | | |
| DCGW11T304S01015M | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | | | | ● | | | | | |
| DCGW11T308S01015M | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 1,50 | | | | ● | | | | | |

## ■ DCGW-MT


(MT)

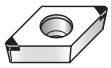
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCGW11T304S01015MT | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | ● | ● | ● | | ● | | | ● | |
| DCGW11T308S01015MT | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 1,50 | ● | ● | ● | | ● | | | ● | |

## ■ DCMW-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMW070204FST | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | 2,50 | | | | | | | | | ● |
| DCMW11T304FST | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | | | | | | | | ● | ● |
| DCMW11T308FST | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 2,30 | | | | | | | | | ● |

## ■ DCMW-MT


(MT)

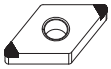
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMW070202S01020MT | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | 1,80 | | | | | ● | | | | |
| DCMW070204S01020MT | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | 1,70 | | | | | ● | | | | |
| DCMW11T308S01020MT | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 1,50 | | | | | ● | | | | |

## ■ DCMW-ST

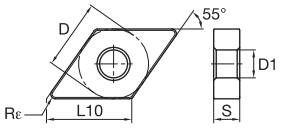
(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMW070202S01020ST | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | 1,80 | | | | | ● | | | | |
| DCMW11T304S01020ST | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | | | | | ● | | | ● | |

## ■ DNGA-EMT


(MT)

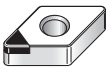
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DNGA150408EMT | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | 1,50 | ● | | | ● | | | | ● | |
| DNGA150412EMT | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | 1,30 | | | | ● | | | | | |




● primera elección
○ elección alternativa

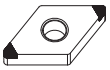
| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ DNGA-FST


(ST)

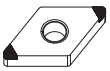
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNGA150404FST** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | 2,50 | | | | | | | | | ● |
| **DNGA150408FST** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | 2,30 | | | | | | | | | ● |

## ■ DNGA-FWMT


(MT)

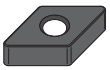
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNGA150404EFWMT** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | 1,70 | | | | ● | | | | | |
| **DNGA150408EFWMT** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | 1,50 | ● | | | ● | | | | | |
| **DNGA150412EFWMT** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | 1,30 | | | | ● | | | | | |

## ■ DNGA-MT


(MT)

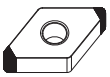
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNGA150404S01020MT** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | 1,70 | ● | | | | | | | | |
| **DNGA150404S01025MT** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | 1,70 | | ● | ● | ● | | | | | |
| **DNGA150408S01020MT** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | 1,50 | | | | | | | | ● | |
| **DNGA150408S01025MT** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | 1,50 | | ● | ● | ● | ● | | | | |
| **DNGA150412S01025MT** | 12,70 | 15,50 | 4,76 | 1,2 | 5,16 | 1,30 | | | ● | ● | ● | | | | |
| **DNGA150608S01020MT** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | 1,50 | ● | | | | | | | | |

## ■ DNMA



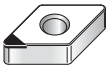
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMA110408S02020** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | – | | | | | | | ● | | |
| **DNMA110412S02020** | 9,53 | 11,63 | 4,76 | 1,2 | 3,81 | – | | | | | | | ● | | |

## ■ DNMA-MTV

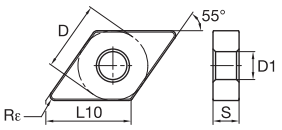

(MTV)

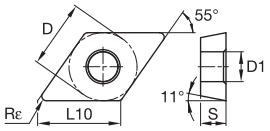
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMA150612S01020MTV** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | 1,30 | | | | | | | | ● | |

## ■ DNMA-ST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMA150404S01020ST** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | 1,70 | | | | | ● | | | | |
| **DNMA150604S01020ST** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | 1,70 | | | | | ● | | | | |

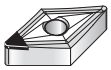



● primera elección
○ elección alternativa

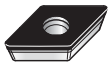
| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## DNMS-FST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMS150404FST** | 12,70 | 15,50 | 4,76 | 0,4 | 5,16 | 2,50 | | | | | | | | | ● |
| **DNMS150408FST** | 12,70 | 15,50 | 4,76 | 0,8 | 5,16 | 2,30 | | | | | | | | | ● |

## DPGW-C


(C)

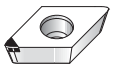
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DPGW070202EC** | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | – | | | | ● | | | | | |
| **DPGW070204S01015C** | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | – | | | | ● | | | | | |
| **DPGW070208S01015C** | 6,35 | 7,75 | 2,38 | 0,8 | 2,80 | – | | | | ● | | | | | |

## DPGW-EMT

(MT)

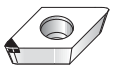
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DPGW11T304EMT** | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | | | | | | | | ● | |

## DPGW-FST


(ST)

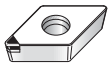
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DPGW070202FST** | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | 2,70 | | | | | | | | | ● |
| **DPGW070204FST** | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | 2,50 | | | | | | | | | ● |
| **DPGW11T304FST** | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 2,50 | | | | | | | | | ● |

## DPGW-FWST

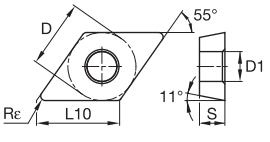

(ST)

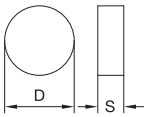
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DPGW070204FWST** | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | 2,50 | | | | | | | | | ● |
| **DPGW11T304FWST** | 9,53 | 11,63 | 3,97 | 0,2 | 4,40 | 2,50 | | | | | | | | | ● |

## DPGW-M


(M)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DPGW070202EM** | 6,35 | 7,75 | 2,38 | 0,2 | 2,80 | 1,80 | | | | ● | | | | | |
| **DPGW070204S01015M** | 6,35 | 7,75 | 2,38 | 0,4 | 2,80 | 1,70 | | | | ● | | | | | |
| **DPGW070208S01015M** | 6,35 | 7,75 | 2,38 | 0,8 | 2,80 | 1,50 | | | | ● | | | | | |
| **DPGW11T304S01015M** | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | | | | ● | | | | | |
| **DPGW11T308S01015M** | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 1,50 | | | | ● | | | | | |




● primera elección
○ elección alternativa

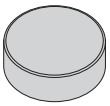
| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ DPGW-MT

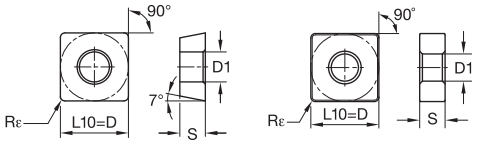
(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DPGW11T304S01015MT | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | 1,70 | | | ● | | ● | | | | |
| DPGW11T308S01015MT | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | 1,50 | | | ● | | ● | | | | |

## ■ RNMN



| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RNMN090300S02020 | 9,53 | – | 3,18 | – | – | – | | | | | | | ● | | |
| RNMN120300S02020 | 12,70 | – | 3,18 | – | – | – | | | | | | ● | ● | | |
| RNMN120400S02020 | 12,70 | – | 4,76 | – | – | – | | | | | | | ● | | |




● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## SCMW-FST

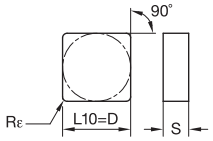
(ST)

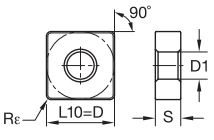
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMW09T308FST** | 9,53 | 9,53 | 3,97 | 0,8 | 4,40 | 1,50 | | | | | ● | | | ● | |

## SNGA-MT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SNGA120404S01025MT** | 12,70 | 12,70 | 4,76 | 0,4 | 5,16 | 1,50 | | | | ● | | | | | |
| **SNGA120408S01020MT** | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | 1,50 | ● | | | | | | | | |
| **SNGA120408S01025MT** | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | 1,50 | | | ● | ● | | | | | |
| **SNGA120412S01025MT** | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | 1,50 | | | ● | ● | | | | | |

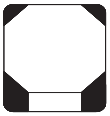



● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ SNGN-MTV


(MTV)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNGN120412FMTV | 12,70 | 12,70 | 4,76 | 1,2 | – | 1,50 | | | | | | | | ● | |

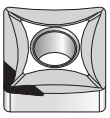
## ■ SNMN

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMN090308S02020 | 9,53 | 9,53 | 3,18 | 0,8 | – | – | | | | | | | ● | | |
| SNMN090312S02020 | 9,53 | 9,53 | 3,18 | 1,2 | – | – | | | | | | ● | ● | | |
| SNMN090316S02020 | 9,53 | 9,53 | 3,18 | 1,6 | – | – | | | | | | | ● | | |
| SNMN120308S02020 | 12,70 | 12,70 | 3,18 | 0,8 | – | – | | | | | | | ● | | |
| SNMN120312S02020 | 12,70 | 12,70 | 3,18 | 1,2 | – | – | | | | | | | ● | | |
| SNMN120316S02020 | 12,70 | 12,70 | 3,18 | 1,6 | – | – | | | | | | | ● | | |
| SNMN120416T02020 | 12,70 | 12,70 | 4,76 | 1,6 | – | – | | | | | | | ● | | |

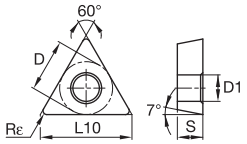
## ■ SNMA

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMA120408S01025 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | – | | | | | ● | | | | |
| SNMA120408S02020 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | – | | | | | | | ● | | |
| SNMA120412S01025 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | – | | | | | ● | | | | |
| SNMA120412S02020 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | – | | | | | | | ● | | |

## ■ SNMS-FST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMS120408FST | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | 2,30 | | | | | | | | | ● |
| SNMS120412FST | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | 2,30 | | | | | | | | | ● |




● primera elección
○ elección alternativa

| | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

## ■ TCGW-C

(C)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCGW110202EC** | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | – | | | | ● | | | | | |
| **TCGW110202S01015C** | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | – | | | ● | | | | | | |
| **TCGW110204S01015C** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | – | | | ● | ● | | | | | |

## ■ TCGW-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCGW110204FST** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | 2,50 | | | | | | | | | ● |
| **TCGW16T304FST** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | 2,50 | | | | | | | | | ● |

## ■ TCGW-M

(M)

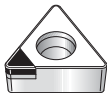
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCGW110202EM** | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | 1,70 | | | | ● | | | | | |
| **TCGW110204S01015M** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | 1,60 | | | | ● | | | | | |
| **TCGW16T304S01015M** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | 1,60 | | | | ● | | | | | |
| **TCGW16T308S01015M** | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | 1,50 | | | | ● | | | | | |

## ■ TCGW-MT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCGW16T304S01015MT** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | 1,60 | | | | | ● | | | | |

## ■ TCMW-FST

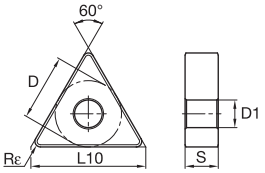

(ST)

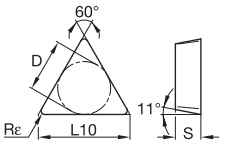
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCMW110204FST** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | 1,60 | | | | | | | | ● | ● |
| **TCMW16T304FST** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | 1,60 | | | | | | | | ● | ● |

## ■ TCMW-ST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TCMW110202S01020ST** | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | 1,70 | | | | | ● | | | | |
| **TCMW110204S01020ST** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | 1,60 | | | | | | | | ● | |
| **TCMW16T308S01020ST** | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | 1,50 | | | | | ● | | | | |




● primera elección
○ elección alternativa

| | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

## ■ TNGA-FWMT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC |
|---|---|---|---|---|---|---|
| TNGA160408EFWMT | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | 1,50 |
| TNGA160412EFWMT | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | 1,40 |

## ■ TNGA-MT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC |
|---|---|---|---|---|---|---|
| TNGA160404S01025MT | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | 1,60 |
| TNGA160408S01020MT | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | 1,50 |
| TNGA160408S01025MT | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | 1,50 |
| TNGA160412S01025MT | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | 1,40 |
| TNGA160416S01025MT | 9,53 | 16,50 | 4,76 | 1,6 | 3,81 | 1,20 |

## ■ TNMS-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC |
|---|---|---|---|---|---|---|
| TNMS160404FST | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | 2,50 |
| TNMS160408FST | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | 2,20 |

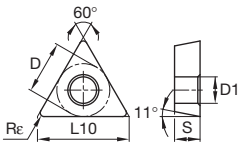
## ■ TPGN

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC |
|---|---|---|---|---|---|---|
| TPGN110304F | 6,35 | 11,00 | 3,18 | 0,4 | – | – |
| TPGN110308F | 6,35 | 11,00 | 3,18 | 0,8 | – | – |
| TPGN160304F | 9,53 | 16,50 | 3,18 | 0,4 | – | – |
| TPGN160308F | 9,53 | 16,50 | 3,18 | 0,8 | – | – |
| TPGN160312F | 9,53 | 16,50 | 3,18 | 1,2 | – | – |
| TPGN220404F | 12,70 | 22,00 | 4,76 | 0,4 | – | – |
| TPGN220408F | 12,70 | 22,00 | 4,76 | 0,8 | – | – |

## ■ TPGN-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC |
|---|---|---|---|---|---|---|
| TPGN110308FST | 6,35 | 11,00 | 3,18 | 0,8 | – | 1,50 |
| TPGN160304FST | 9,53 | 16,50 | 3,18 | 0,4 | – | 1,60 |
| TPGN160308FST | 9,53 | 16,50 | 3,18 | 0,8 | – | 1,50 |




● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## TPGW-C

(C)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGW110202EC** | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | – | | | | ● | | | | | |
| **TPGW110204EC** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | – | | | | | | | | ● | |
| **TPGW110204S01015C** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | – | | ● | ● | ● | | | | | |
| **TPGW110208S01015C** | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | – | | ● | ● | ● | | | | | |

## TPGW-FST

(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGW110204FST** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | 2,50 | | | | | | | | | ● |
| **TPGW110208FST** | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | 2,20 | | | | | | | | | ● |
| **TPGW16T304FST** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | 2,50 | | | | | | | | | ● |
| **TPGW16T308FST** | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | 2,20 | | | | | | | | | ● |

## TPGW-M

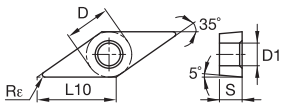
(M)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGW110202EM** | 6,35 | 11,00 | 2,38 | 0,2 | 2,80 | 1,70 | | | | ● | | | | | |
| **TPGW110204S01015M** | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | 1,60 | | | | ● | | | | | |
| **TPGW110208S01015M** | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | 1,50 | ● | | | ● | | | | | |
| **TPGW16T304S01015M** | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | 1,60 | | | | ● | | | | | |
| **TPGW16T308S01015M** | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | 1,50 | | | | ● | | | | | |

## TPGW-MT

(MT)

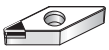
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPGW16T308S01015MT** | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | 1,50 | | | | | ● | | | | |




● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ VBGW-FST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBGW110304FST** | 6,35 | 11,07 | 3,18 | 0,4 | 2,80 | 3,30 | | | | | | | | | ● |
| **VBGW160404FST** | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | 3,30 | | | | | | | | | ● |

## ■ VBGW-M

(M)

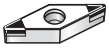
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBGW160404S01015M** | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | 2,20 | | | | ● | | | | | |
| **VBGW160408S01015M** | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | 1,80 | | | | ● | | | | | |

## ■ VBGW-MT

(MT)

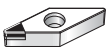
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBGW160404S01015MT** | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | 2,20 | | ● | ● | | ● | | | | |
| **VBGW160408S01015MT** | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | 1,80 | ● | ● | ● | | ● | | | | |

## ■ VBMW-MT

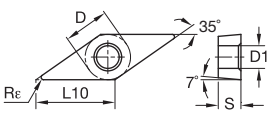

(MT)

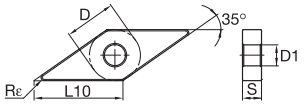
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBMW160412S01020MT** | 9,53 | 16,61 | 4,76 | 1,2 | 4,40 | 1,30 | | | | | ● | | | | |

## ■ VBMW-ST


(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBMW160408S01020ST** | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | 1,80 | | | | | ● | | | | |



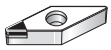




● primera elección
○ elección alternativa

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | ● |
| S | | | | | | | | ○ | |
| H | ● | ● | ● | ● | ● | ● | | ● | |

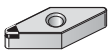
## ■ VCMW-FST

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VCMW110304FST | 6,35 | 11,07 | 3,18 | 0,4 | 2,80 | 3,30 | | | | | | | | | ● |
| VCMW160402FST | 9,53 | 16,61 | 4,76 | 0,2 | 4,40 | 3,60 | | | | | | | | | ● |


(ST)

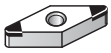
## ■ VNGA-FST

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VNGA160404FST | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 | 3,30 | | | | | | | | | ● |
| VNGA160408FST | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 | 2,60 | | | | | | | | | ● |


(ST)

## ■ VNGA-MT

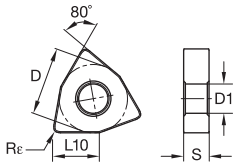
| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VNGA160404S01020MT | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 | 2,20 | ● | | | | | | | | |
| VNGA160404S01025MT | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 | 2,20 | | ● | ● | ● | ● | | | | |
| VNGA160408S01020MT | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 | 1,80 | ● | | | | | | | | |
| VNGA160408S01025MT | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 | 1,80 | | ● | ● | ● | ● | | | | |


(MT)

## ■ VNMS-FST

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VNMS160404FST | 9,53 | 16,61 | 4,76 | 0,4 | 3,81 | 3,30 | | | | | | | | | ● |
| VNMS160408FST | 9,53 | 16,61 | 4,76 | 0,8 | 3,81 | 2,60 | | | | | | | | | ● |

(ST)




● primera elección
○ elección alternativa

| | | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | |
| M | | | | | | | | | | |
| K | | ○ | | | | | ○ | ● | ● | |
| N | | | | | | | | | | ● |
| S | | | | | | | | | ○ | |
| H | | ● | ● | ● | ● | ● | ● | | ● | |

## ■ WNGA-FST

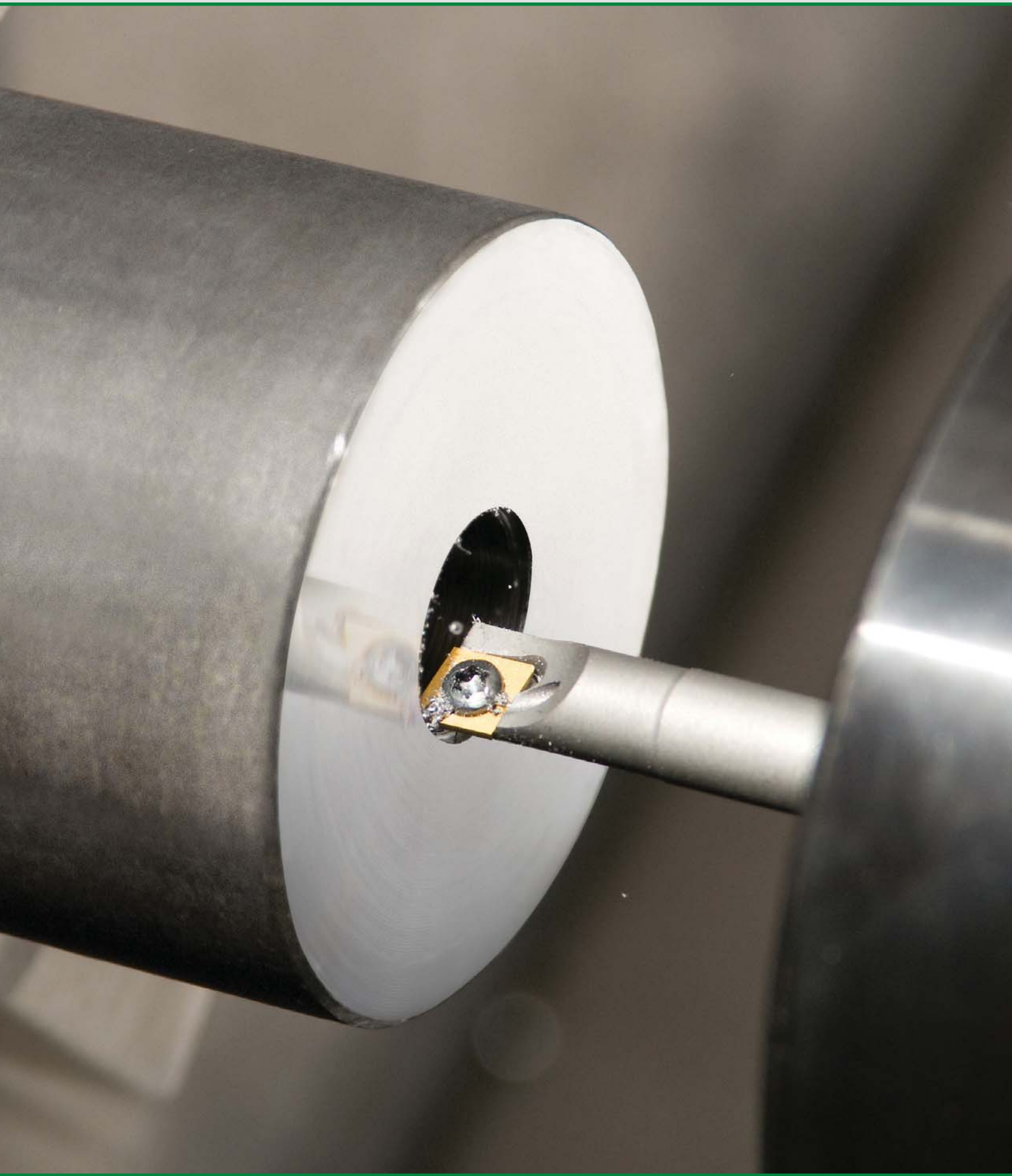
(ST)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNGA080404FST** | 12,70 | 8,69 | 4,76 | 0,4 | 5,16 | 2,40 | | | | | | | | | ● |
| **WNGA080408FST** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | 1,65 | | | | | | | | | ● |

## ■ WNGA-MT

(MT)

| Número de catálogo ISO | D | L10 | S | Rε | D1 | Max DOC | WBH10C | WBH10P | WBH10U | WBH25P | WBH25U | WBH40C | WBK40U | WBK45U | WDN25U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNGA080404S01025MT** | 12,70 | 8,69 | 4,76 | 0,4 | 5,16 | 1,60 | | | ● | | | | | | |
| **WNGA080408S01020MT** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | 1,12 | ● | | | | | | | | |
| **WNGA080408S01025MT** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | 1,12 | | | ● | | | | | | |



# Herramientas de mandrinado de orificios pequeños

**Mandrinado de orificios pequeños • Herramientas para diámetro interior de orificios pequeños de plaquitas intercambiables ..... C2–C47**

Elección de la barra de mandrinar correcta para el mandrinado de orificios pequeños ..... C4–C7
Sistema de numeración de catálogo ..... C8–C9
Barras de mandrinar para torneado ..... C10–C23
Barras de mandrinar para perfilado ..... C24–C25
Barras de mandrinar para ranurado y roscado ..... C26
Manguitos ..... C27
Guía para la selección de plaquitas ..... C28–C29
Geometrías del rompevirutas: positivas ..... C30–C31
Calidades y descripciones de calidades ..... C32–C33
Tabla de velocidades y avances ..... C34–C35
Sistema de numeración de catálogo ..... C36–C37
Plaquitas positivas ..... C38–C45
Tabla de referencias cruzadas ..... C46
Hardware ..... C47

**Serie A/B ..... C48–C59**

**Quadralock™ ..... C60–C69**

**Barras de metal duro integral ..... C70–C124**

**Información técnica ..... C126–C129**

**Hoja de trabajo de soluciones a medida ..... C130–C131**

# Mandrinado de orificios pequeños • **Herramientas diámetros interiores con plaquitas intercambiables**

La línea WIDIA™ de barras de micro-mandrinado proporciona unas herramientas de taladrado precisas con diámetros tan pequeños como 1,57 mm. Estas plaquitas económicas e intercambiables están disponibles en mangos de acero y metal duro y son ideales para una amplia gama de aplicaciones, incluyendo micro-mandrinado de precisión.

## Barras de mandrinar plaquitas de diamante a 80°

- Disponibles con mangos tan pequeños como 4,0 mm para mandrinar >4,57 mm de diámetro.
- Geometría de desprendimiento positivo para una acción de corte libre y mejores acabados superficiales.
- Excelente evacuación de virutas y sin obstrucciones.
- Con múltiples calidades para mandrinar una amplia gama de materiales.

## Roscado y ranurado Barras de mandrinar

- Cambios de plaquita sencillos para roscado y ranurado.
- Roscado con 48 TPI mínimo, TP (paso) de 1,3 mm.
- Capacidades de roscado y ranurado de hasta 6,91 mm de diámetro de mandrinado.

Herramientas de aplicaciones múltiples: ranurado y roscado con la misma barra.

Plaquitas disponibles en múltiples tipos y calidades, incluyendo policristalino con punta de diamante, para todas las aplicaciones de mecanizado.

Radios de 0,05 mm de nariz de plaquita disponibles; repetibilidad de plaquitas de hasta 0,005 mm.

Elija mangos de acero o de metal duro de alta calidad con refrigeración interior.

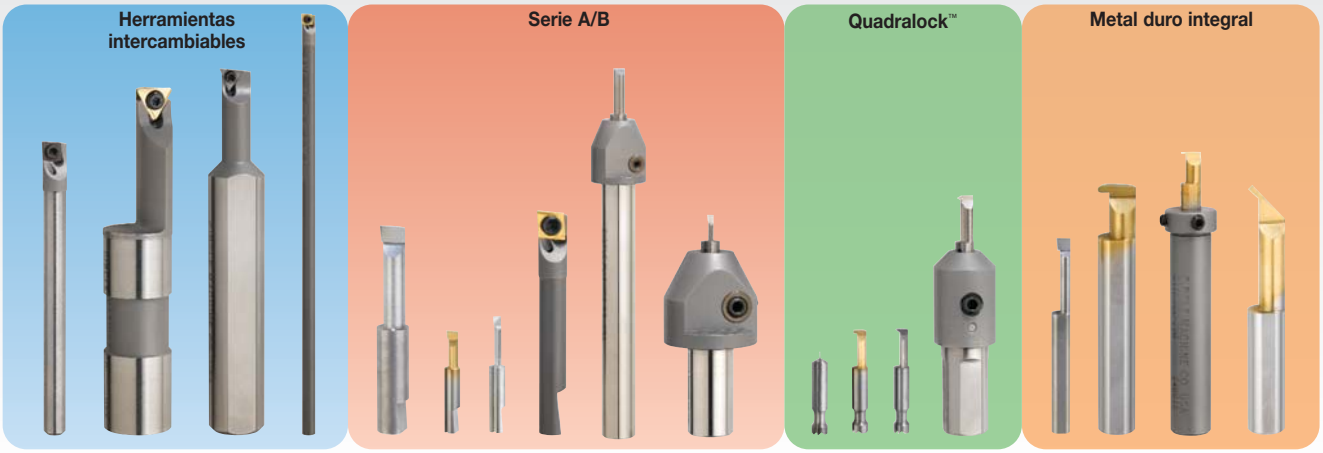
## Barras de mandrinar plaquitas triangulares

- Geometría de desprendimiento positivo para mandrinar orificios > 6,98 mm de diámetro.
- Diseñado para una menor obstrucción y una mayor evacuación de virutas.
- En stock, todas las calidades, incluyendo tipos de punta diamante.
- En stock, mangos tan pequeños como 6,0 mm para 7,06 mm de diámetro de mandrinado mínimo.

## Las soluciones de mandrinado más completas del mundo

La completa línea de herramientas de mandrinado de WIDIA™ cumplirá todos los requisitos de sus trabajos más exigentes. Sea cual sea el trabajo en cuestión, encontrará sin duda la solución más apropiada en esta completa guía de fácil uso.

Diseñamos sólo las MEJORES herramientas del mercado, con la garantía de que reducirán el tiempo de mecanizado, ofrecerán unos resultados excelentes y superarán los resultados de la competencia.




## Selección de la plataforma correcta de productos de mandrinado de orificios pequeños para su aplicación

**1 Determine el sistema de herramientas que se utilizará en función del tamaño del orificio que se va a mandrinar (Dmin).**

*NOTA: una selección de barras adecuada deberá tener una dimensión de mandrinado mínima inferior al tamaño del orificio que se va a mandrinar.*

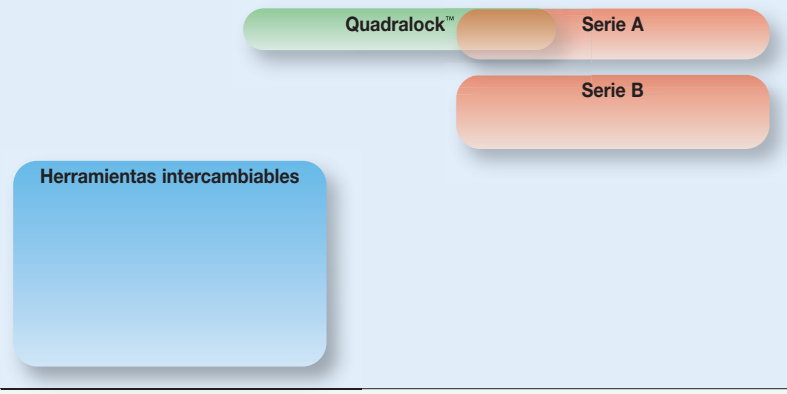
- Herramientas intercambiables
- Serie A/B
- Quadralock
- Metal duro integral

**Mandrinado**

| diámetro de mandrinado mínimo (Dmin) | alto rendimiento ◀ ▶ rendimiento general |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |
| 21 | |
| 22 | |
| 23 | |
| 24 | |
| 25 | |
| 26 | |
| 27 | |
| 28 | |
| 29 | |
| 30 | |
| 31 | |
| 32 | |
| 33 | |
| 34 | |
| 35 | |

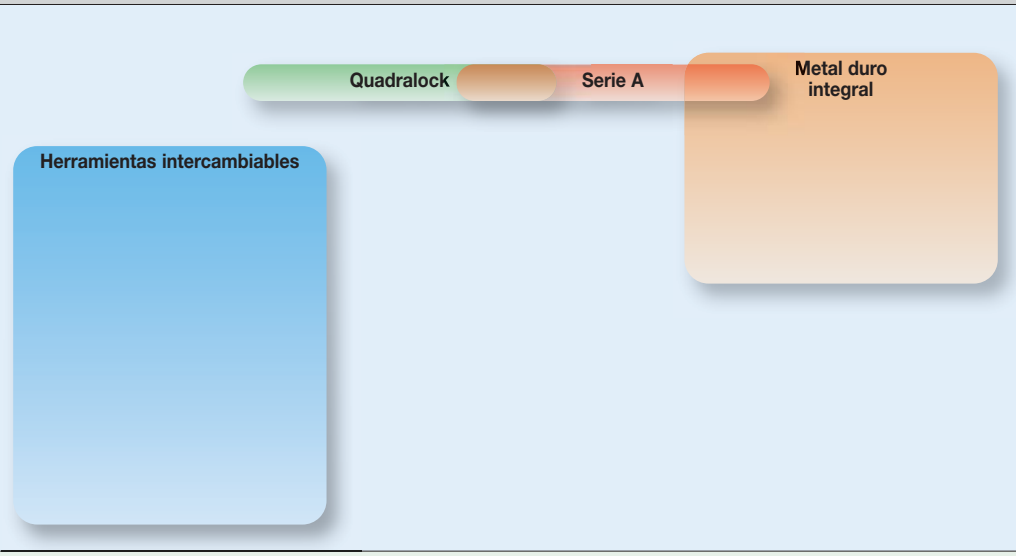
**Perfilado**

| diámetro de mandrinado mínimo (Dmin) | alto rendimiento ◀ ▶ rendimiento general |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |



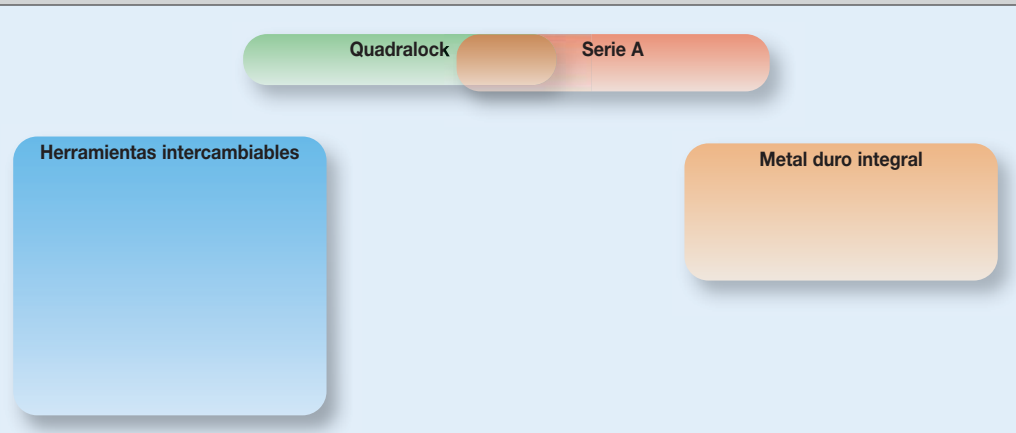

**Roscado**

| diámetro de mandrinado mínimo (Dmin) | alto rendimiento ◀ ▶ rendimiento general |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |
| 21 | |
| 22 | |
| 23 | |
| 24 | |
| 25 | |




**Ranurado**

| diámetro de mandrinado mínimo (Dmin) | alto rendimiento ◀ ▶ rendimiento general |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |




*NOTA: una selección de barras adecuada deberá tener una dimensión de mandrinado mínima inferior al tamaño del orificio que se va a mandrinar.*

## Determine los materiales que se van a mecanizar y la plaquita adecuada

**2 Determine la barra de mandrinar (D).**

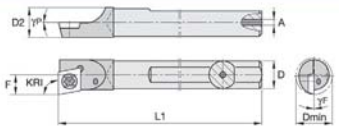
**A Seleccione el tamaño del mango (D) en función de los requisitos de su máquina.**

**B Determine la profundidad de mandrinado (la extensión de la barra de mandrinar desde el porta).** Multiplique el diámetro de la barra por 4. Si la profundidad de mandrinado es menor, utilice una barra de acero. Si la profundidad de mandrinado supera la proporción de 4:1, utilice una barra de metal duro. Utilice L1 o L4 dependiendo de la barra seleccionada. *(Consulte la tabla de voladizos máximos recomendados en la* ***página 126****.)* Para herramientas intercambiables, consulte el **paso 3**. Para todos los demás sistemas de herramientas, consulte directamente el **paso 4**.

**C Determine el ángulo de ataque (KRI).** Se utiliza un ángulo de ataque de cero grados cuando se necesita la máxima estabilidad. El ángulo de ataque puede variar en función de condiciones cambiantes, como el mandrinado de un agujero ciego.

### Small Hole Boring Bars for Turning
Clamping System S • Carbide

WIDIA CIRCLE




■ CCBM

| order number | catalogue number | C KRI | A D | D min | D2 | F | B L1 | A | γF° | γP° | gage insert | insert screw | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right hand | | | | | | | | | | | | |
| 2831801 | CCBM51000R | 90 | 5,00 | 5,94 | 5,33 | 3,18 | 100,58 | 1,02 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |
| 3896025 | CCBM61000R | 90 | 6,00 | 7,08 | 6,20 | 3,73 | 100,33 | 1,19 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |
| 2831301 | CCBM61520R | 90 | 6,00 | 7,08 | 6,20 | 3,73 | 152,15 | 1,19 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |
| 2831277 | CCBM81520R | 90 | 8,00 | 9,04 | 8,20 | 4,70 | 152,15 | 2,36 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |
| 2831826 | CCBM51005R | 95 | 5,00 | 5,94 | 5,33 | 3,02 | 100,58 | 1,02 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |
| 2831031 | CCBM51525R | 95 | 5,00 | 5,94 | 5,33 | 3,02 | 152,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |
| 2831821 | CCBM61005R | 95 | 6,00 | 7,08 | 6,20 | 3,73 | 100,33 | 1,19 | 0.0 | 5.0 | CD..S4T002 | CC11 | T6 |

**3 Determine el rompevirutas más apto para el material que se va a mecanizar.**

Consulte las tablas de geometrías de rompevirutas para el mandrinado de orificios pequeños en las **páginas C30 y C31**.

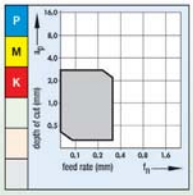
### Small Hole Boring Chipbreaker Geometries

WIDIA CIRCLE

**Single-Sided, Positive Inserts**

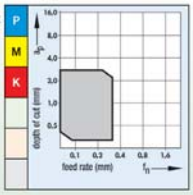
**..HB**

Flat inserts. Peripheral ground for best surface quality and reduced cutting pressure. Very stable cutting edge offers maximum rigidity.




**..HT**

Peripheral ground insert chipbreaker. Good chip control. Geometry for general-purpose application.

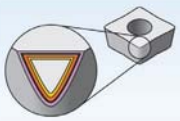



**4 Determine la mejor calidad para el material que se va a mecanizar.**

Consulte la tabla de calidades y descripción de calidades en las **páginas C32 y C33**.

### Grades and Grade Descriptions
Small Hole Boring

WIDIA CIRCLE



Coatings provide high-speed capability and are engineered for finishing to light roughing.

| | |
|---|---|
| P | Steel |
| M | Stainless Steel |
| K | Cast Iron |
| N | Non-Ferrous Materials |
| S | High-Temp Alloys |
| H | Hardened Materials |

| Coating | Grade Description | 05 10 15 20 25 30 35 40 45 |
|---|---|---|
| CM1 | Uncoated carbide. A very tough, ultra-fine grain unalloyed substrate. For general-purpose machining of most steels, stainless steels, high-temperature alloys, titanium, irons, and non-ferrous materials. Performs best at low speeds and will handle interruptions and high feed rates. Use when C2, C3, or C25 fail due to chipping or breaking. | P, M, K, N, S |
| HW-S25 | | M |

## Determine los materiales que se van a mecanizar y la plaquita adecuada

5 Seleccione la plaquita apropiada en función del estilo, la calidad y la geometría.

### Small Hole Boring Positive Inserts

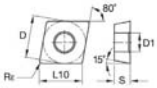
WIDIA CIRCLE

● first choice
○ alternate choice

■ CDHB

| ISO catalogue number | D | L10 | S | Rε | D1 | max DOC* | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CDHBS4T002 | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | – | | ● | | ● | | ● | ● | ● | ● | | |
| CDHBS4T004 | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | – | | ● | | ● | | ● | ● | ● | ● | | |
| CDHBS4T0X0 | 3,97 | 4,03 | 1,02 | 0,05 | 2,13 | – | | ● | | ● | | ● | ● | | ● | | |
| CDHBS4T002M | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | 0,96 | | | | | | | | | | ● | ● |
| CDHBS4T0X0M | 3,97 | 4,03 | 1,02 | 0,05 | 2,13 | 0,96 | | | | | | | | | | ● | ● |
| CDHBS4T004M | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | 0,96 | | | | | | | | | | ● | ● |

*max DOC only applies to tipped inserts, which are designated with an "M" at the end of the catalogue number.




■ CDHH-R/L

| ISO catalogue number | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Right hand CDHHS4T002R | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | | | | ● | | ● | ● | | | | |
| CDHHS4T004R Left hand | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | | | | ● | | | | | | | |
| CDHHS4T002L | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | | | | ● | | ● | ● | | ● | | |
| CDHHS4T004L | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | | | | ● | | ● | ● | | | | |

*max DOC only applies to tipped inserts, which are designated with an "M" at the end of the catalogue number.

6 Determine en la tabla de velocidades y avances los datos de corte apropiados.

- **A** En función de la calidad y la geometría del filo, identifique la velocidad de arranque (vc) y el avance (fz). La primera opción en avances de arranque está en **negrita**.
- **B** Utilice la velocidad correspondiente que se encuentra en la misma columna, debajo de los datos de avance.

WIDIA CIRCLE

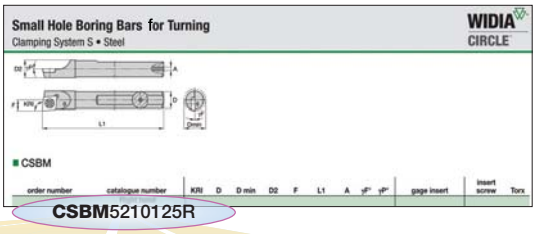
### Speed and Feed Chart

A/B Series Inserts • Metric

| ANSI ISO 513 | VDI 3323 | Cutting Speed • vc m/min | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material Group | | min | Start | max | min | Start | max | min | Start | max | min | Start | max |
| | ap [mm] | 0,025 | — | 0,200 | 0,025 | — | 0,200 | | | | | | |
| | f [mm/rev] | 0,178 | — | 0,013 | 0,178 | — | 0,013 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 1 | 95 | **120** | 145 | 55 | **70** | 85 | | | | | | |
| | 2 | 70 | **90** | 105 | 40 | **50** | 60 | | | | | | |
| | 3 | 55 | **70** | 80 | 35 | **40** | 50 | | | | | | |
| | 4 | 65 | **75** | 90 | 40 | **45** | 55 | | | | | | |
| | 5 | 45 | **55** | 70 | 30 | **35** | 40 | | | | | | |
| | 6 | 75 | **95** | 110 | 45 | **55** | 65 | | | | | | |
| P | 7 | 50 | **60** | 75 | 30 | **40** | 45 | | | | | | |
| | 8 | 45 | **55** | 70 | 30 | **35** | 40 | | | | | | |
| | 9 | 40 | **50** | 60 | 25 | **30** | 35 | | | | | | |
| | 10 | 70 | **85** | 100 | 40 | **50** | 60 | | | | | | |
| | 11 | 45 | **55** | 65 | 25 | **30** | 40 | | | | | | |
| | 12 | 70 | **85** | 100 | 40 | **50** | 60 | | | | | | |
| | 13.1 | 55 | **70** | 85 | 35 | **40** | 50 | | | | | | |
| | 13.2 | 45 | **55** | 65 | 25 | **30** | 40 | | | | | | |
| | ap [mm] | 0,025 | — | 0,200 | 0,025 | — | 0,200 | | | | | | |
| | f [mm/rev] | 0,178 | — | 0,013 | 0,178 | — | 0,013 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 14.1 | 75 | **95** | 110 | 55 | **70** | 85 | | | | | | |
| M | 14.2 | 60 | **75** | 90 | 45 | **55** | 65 | | | | | | |
| | 14.3 | 70 | **85** | 100 | 50 | **65** | 75 | | | | | | |
| | 14.4 | 45 | **55** | 65 | 35 | **40** | 45 | | | | | | |
| | ap [mm] | 0,001 | — | 0,010 | 0,001 | — | 0,010 | | | | | | |
| | f [mm/rev] | 0,007 | — | 0,0005 | 0,007 | — | 0,0005 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 15 | 75 | **90** | 110 | 55 | **70** | 85 | | | | | | |
| | 16 | 50 | **65** | 75 | 40 | **50** | 60 | | | | | | |
| K | 17 | 80 | **100** | 120 | 65 | **80** | 95 | | | | | | |
| | 18 | 55 | **65** | 80 | 40 | **50** | 60 | | | | | | |
| | 19 | 100 | **125** | 145 | 75 | **95** | 115 | | | | | | |

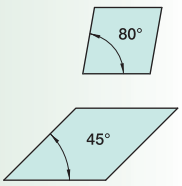
## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.

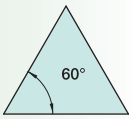



| C | S | B | M | |
|---|---|---|---|---|
| Tipo de serie | Tipo de barra | Denominación del estilo de barra | Unidades | Forma de la plaquita *(opcional)* |

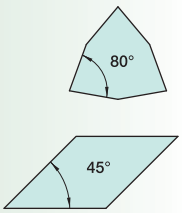
**C**



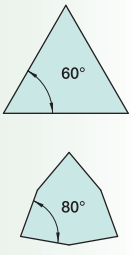

**F**



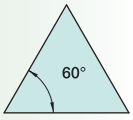

**G**

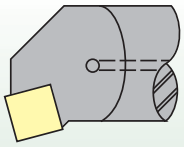



**Q**

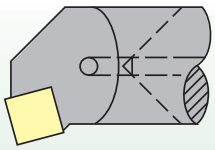



**S**



**S** = Acero
(con refrigeración)



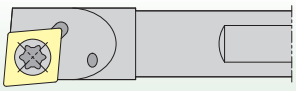
**C** = metal duro
(con refrigeración)

**M** = sistema métrico

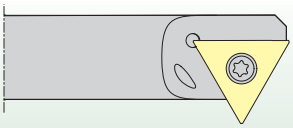
**C**

**W**

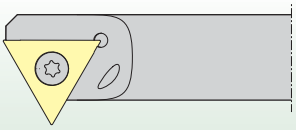
**B**
Barra de mandrinar



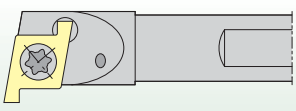
**C**
Barra de biselado exterior



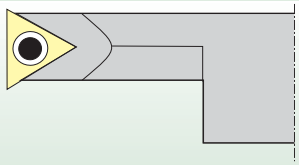
**I**
Barra de roscado interior



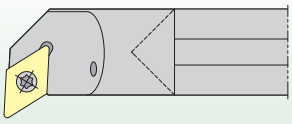
**M**
Barra de ranurado interno desplazada



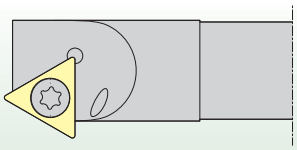
**O**
Salto Barra de mandrinar



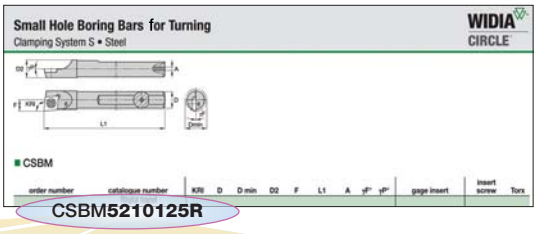
**P**
Barra de perfilado



**R**
Barra de biselado en retroceso o biselado inverso



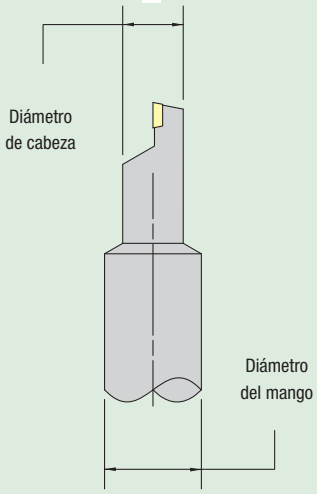
*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## 52
Diámetro de cabeza
*aparece como "D2"*

| | | |
|---|---|---|
| 7 | = | 6,60 mm |
| 8 | = | 8,18 mm |
| | | 8,20 mm |
| 10 | = | 9,78 mm |
| 13 | = | 12,70 mm |
| | | 12,95 mm |
| 45 | = | 4,57 mm |
| 48 | = | 4,80 mm |
| 52 | = | 5,16 mm |
| 53 | = | 5,30 mm |
| 64 | = | 6,60 mm |
| 66 | = | 6,55 mm |
| | | 6,60 mm |
| 82 | = | 8,15 mm |
| 95 | = | 9,50 mm |
| 99 | = | 9,91 mm |
| 159 | = | 15,88 mm |

*En caso de estar en bruto, el valor será igual al diámetro del mango.




*NOTA: Sólo se muestra en barras escalonadas.*

## 10
Diámetro del mango
*aparece como "D"*

| | | |
|---|---|---|
| 4 | = | 4,00 mm |
| 5 | = | 5,00 mm |
| 6 | = | 6,00 mm |
| 8 | = | 8,00 mm |
| 10 | = | 10,00 mm |
| 12 | = | 12,00 mm |
| 16 | = | 16,00 mm |

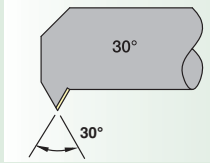
## 12
Longitud/Profundidad
*aparece como "L1/L4"*

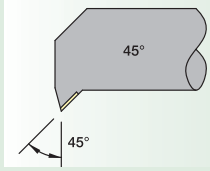
Longitud de mandrinado para barras escalonadas

Profundidad de rosca para barras de roscado

Longitud total para barras de mango recto

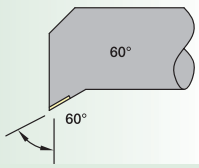
| | | |
|---|---|---|
| 12 | = | 12,70 mm |
| 19 | = | 19,05 mm |
| 22 | = | 22,23 mm |
| 25 | = | 25,40 mm |
| 32 | = | 31,75 mm |
| 38 | = | 38,10 mm |
| 48 | = | 47,63 mm |
| 51 | = | 50,80 mm |
| 63 | = | 63,50 mm |
| 64 | = | 64,00 mm |
| 76 | = | 76,00 mm |
| 79 | = | 79,38 mm |
| 100 | = | 100,58 mm/101,50 mm/ 101,60 mm |
| 102 | = | 101,60 mm |
| 127 | = | 127,00 mm |
| 152 | = | 152,00 mm/152,40 mm |
| 178 | = | 177,80 mm/179,90 mm |
| 203 | = | 203,20 mm |
| 254 | = | 254,00 mm |

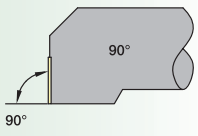


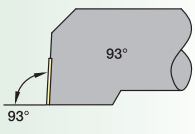



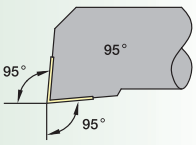

## 5
Ángulo de ataque
*aparece como "KRI" para barras según el sistema métrico y "KRA" para barras medidas en pulgadas.*

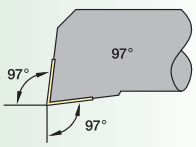
| | | |
|---|---|---|
| 0 | = | 90° Para barras de roscado/ranurado |
| 3 | = | 93° |
| 5 | = | 95° |
| 7 | = | 97° |
| 225 | = | 67,5° |
| 30 | = | 30° |
| 45 | = | 45° |
| 60 | = | 60° |

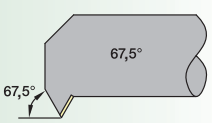


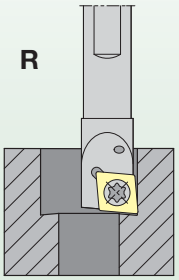




## R
Dirección de la herramienta

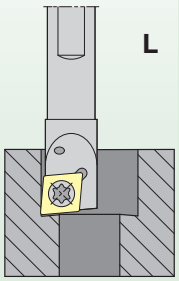
**R** = A derechas

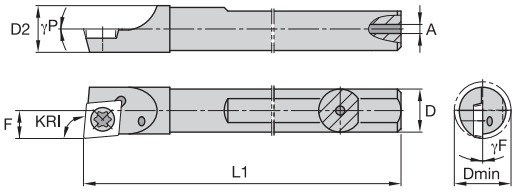
**L** = A izquierdas

Barra de mandrinar a derechas



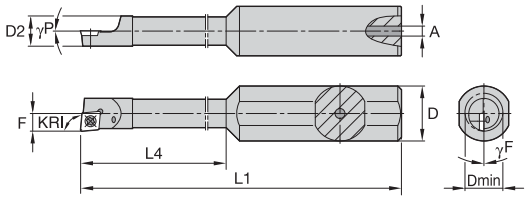

Barra de mandrinar a izquierdas





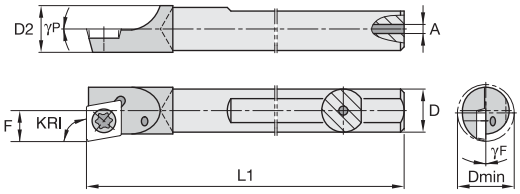

## CSBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3896205** | **CSBM5650R** | 90 | 5,00 | 5,94 | 5,16 | 3,10 | 63,50 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831676** | **CSBM6650R** | 90 | 6,00 | 7,09 | 6,20 | 3,73 | 63,50 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3518693** | **CSBM8760R** | 90 | 8,00 | 9,05 | 8,18 | 4,70 | 76,00 | 1,52 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831441** | **CSBM5655R** | 95 | 5,00 | 5,78 | 5,16 | 2,95 | 63,50 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831687** | **CSBM6655R** | 95 | 6,00 | 7,09 | 6,20 | 3,73 | 63,50 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831666** | **CSBM8765R** | 95 | 8,00 | 9,05 | 8,18 | 4,70 | 76,00 | 1,52 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831701** | **CSBM4657R** | 97 | 4,00 | 4,57 | 4,22 | 2,41 | 63,50 | 1,02 | 0.0 | 0.0 | CD..S4T002 | **CC09** | T6 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896204** | **CSBM5650L** | 90 | 5,00 | 5,94 | 5,16 | 3,10 | 63,50 | 1,11 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **3896207** | **CSBM6650L** | 90 | 6,00 | 7,09 | 6,20 | 3,73 | 63,50 | 1,11 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896209** | **CSBM8760L** | 90 | 8,00 | 9,05 | 8,18 | 4,70 | 76,00 | 1,52 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896206** | **CSBM5655L** | 95 | 5,00 | 5,78 | 5,16 | 2,95 | 63,50 | 1,11 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **3896208** | **CSBM6655L** | 95 | 6,00 | 7,09 | 6,20 | 3,73 | 63,50 | 1,11 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3517652** | **CSBM8765L** | 95 | 8,00 | 9,05 | 8,18 | 4,70 | 76,00 | 1,52 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831695** | **CSBM4657L** | 97 | 4,00 | 4,57 | 4,22 | 2,41 | 63,50 | 1,11 | 0.0 | 0.0 | CD..S4T002 | **CC09** | T6 |



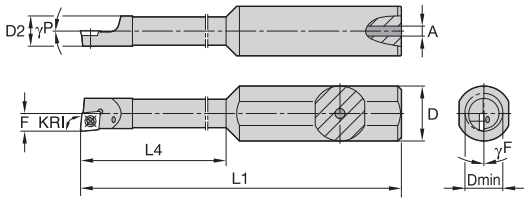

## CSBM • ESCALONADAS

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2831628** | **CSBM5210120R** | 90 | 10,00 | 5,94 | 5,16 | 3,10 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831606** | **CSBM5210250R** | 90 | 10,00 | 5,94 | 5,16 | 3,10 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831499** | **CSBM5212250R** | 90 | 12,00 | 5,94 | 5,16 | 3,10 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831477** | **CSBM6412190R** | 90 | 12,00 | 7,42 | 6,60 | 3,86 | 70,00 | 19,05 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831462** | **CSBM6412320R** | 90 | 12,00 | 7,42 | 6,60 | 3,86 | 70,00 | 31,75 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831661** | **CSBM4510125R** | 95 | 10,00 | 5,18 | 4,57 | 2,64 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831651** | **CSBM4510255R** | 95 | 10,00 | 5,18 | 4,57 | 2,64 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831639** | **CSBM5210125R** | 95 | 10,00 | 5,78 | 5,16 | 2,95 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831615** | **CSBM5210255R** | 95 | 10,00 | 5,78 | 5,16 | 2,95 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831595** | **CSBM6410195R** | 95 | 10,00 | 7,24 | 6,60 | 3,68 | 70,00 | 19,05 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831571** | **CSBM6410325R** | 95 | 10,00 | 7,24 | 6,60 | 3,68 | 70,00 | 31,75 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831548** | **CSBM4512125R** | 95 | 12,00 | 5,18 | 4,57 | 2,64 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831535** | **CSBM5212125R** | 95 | 12,00 | 5,78 | 5,16 | 2,95 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831512** | **CSBM5212255R** | 95 | 12,00 | 5,78 | 5,16 | 2,95 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831490** | **CSBM6412195R** | 95 | 12,00 | 7,24 | 6,60 | 3,68 | 70,00 | 19,05 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831468** | **CSBM6412325R** | 95 | 12,00 | 7,24 | 6,60 | 3,68 | 70,00 | 31,75 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **2831656** | **CSBM4510125L** | 95 | 10,00 | 5,18 | 4,57 | 2,64 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831588** | **CSBM6410195L** | 95 | 10,00 | 7,24 | 6,60 | 3,68 | 70,00 | 19,05 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3890853** | **CSBM4512125L** | 95 | 12,00 | 5,18 | 4,57 | 2,64 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **3890854** | **CSBM4512255L** | 95 | 12,00 | 5,18 | 4,57 | 2,64 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831528** | **CSBM5212125L** | 95 | 12,00 | 5,78 | 5,16 | 2,95 | 70,00 | 12,70 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831505** | **CSBM5212255L** | 95 | 12,00 | 5,78 | 5,16 | 2,95 | 70,00 | 25,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831483** | **CSBM6412195L** | 95 | 12,00 | 7,24 | 6,60 | 3,68 | 70,00 | 19,05 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3890855** | **CSBM6412325L** | 95 | 12,00 | 7,24 | 6,60 | 3,68 | 70,00 | 31,75 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |



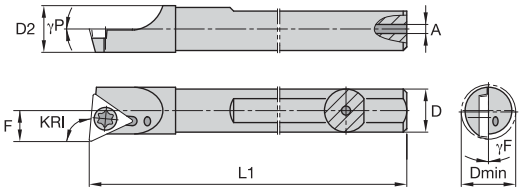

## CCBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **2831801** | **CCBM51000R** | 90 | 5,00 | 5,94 | 5,33 | 3,18 | 100,58 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896025** | **CCBM61000R** | 90 | 6,00 | 7,08 | 6,20 | 3,73 | 100,33 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831301** | **CCBM61520R** | 90 | 6,00 | 7,08 | 6,20 | 3,73 | 152,15 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831277** | **CCBM81520R** | 90 | 8,00 | 9,04 | 8,20 | 4,70 | 152,15 | 2,36 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831826** | **CCBM51005R** | 95 | 5,00 | 5,94 | 5,33 | 3,02 | 100,58 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831031** | **CCBM51525R** | 95 | 5,00 | 5,94 | 5,33 | 3,02 | 152,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831821** | **CCBM61005R** | 95 | 6,00 | 7,08 | 6,20 | 3,73 | 100,33 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831311** | **CCBM61525R** | 95 | 6,00 | 7,08 | 6,20 | 3,73 | 152,15 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3520653** | **CCBM81005R** | 95 | 8,00 | 9,04 | 8,20 | 4,70 | 101,60 | 2,36 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831289** | **CCBM81525R** | 95 | 8,00 | 9,04 | 8,20 | 4,70 | 152,15 | 2,36 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831832** | **CCBM41007R** | 97 | 4,00 | 4,57 | 4,22 | 2,41 | 100,33 | 1,02 | 0.0 | 0.0 | CD..S4T002 | **CC09** | T6 |
| **2831324** | **CCBM41527R** | 97 | 4,00 | 4,57 | 4,22 | 2,41 | 152,40 | 1,02 | 0.0 | 0.0 | CD..S4T002 | **CC09** | T6 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896023** | **CCBM51000L** | 90 | 5,00 | 5,94 | 5,33 | 3,18 | 100,58 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896024** | **CCBM61000L** | 90 | 6,00 | 7,08 | 6,20 | 3,73 | 100,33 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896026** | **CCBM61520L** | 90 | 6,00 | 7,08 | 6,20 | 3,73 | 152,15 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896028** | **CCBM81520L** | 90 | 8,00 | 9,04 | 8,20 | 4,70 | 152,15 | 2,36 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831807** | **CCBM51005L** | 95 | 5,00 | 5,94 | 5,33 | 3,02 | 100,58 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831025** | **CCBM51525L** | 95 | 5,00 | 5,94 | 5,33 | 3,02 | 152,40 | 1,02 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831791** | **CCBM61005L** | 95 | 6,00 | 7,08 | 6,20 | 3,73 | 100,33 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831307** | **CCBM61525L** | 95 | 6,00 | 7,08 | 6,20 | 3,73 | 152,15 | 1,19 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896027** | **CCBM81005L** | 95 | 8,00 | 9,04 | 8,20 | 4,70 | 101,60 | 2,36 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831283** | **CCBM81525L** | 95 | 8,00 | 9,04 | 8,20 | 4,70 | 152,15 | 2,36 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831813** | **CCBM41007L** | 97 | 4,00 | 4,57 | 4,22 | 2,41 | 100,33 | 1,02 | 0.0 | 0.0 | CD..S4T002 | **CC09** | T6 |
| **3896002** | **CCBM41527L** | 97 | 4,00 | 4,57 | 4,22 | 2,41 | 152,40 | 1,02 | 0.0 | 0.0 | CD..S4T002 | **CC09** | T6 |



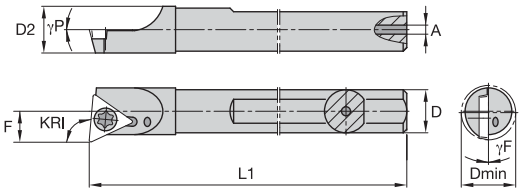

## CCBM • ESCALONADAS

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2831211** | **CCBM5312510R** | 90 | 12,00 | 6,10 | 5,30 | 3,18 | 88,90 | 50,80 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831232** | **CCBM5312250R** | 90 | 12,00 | 6,10 | 5,30 | 3,18 | 63,50 | 25,40 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831127** | **CCBM5316510R** | 90 | 16,00 | 6,10 | 5,30 | 3,18 | 114,30 | 50,80 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831188** | **CCBM6612320R** | 90 | 12,00 | 7,42 | 6,55 | 3,86 | 69,85 | 31,75 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831175** | **CCBM6612630R** | 90 | 12,00 | 7,42 | 6,55 | 3,86 | 101,60 | 63,50 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831110** | **CCBM6516320R** | 90 | 16,00 | 7,42 | 6,55 | 3,86 | 95,25 | 31,75 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831255** | **CCBM4812485R** | 95 | 12,00 | 5,28 | 4,80 | 2,64 | 85,73 | 47,63 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831265** | **CCBM4812225R** | 95 | 12,00 | 5,28 | 4,80 | 2,64 | 60,33 | 22,23 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **3896015** | **CCBM4816225R** | 95 | 16,00 | 5,28 | 4,80 | 2,64 | 85,73 | 22,23 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **3896017** | **CCBM4816485R** | 95 | 16,00 | 5,28 | 4,80 | 2,64 | 111,13 | 47,63 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831221** | **CCBM5312515R** | 95 | 12,00 | 5,94 | 5,30 | 3,02 | 88,90 | 50,80 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831244** | **CCBM5312255R** | 95 | 12,00 | 5,94 | 5,30 | 3,02 | 63,50 | 25,40 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831162** | **CCBM5316255R** | 95 | 16,00 | 5,94 | 5,30 | 3,02 | 88,90 | 25,40 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831139** | **CCBM5316515R** | 95 | 16,00 | 5,94 | 5,30 | 3,02 | 114,30 | 50,80 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896019** | **CCBM6612635R** | 95 | 12,00 | 7,24 | 6,55 | 3,68 | 101,60 | 63,50 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831201** | **CCBM6612325R** | 95 | 12,00 | 7,24 | 6,55 | 3,68 | 69,85 | 31,75 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896018** | **CCBM6516325R** | 95 | 16,00 | 7,24 | 6,55 | 3,68 | 95,25 | 31,75 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **2831260** | **CCBM4812225L** | 95 | 12,00 | 5,28 | 4,80 | 2,64 | 60,33 | 22,23 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **3896016** | **CCBM4816485L** | 95 | 16,00 | 5,28 | 4,80 | 2,64 | 111,13 | 47,63 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC09** | T6 |
| **2831238** | **CCBM5312255L** | 95 | 12,00 | 5,94 | 5,30 | 3,02 | 63,50 | 25,40 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831132** | **CCBM5316515L** | 95 | 16,00 | 5,94 | 5,30 | 3,02 | 114,30 | 50,80 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831157** | **CCBM5316255L** | 95 | 16,00 | 5,94 | 5,30 | 3,02 | 88,90 | 25,40 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831194** | **CCBM6612325L** | 95 | 12,00 | 7,24 | 6,55 | 3,68 | 69,85 | 31,75 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **3896093** | **CCBM6612635L** | 95 | 12,00 | 7,24 | 6,55 | 3,68 | 101,60 | 63,50 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |
| **2831117** | **CCBM6516325L** | 95 | 16,00 | 7,24 | 6,55 | 3,68 | 95,25 | 31,75 | 3,18 | 0.0 | 5.0 | CD..S4T002 | **CC11** | T6 |



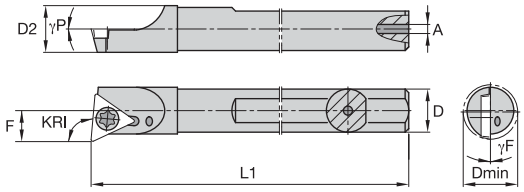

## FSBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **2829554** | **FSBM61000R** | 90 | 6,00 | 7,06 | 6,20 | 3,71 | 101,60 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829539** | **FSBM81000R** | 90 | 8,00 | 9,14 | 8,20 | 4,80 | 101,60 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829566** | **FSBM61005R** | 95 | 6,00 | 7,06 | 6,20 | 3,71 | 101,60 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829548** | **FSBM81005R** | 95 | 8,00 | 9,14 | 8,20 | 4,80 | 101,60 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896211** | **FSBM61000L** | 90 | 6,00 | 7,06 | 6,20 | 3,71 | 101,60 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896213** | **FSBM81000L** | 90 | 8,00 | 9,14 | 8,20 | 4,80 | 101,60 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896212** | **FSBM61005L** | 95 | 6,00 | 7,06 | 6,20 | 3,71 | 101,60 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829545** | **FSBM81005L** | 95 | 8,00 | 9,14 | 8,20 | 4,80 | 101,60 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |



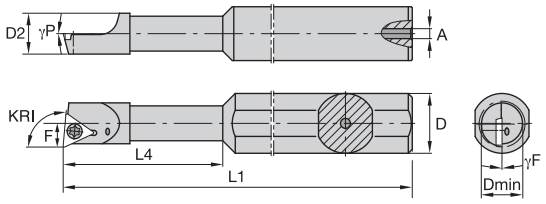

## QSBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **2824886** | **QSBM121520R** | 90 | 12,00 | 13,16 | 12,19 | 6,81 | 152,00 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **3886552** | **QSBM101275R** | 95 | 10,00 | 11,15 | 10,21 | 5,79 | 127,00 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **2824898** | **QSBM121525R** | 95 | 12,00 | 13,16 | 12,19 | 6,81 | 152,00 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3886550** | **QSBM101270L** | 90 | 10,00 | 11,15 | 10,21 | 5,79 | 127,00 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3886943** | **QSBM121520L** | 90 | 12,00 | 13,16 | 12,19 | 6,81 | 152,00 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **3886551** | **QSBM101275L** | 95 | 10,00 | 11,15 | 10,21 | 5,79 | 127,00 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |



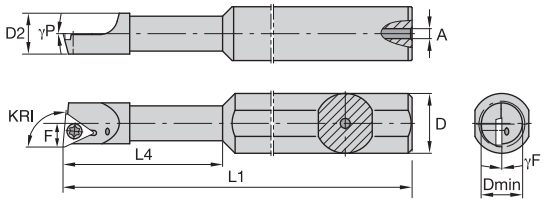

## SSBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3886965** | **SSBM161780R** | 90 | 16,00 | 17,20 | 16,13 | 8,89 | 177,80 | 6,35 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3886968** | **SSBM202030R** | 90 | 20,00 | 21,23 | 20,19 | 10,92 | 203,20 | 7,14 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3886964** | **SSBM161780L** | 90 | 16,00 | 17,20 | 16,13 | 8,89 | 179,90 | 6,35 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3886967** | **SSBM202030L** | 90 | 20,00 | 21,23 | 20,19 | 10,92 | 203,20 | 7,14 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3886966** | **SSBM161785L** | 95 | 16,00 | 17,20 | 16,13 | 8,89 | 179,90 | 6,35 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3886969** | **SSBM202035L** | 95 | 20,00 | 21,23 | 20,19 | 10,92 | 203,20 | 7,14 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |



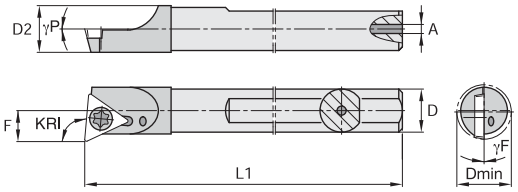

## FSBM • ESCALONADAS

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2829496** | **FSBM6612190R** | 90 | 12,00 | 7,52 | 6,60 | 3,96 | 76,00 | 19,05 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890858** | **FSBM6612320R** | 90 | 12,00 | 7,52 | 6,60 | 3,96 | 76,00 | 31,75 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829472** | **FSBM8212250R** | 90 | 12,00 | 9,09 | 8,15 | 4,75 | 76,00 | 25,40 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829448** | **FSBM8212380R** | 90 | 12,00 | 9,09 | 8,15 | 4,75 | 76,00 | 38,10 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890860** | **FSBM6616190R** | 90 | 16,00 | 7,52 | 6,60 | 3,96 | 102,00 | 19,05 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829408** | **FSBM8216380R** | 90 | 16,00 | 9,09 | 8,15 | 4,75 | 102,00 | 38,10 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829533** | **FSBM5212125R** | 95 | 12,00 | 6,99 | 5,16 | 3,20 | 76,00 | 12,70 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3890857** | **FSBM5212255R** | 95 | 12,00 | 6,99 | 5,16 | 3,20 | 76,00 | 25,40 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829508** | **FSBM6612195R** | 95 | 12,00 | 7,52 | 6,60 | 3,96 | 76,00 | 19,05 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890859** | **FSBM6612325R** | 95 | 12,00 | 7,52 | 6,60 | 3,96 | 76,00 | 31,75 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829459** | **FSBM8212385R** | 95 | 12,00 | 9,09 | 8,15 | 4,75 | 76,00 | 38,10 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3897011** | **FSBM5216125R** | 95 | 16,00 | 6,99 | 5,16 | 3,20 | 102,00 | 12,70 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829429** | **FSBM6616195R** | 95 | 16,00 | 7,52 | 6,60 | 3,96 | 102,00 | 19,05 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890862** | **FSBM6616325R** | 95 | 16,00 | 7,52 | 6,60 | 3,96 | 102,00 | 31,75 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890863** | **FSBM8216385R** | 95 | 16,00 | 9,09 | 8,15 | 4,75 | 102,00 | 38,10 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **2829442** | **FSBM8212380L** | 90 | 12,00 | 9,09 | 8,15 | 4,75 | 76,00 | 38,10 | 1,52 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890861** | **FSBM6616320L** | 90 | 16,00 | 7,52 | 6,60 | 3,96 | 102,00 | 31,75 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3890856** | **FSBM5212125L** | 95 | 12,00 | 6,99 | 5,16 | 3,20 | 76,00 | 12,70 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829501** | **FSBM6612195L** | 95 | 12,00 | 7,52 | 6,60 | 3,96 | 76,00 | 19,05 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |



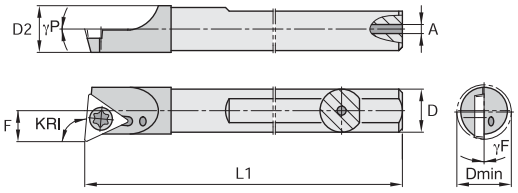

## ■ QSBM • ESCALONADAS

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2825013** | **QSBM9912480R** | 90 | 12,00 | 11,12 | 9,91 | 5,61 | 95,25 | 47,63 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3890865** | **QSBM9916480R** | 90 | 16,00 | 11,12 | 9,91 | 5,61 | 107,95 | 47,63 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3886946** | **QSBM1316630R** | 90 | 16,00 | 14,30 | 12,95 | 7,52 | 107,95 | 63,50 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **3886949** | **QSBM15920630R** | 90 | 20,00 | 17,47 | 15,88 | 8,97 | 114,30 | 63,50 | 2,49 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **2825052** | **QSBM9912295R** | 95 | 12,00 | 11,12 | 9,91 | 5,61 | 95,25 | 28,58 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **2825024** | **QSBM9912485R** | 95 | 12,00 | 11,12 | 9,91 | 5,61 | 95,25 | 47,63 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3890864** | **QSBM9916295R** | 95 | 16,00 | 11,12 | 9,91 | 5,61 | 107,95 | 28,58 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **2824993** | **QSBM9916485R** | 95 | 16,00 | 11,12 | 9,91 | 5,61 | 107,95 | 47,63 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3886945** | **QSBM1316385R** | 95 | 16,00 | 14,30 | 12,95 | 7,52 | 107,95 | 38,10 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **3886948** | **QSBM1316635R** | 95 | 16,00 | 14,30 | 12,95 | 7,52 | 107,95 | 63,50 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **2824950** | **QSBM9920385R** | 95 | 20,00 | 11,12 | 9,91 | 5,61 | 101,60 | 38,10 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3886950** | **QSBM15920635R** | 95 | 20,00 | 17,47 | 15,88 | 8,97 | 114,30 | 63,50 | 2,49 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **2825019** | **QSBM9912485L** | 95 | 12,00 | 11,12 | 9,91 | 5,61 | 95,25 | 47,63 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3896089** | **QSBM9916295L** | 95 | 16,00 | 11,12 | 9,91 | 5,61 | 107,95 | 28,58 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3886944** | **QSBM1316385L** | 95 | 16,00 | 14,30 | 12,95 | 7,52 | 107,95 | 38,10 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **3886947** | **QSBM1316635L** | 95 | 16,00 | 14,30 | 12,95 | 7,52 | 107,95 | 63,50 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **2824945** | **QSBM9920385L** | 95 | 20,00 | 11,12 | 9,91 | 5,61 | 101,60 | 38,10 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |



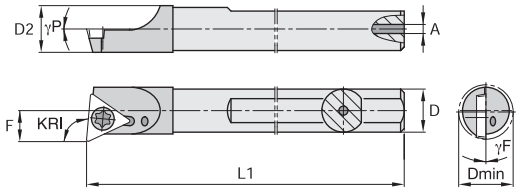

## FCBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3896036** | **FCBM51000R** | 90 | 5,00 | 6,98 | 5,30 | 3,40 | 100,58 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896031** | **FCBM61520R** | 90 | 6,00 | 7,06 | 6,20 | 3,70 | 152,40 | 1,19 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829356** | **FCBM81520R** | 90 | 8,00 | 9,16 | 8,20 | 4,80 | 152,40 | 2,36 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896038** | **FCBM51005R** | 95 | 5,00 | 6,98 | 5,30 | 3,20 | 100,58 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829390** | **FCBM61525R** | 95 | 6,00 | 7,06 | 6,20 | 3,70 | 152,40 | 1,19 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829368** | **FCBM81525R** | 95 | 8,00 | 9,16 | 8,20 | 4,80 | 152,40 | 2,36 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896035** | **FCBM51000L** | 90 | 5,00 | 6,98 | 5,30 | 3,40 | 100,58 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896030** | **FCBM61520L** | 90 | 6,00 | 7,06 | 6,20 | 3,70 | 152,40 | 1,19 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896032** | **FCBM81520L** | 90 | 8,00 | 9,16 | 8,20 | 4,80 | 152,40 | 2,36 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896037** | **FCBM51005L** | 95 | 5,00 | 6,98 | 5,30 | 3,20 | 100,58 | 1,02 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829385** | **FCBM61525L** | 95 | 6,00 | 7,06 | 6,20 | 3,70 | 152,40 | 1,19 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896033** | **FCBM81525L** | 95 | 8,00 | 9,16 | 8,20 | 4,80 | 152,40 | 2,36 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |



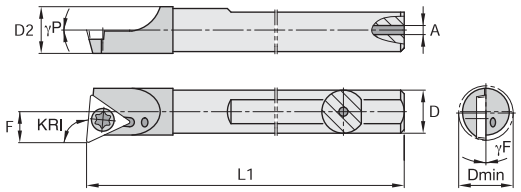

## QCBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3854445** | **QCBM102540R** | 90 | 10,00 | 11,15 | 10,21 | 5,79 | 254,00 | 3,20 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **2824737** | **QCBM122540R** | 90 | 12,00 | 13,16 | 12,19 | 6,81 | 254,00 | 4,70 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **2824776** | **QCBM102545R** | 95 | 10,00 | 11,15 | 10,21 | 5,79 | 254,00 | 3,20 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **2824747** | **QCBM122545R** | 95 | 12,00 | 13,16 | 12,19 | 6,81 | 254,00 | 4,70 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896042** | **QCBM102540L** | 90 | 10,00 | 11,15 | 10,21 | 5,79 | 254,00 | 3,20 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3896043** | **QCBM122540L** | 90 | 12,00 | 13,16 | 12,19 | 6,81 | 254,00 | 4,70 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **2824769** | **QCBM102545L** | 95 | 10,00 | 11,15 | 10,21 | 5,79 | 254,00 | 3,20 | 0.0 | 5.0 | TP..110202 | **QC21** | T9 |
| **3896044** | **QCBM122545L** | 95 | 12,00 | 13,16 | 12,19 | 6,81 | 254,00 | 4,70 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |



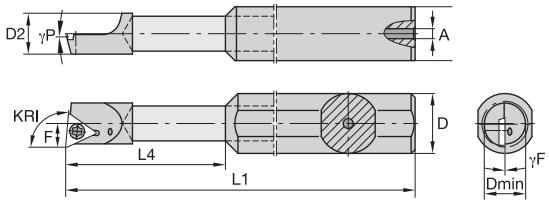

## SCBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3895892** | **SCBM162540R** | 90 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3897083** | **SCBM202540R** | 90 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896004** | **SCBM162545R** | 95 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896006** | **SCBM202545R** | 95 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3895891** | **SCBM162540L** | 90 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896005** | **SCBM202540L** | 90 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896003** | **SCBM162545L** | 95 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896091** | **SCBM202545L** | 95 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 5,51 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |



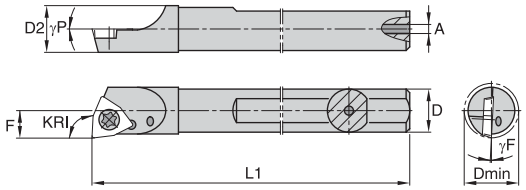

## SDBM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3896011** | **SDBM162540R** | 90 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,54 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896014** | **SDBM202540R** | 90 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 7,11 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **2822085** | **SDBM162545R** | 95 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,54 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896092** | **SDBM202545R** | 95 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 7,11 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896010** | **SDBM162540L** | 90 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,54 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896013** | **SDBM202540L** | 90 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 7,11 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3896012** | **SDBM162545L** | 95 | 16,00 | 17,25 | 16,13 | 8,89 | 254,00 | 5,54 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3897084** | **SDBM202545L** | 95 | 20,00 | 21,25 | 20,19 | 10,90 | 254,00 | 7,11 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |



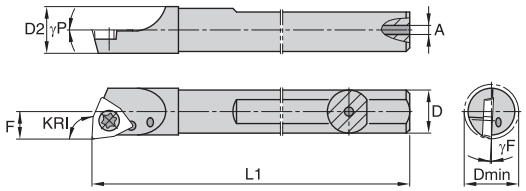

## FCBM • ESCALONADAS

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2829339** | **FCBM5312250R** | 90 | 12,00 | 6,98 | 5,30 | 3,40 | 63,50 | 25,40 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829309** | **FCBM6612320R** | 90 | 12,00 | 7,52 | 6,60 | 3,96 | 69,85 | 31,75 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896072** | **FCBM6612630R** | 90 | 12,00 | 7,52 | 6,60 | 3,96 | 101,60 | 63,50 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829289** | **FCBM8212380R** | 90 | 12,00 | 9,09 | 8,20 | 4,75 | 76,20 | 38,10 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829268** | **FCBM8212790R** | 90 | 12,00 | 9,09 | 8,20 | 4,75 | 117,48 | 79,38 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896069** | **FCBM5316250R** | 90 | 16,00 | 6,98 | 5,30 | 3,40 | 88,90 | 25,40 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829253** | **FCBM5316510R** | 90 | 16,00 | 6,98 | 5,30 | 3,40 | 114,30 | 50,80 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896084** | **FCBM6616320R** | 90 | 16,00 | 7,52 | 6,60 | 3,96 | 95,25 | 31,75 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896094** | **FCBM6616630R** | 90 | 16,00 | 7,52 | 6,60 | 3,96 | 127,00 | 63,50 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896086** | **FCBM8216380R** | 90 | 16,00 | 9,09 | 8,20 | 4,75 | 101,60 | 38,10 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896095** | **FCBM8216790R** | 90 | 16,00 | 9,09 | 8,20 | 4,75 | 117,48 | 79,38 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829350** | **FCBM5312255R** | 95 | 12,00 | 6,98 | 5,30 | 3,20 | 63,50 | 25,40 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829323** | **FCBM6612325R** | 95 | 12,00 | 7,52 | 6,60 | 3,96 | 69,85 | 31,75 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896083** | **FCBM6612635R** | 95 | 12,00 | 7,52 | 6,60 | 3,96 | 101,60 | 63,50 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829301** | **FCBM8212385R** | 95 | 12,00 | 9,09 | 8,20 | 4,75 | 76,20 | 38,10 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829279** | **FCBM8212795R** | 95 | 12,00 | 9,09 | 8,20 | 4,75 | 117,48 | 79,38 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3897085** | **FCBM5316255R** | 95 | 16,00 | 6,98 | 5,30 | 3,20 | 88,90 | 25,40 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896071** | **FCBM5316515R** | 95 | 16,00 | 6,98 | 5,30 | 3,20 | 114,30 | 50,80 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3790247** | **FCBM6616325R** | 95 | 16,00 | 7,52 | 6,60 | 3,96 | 95,25 | 31,75 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3786518** | **FCBM6616635R** | 95 | 16,00 | 7,52 | 6,60 | 3,96 | 127,00 | 63,50 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3897086** | **FCBM8216385R** | 95 | 16,00 | 9,09 | 8,20 | 4,75 | 101,60 | 38,10 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3786519** | **FCBM8216795R** | 95 | 16,00 | 9,09 | 8,20 | 4,75 | 117,48 | 79,38 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **3896067** | **FCBM5312510L** | 90 | 12,00 | 6,98 | 5,30 | 3,40 | 88,90 | 50,80 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829344** | **FCBM5312255L** | 95 | 12,00 | 6,98 | 5,30 | 3,20 | 63,50 | 25,40 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896068** | **FCBM5312515L** | 95 | 12,00 | 6,98 | 5,30 | 3,20 | 88,90 | 50,80 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **2829319** | **FCBM6612325L** | 95 | 12,00 | 7,52 | 6,60 | 3,96 | 69,85 | 31,75 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **2829295** | **FCBM8212385L** | 95 | 12,00 | 9,09 | 8,20 | 4,75 | 76,20 | 38,10 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896070** | **FCBM5316255L** | 95 | 16,00 | 6,98 | 5,30 | 3,20 | 88,90 | 25,40 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC11** | T7 |
| **3896085** | **FCBM6616325L** | 95 | 16,00 | 7,52 | 6,60 | 3,96 | 95,25 | 31,75 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |
| **3896087** | **FCBM8216385L** | 95 | 16,00 | 9,09 | 8,20 | 4,75 | 101,60 | 38,10 | 3,18 | 0.0 | 5.0 | TD..07S102 | **FC14** | T7 |



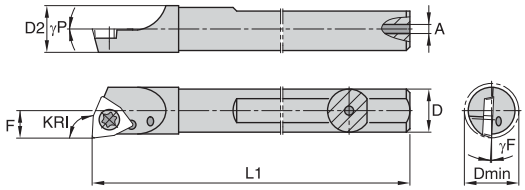

## GSBMW

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **2828134** | **GSBMW51003R** | 93 | 5,00 | 6,60 | 5,72 | 3,20 | 101,50 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **2828122** | **GSBMW61003R** | 93 | 6,00 | 6,78 | 6,20 | 3,43 | 101,50 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **3886549** | **GSBMW81003R** | 93 | 8,00 | 8,10 | 8,18 | 4,42 | 101,50 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT15** | T6 |
| | **A izquierdas** | | | | | | | | | | | | |
| **2828130** | **GSBMW51003L** | 93 | 5,00 | 6,60 | 5,72 | 3,20 | 101,50 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **2828116** | **GSBMW61003L** | 93 | 6,00 | 6,78 | 6,20 | 3,43 | 101,50 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **3886548** | **GSBMW81003L** | 93 | 8,00 | 8,10 | 8,18 | 4,42 | 101,50 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT15** | T6 |



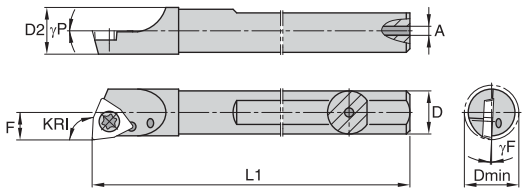

## QSBMW

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3886951** | **QSBMW101273R** | 93 | 9,99 | 10,94 | 10,21 | 5,59 | 127,00 | 2,36 | -3.0 | 0.0 | WP..040204 | **QTM20** | T7 |
| **3393828** | **QSBMW121523R** | 93 | 11,99 | 12,90 | 12,19 | 6,55 | 152,40 | 2,36 | -3.0 | 0.0 | WP..040204 | **QTM26** | T7 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3886952** | **QSBMW101273L** | 93 | 9,99 | 10,94 | 10,21 | 5,59 | 127,00 | 2,36 | -3.0 | 0.0 | WP..040204 | **QTM20** | T7 |
| **3886963** | **QSBMW121523L** | 93 | 11,99 | 12,90 | 12,19 | 6,55 | 152,40 | 2,36 | -3.0 | 0.0 | WP..040204 | **QTM26** | T7 |



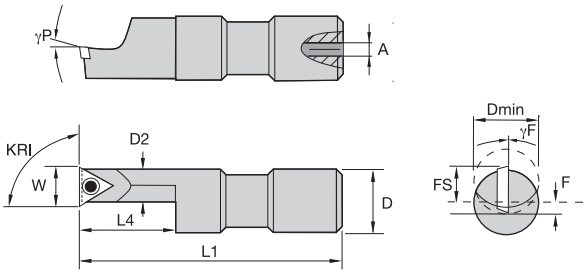

## GCBMW

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3896040** | **GCBMW51523R** | 93 | 5,00 | 6,60 | 5,33 | 3,20 | 152,40 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **2827711** | **GCBMW61523R** | 93 | 6,00 | 6,78 | 6,20 | 3,43 | 152,40 | 1,19 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **2827699** | **GCBMW81523R** | 93 | 8,00 | 8,80 | 8,18 | 4,42 | 152,40 | 2,36 | -3.0 | 0.0 | WP..S30104 | **CT15** | T6 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896039** | **GCBMW51523L** | 93 | 5,00 | 6,60 | 5,33 | 3,20 | 152,40 | 1,02 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **2827705** | **GCBMW61523L** | 93 | 6,00 | 6,78 | 6,20 | 3,43 | 152,40 | 1,19 | -3.0 | 0.0 | WP..S30104 | **CT11** | T6 |
| **3897012** | **GCBMW81523L** | 93 | 8,00 | 8,80 | 8,18 | 4,42 | 152,40 | 2,36 | -3.0 | 0.0 | WP..S30104 | **CT15** | T6 |



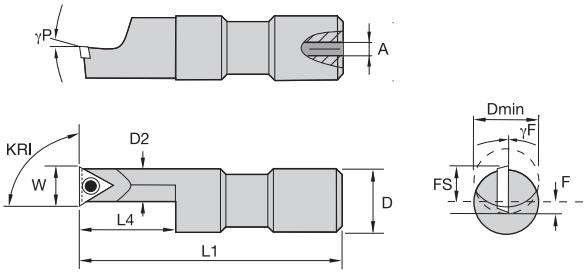

## QCBMW

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3782378** | **QCBMW102543R** | 93 | 10,00 | 10,95 | 10,21 | 5,59 | 254,00 | 3,20 | -3.0 | 0.0 | WP..040204 | **QTM20** | T7 |
| | **A izquierdas** | | | | | | | | | | | | |
| **3896045** | **QCBMW102543L** | 93 | 10,00 | 10,95 | 10,21 | 5,59 | 254,00 | 3,20 | -3.0 | 0.0 | WP..040204 | **QTM20** | T7 |
| **3896046** | **QCBMW122543L** | 93 | 12,00 | 12,90 | 12,19 | 6,55 | 254,00 | 4,70 | -3.0 | 0.0 | WP..040204 | **QTM26** | T7 |



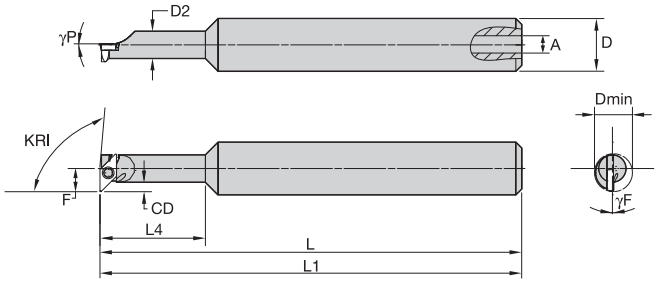

## QSOM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | FS | W | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **2824815** | **QSOM9516380R** | 90 | 16,00 | 16,51 | 9,50 | 0,64 | 95,25 | 38,10 | 10,10 | 10,74 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |
| **2824819** | **QSOM9516385R** | 95 | 16,00 | 16,51 | 9,50 | 0,64 | 95,25 | 38,10 | 10,63 | 10,70 | 2,03 | 0.0 | 5.0 | TP..110202 | **QC26** | T9 |

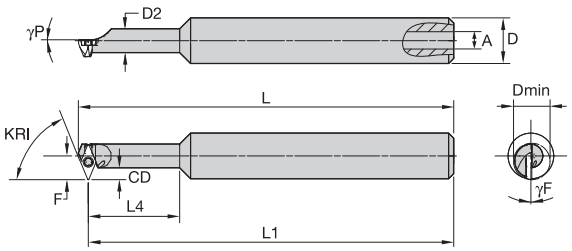



## SSOM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | L1 | L4 | FS | W | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **3896090** | **SSOM1325380R** | 90 | 24,99 | 24,61 | 12,70 | 1,78 | 95,25 | 38,10 | 14,46 | 16,24 | 3,00 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3890867** | **SSOM1325630R** | 90 | 24,99 | 24,61 | 12,70 | 1,78 | 120,65 | 63,50 | 14,46 | 16,24 | 3,00 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3890866** | **SSOM1325385R** | 95 | 24,99 | 24,61 | 12,70 | 1,78 | 95,25 | 38,10 | 14,40 | 16,18 | 3,00 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |
| **3890868** | **SSOM1325635R** | 95 | 24,99 | 24,61 | 12,70 | 1,78 | 120,65 | 63,50 | 14,40 | 16,18 | 3,00 | 0.0 | 5.0 | TP..160302 | **SC30** | T10 |



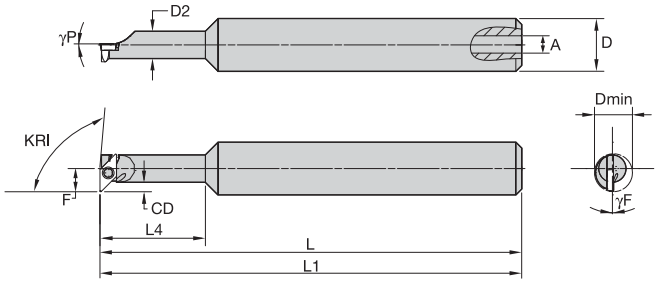

NOTA: KRI representado con 95°.



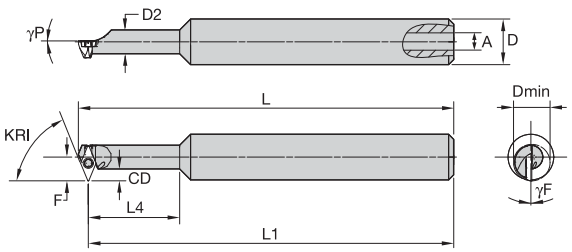

NOTA: KRI representado con 67,5°.

## CSPM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | CD | L | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **2831399** | **CSPM71225225R** | 67.5 | 12,00 | 10,16 | 6,60 | 6,60 | 3,30 | 104,65 | 101,60 | 25,40 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| **3758942** | **CSPM81232225R** | 67.5 | 12,00 | 11,37 | 8,18 | 7,01 | 2,92 | 105,16 | 101,60 | 31,75 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| **2831411** | **CSPM712255R** | 95.0 | 12,00 | 9,14 | 6,60 | 5,59 | 2,29 | 101,60 | 101,60 | 25,40 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| **2831390** | **CSPM812325R** | 95.0 | 12,00 | 10,74 | 8,20 | 6,38 | 2,30 | 101,60 | 101,60 | 31,75 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **2831394** | **CSPM71225225L** | 67.5 | 12,00 | 10,16 | 6,60 | 6,60 | 3,30 | 104,65 | 101,60 | 25,40 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| **2831378** | **CSPM81232225L** | 67.5 | 12,00 | 11,37 | 8,18 | 7,01 | 2,92 | 101,60 | 101,60 | 31,75 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| **2831405** | **CSPM712255L** | 95.0 | 12,00 | 9,14 | 6,60 | 5,59 | 2,29 | 101,60 | 101,60 | 25,40 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |
| **2831383** | **CSPM812325L** | 95.0 | 12,00 | 10,74 | 8,20 | 6,38 | 2,30 | 101,60 | 101,60 | 31,75 | 1,02 | 0.0 | 0.0 | GC..050102 | **CT15** | T6 |



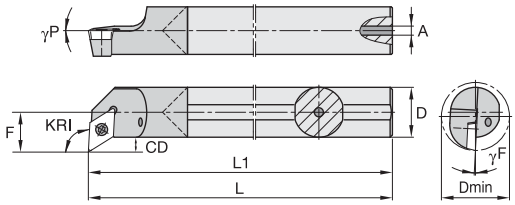

NOTA: KRI representado con 95°.



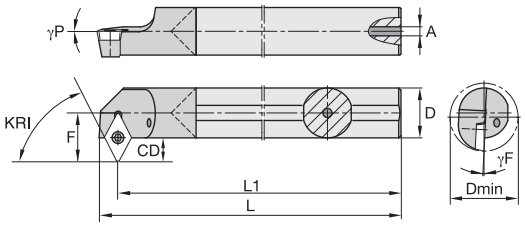

NOTA: KRI representado con 67,5°.

## GSPM

| Número de pedido | Número de catálogo | KRI | D | D min | D2 | F | CD | L | L1 | L4 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | | |
| **2827688** | **GSPM101638225R** | 67.5 | 16,00 | 13,72 | 9,78 | 8,59 | 3,70 | 106,07 | 101,60 | 38,10 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897897** | **GSPM131651225R** | 67.5 | 16,00 | 16,89 | 12,95 | 10,16 | 3,68 | 131,01 | 127,00 | 50,80 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3025010** | **GSPM1016385R** | 95.0 | 16,00 | 13,08 | 9,78 | 7,93 | 3,04 | 114,30 | 114,30 | 38,10 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3518694** | **GSPM1316515R** | 95.0 | 16,00 | 16,00 | 12,95 | 9,50 | 3,02 | 127,00 | 127,00 | 50,80 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| | **A izquierdas** | | | | | | | | | | | | | | | |
| **3897894** | **GSPM101638225L** | 67.5 | 16,00 | 13,72 | 9,78 | 8,59 | 3,70 | 106,07 | 101,60 | 38,10 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897896** | **GSPM131651225L** | 67.5 | 16,00 | 16,89 | 12,95 | 10,16 | 3,98 | 131,01 | 127,00 | 50,80 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897895** | **GSPM1016385L** | 95.0 | 16,00 | 13,08 | 9,78 | 7,93 | 3,04 | 114,30 | 114,30 | 38,10 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3896052** | **GSPM1316515L** | 95.0 | 16,00 | 16,00 | 12,95 | 9,50 | 3,02 | 127,00 | 127,00 | 50,80 | 2,49 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |



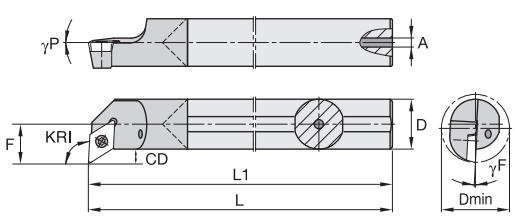

NOTA: KRI representado con 95°.



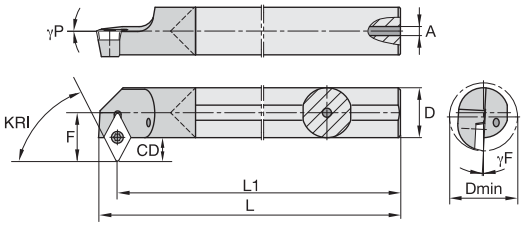

NOTA: KRI representado con 67,5°.

## CCPM

| Número de pedido | Número de catálogo | KRI | D | D min | F | CD | L | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2831010** | **CCPM6152225R** | 67.5 | 6,00 | 10,16 | 6,60 | 3,30 | 155,45 | 152,40 | 1,19 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| **2830986** | **CCPM8152225R** | 67.5 | 8,00 | 11,38 | 7,01 | 2,92 | 155,96 | 152,40 | 2,36 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| **2831020** | **CCPM61525R** | 95.0 | 6,00 | 9,14 | 5,59 | 2,29 | 152,40 | 152,40 | 1,19 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| **3782376** | **CCPM81525R** | 95.0 | 8,00 | 10,74 | 6,38 | 2,29 | 152,40 | 152,40 | 2,36 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **2831004** | **CCPM6152225L** | 67.5 | 6,00 | 10,16 | 6,60 | 3,30 | 155,45 | 152,40 | 1,19 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| **2830980** | **CCPM8152225L** | 67.5 | 8,00 | 11,38 | 7,01 | 2,92 | 155,96 | 152,40 | 2,36 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| **3897899** | **CCPM61525L** | 95.0 | 6,00 | 9,14 | 5,59 | 2,29 | 152,40 | 152,40 | 1,19 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |
| **3896022** | **CCPM81525L** | 95.0 | 8,00 | 10,74 | 6,38 | 2,29 | 152,40 | 152,40 | 2,36 | 0.0 | 0.0 | GP..050102 | **CT15** | T6 |



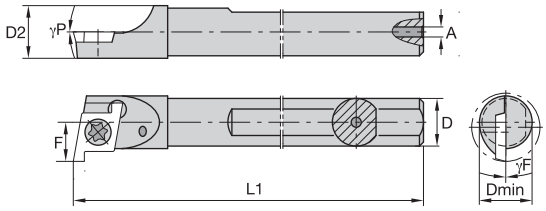

NOTA: KRI representado con 95°.




NOTA: KRI representado con 67,5°.

## GCPM

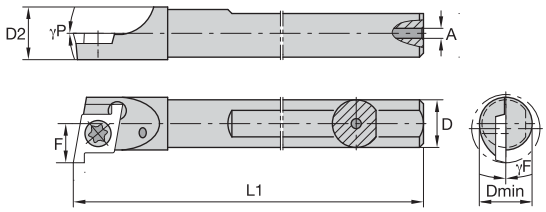
| Número de pedido | Número de catálogo | KRI | D | D min | F | CD | L | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **2827656** | **GCPM10254225R** | 67.5 | 10,00 | 14,20 | 8,81 | 3,68 | 258,47 | 254,00 | 3,20 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897906** | **GCPM12254225R** | 67.5 | 12,00 | 16,18 | 9,80 | 3,68 | 257,89 | 254,00 | 4,70 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3896073** | **GCPM16254225R** | 67.5 | 16,00 | 20,07 | 11,76 | 3,70 | 258,01 | 254,00 | 5,54 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897904** | **GCPM102545R** | 95.0 | 10,00 | 13,54 | 8,15 | 3,02 | 254,00 | 254,00 | 3,20 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3759184** | **GCPM122545R** | 95.0 | 12,00 | 15,52 | 9,14 | 3,02 | 254,00 | 254,00 | 4,70 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897909** | **GCPM162545R** | 95.0 | 16,00 | 19,43 | 11,10 | 3,04 | 254,00 | 254,00 | 5,54 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| | **A izquierdas** | | | | | | | | | | | | | |
| **3897903** | **GCPM10254225L** | 67.5 | 10,00 | 14,20 | 8,81 | 3,68 | 258,47 | 254,00 | 3,20 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897905** | **GCPM12254225L** | 67.5 | 12,00 | 16,18 | 9,80 | 3,68 | 257,89 | 254,00 | 4,70 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897908** | **GCPM16254225L** | 67.5 | 16,00 | 20,07 | 11,76 | 3,70 | 258,01 | 254,00 | 5,54 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3782377** | **GCPM102545L** | 95.0 | 10,00 | 13,54 | 8,15 | 3,02 | 254,00 | 254,00 | 3,20 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **3897907** | **GCPM122545L** | 95.0 | 12,00 | 15,52 | 9,14 | 3,02 | 254,00 | 254,00 | 4,70 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |
| **2827644** | **GCPM162545L** | 95.0 | 16,00 | 19,43 | 11,10 | 3,04 | 254,00 | 254,00 | 5,54 | 0.0 | 0.0 | GC..060202 | **GT21** | T7 |




## CSMM

| Número de pedido | Número de catálogo | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2831054** | **CSMM5640R** | 5,00 | 6,91 | 5,56 | 3,91 | 64,00 | 1,02 | 0.0 | 0.0 | CD.5.. | **CC11** | T6 |
| **2831048** | **CSMM6760R** | 6,00 | 7,92 | 6,60 | 4,45 | 76,00 | 1,02 | 0.0 | 0.0 | CD.5.. | **CC11** | T6 |

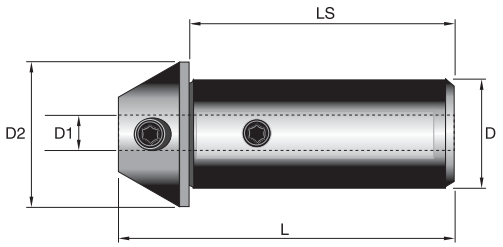
*NOTA: consulte el diseño de la plaquita para obtener información sobre los límites de agujero ciego, el ancho de corte y la profundidad de corte.*




## CCMM

| Número de pedido | Número de catálogo | D | D min | D2 | F | L1 | A | γF° | γP° | plaquita guía | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2831042** | **CCMM51020R** | 5,00 | 6,91 | 5,56 | 3,94 | 101,60 | 1,02 | 0.0 | 0.0 | CD.5.. | **CC11** | T6 |
| **2831036** | **CCMM61020R** | 6,00 | 7,92 | 6,60 | 4,45 | 101,60 | 1,19 | 0.0 | 0.0 | CD.5.. | **CC11** | T6 |

*NOTA: consulte el diseño de la plaquita para obtener información sobre los límites de agujero ciego, el ancho de corte y la profundidad de corte.*




## CSM

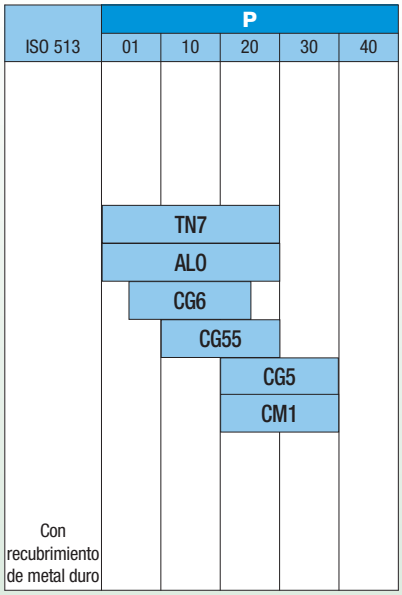
| Número de pedido | Número de catálogo | D1 | D | D2 | LS | L |
|---|---|---|---|---|---|---|
| **2832838** | **CSM22156** | 3,96 | 22,00 | 27,94 | 50,80 | 63,50 |
| **2832832** | **CSM22187** | 4,75 | 22,00 | 27,94 | 50,80 | 63,50 |
| **2832827** | **CSM22250** | 6,35 | 22,00 | 27,94 | 50,80 | 63,50 |
| **2832820** | **CSM22312** | 7,93 | 22,00 | 27,94 | 50,80 | 63,50 |
| **2832813** | **CSM22375** | 9,53 | 22,00 | 27,94 | 50,80 | 63,50 |
| **2832809** | **CSM22500** | 12,70 | 22,00 | 27,94 | 50,80 | 63,50 |

El sistema en tres pasos de selección de plaquitas WIDIA™ facilita la elección y la aplicación de la herramienta más productiva. Las recomendaciones de herramientas se basan en seis grupos de materiales de la pieza de trabajo.

1 **Seleccione la geometría de la plaquita:** elija la geometría en función de la profundidad de corte y avance que mejor se adapte a sus necesidades.

2 **Seleccione la calidad:** determine las condiciones de corte y elija la calidad adecuada.

## TN7–CM1 para acero




resistencia al desgaste = mayor

**TN7** — Cermet resistente al desgaste y con gran fuerza en el filo. Acabado y semiacabado de carbono, aleación y aceros inoxidables a velocidades medias y elevadas.

**ALO** — Puede resistir interrupciones ligeras. Un revestimiento de alúmina permite mayores velocidades de corte.

**CG6** — Calidad de uso general y alta velocidad para todo tipo de aceros y fundiciones.

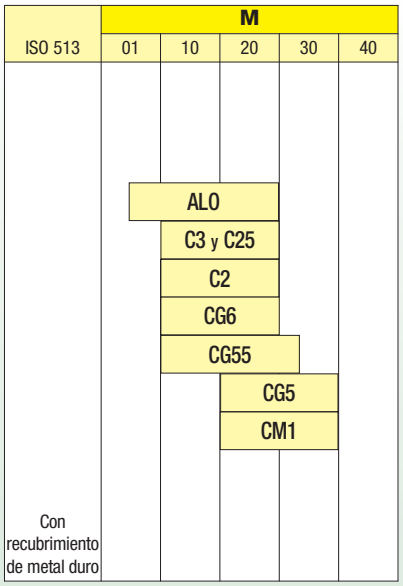
**CG55** — Resistencia al desgaste y gran fuerza en el filo. Reduce los problemas de recrecimiento del filo. Resistencia superior a la deformación térmica y a muescas de profundidad del corte.

**CG5** — Ideal para velocidades bajas. Apto para interrupciones y altas tasas de avance.

**CM1** — Para torneado pesado y cortes muy interrumpidos.

tenacidad = más suave

## ALO–CM1 para acero inoxidable




resistencia al desgaste = mayor

**ALO** — Puede resistir interrupciones ligeras. Un revestimiento de álumina permite mayores velocidades de corte.

**C3 y C25** — Buena resistencia al desgaste con algo de tenacidad.

**C2** — Excepcional resistencia a la abrasión para el mecanizado de fundiciones, aceros inoxidables austeníticos, metales no férreos, materiales no metálicos y la mayoría de las aleaciones de alta temperatura.

**CG6** — Calidad de uso general y alta velocidad para todo tipo de aceros y fundiciones.

**CG55** — Resistencia al desgaste y gran fuerza en el filo. Reduce los problemas de recrecimiento del filo. Resistencia superior a la deformación térmica y a muescas de profundidad del corte.

**CG5** — Ideal para velocidades bajas. Apto para interrupciones y altas tasas de avance.

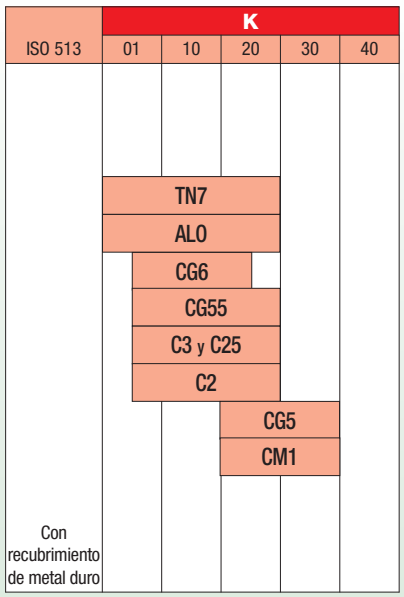
**CM1** — Para torneado pesado y cortes muy interrumpidos.

tenacidad = más suave

**3 Seleccione la velocidad de corte:**
con la tabla de avances y velocidades, establezca la velocidad de corte y obtendrá el rango y las condiciones iniciales óptimas.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

## TN7–CM1 para fundición




resistencia al desgaste = mayor

**TN7** — Cermet resistente al desgaste y con gran fuerza en el filo.

**ALO** — Puede resistir interrupciones ligeras. Un revestimiento de álumina permite mayores velocidades de corte.

**CG6** — Calidad de uso general y alta velocidad para todo tipo de aceros y fundiciones.

**CG55** — Resistencia al desgaste y gran fuerza en el filo. Reduce los problemas de recrecimiento del filo. Resistencia superior a la deformación térmica y a muescas de profundidad del corte.

**C3 y C25** — Buena resistencia al desgaste con algo de tenacidad.

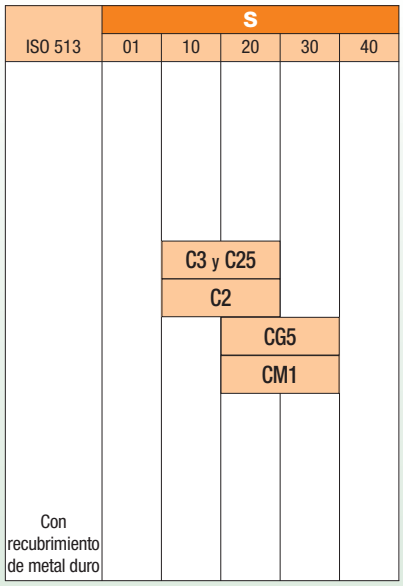
**C2** — Excepcional resistencia a la abrasión para el mecanizado de fundiciones, aceros inoxidables austeníticos, metales no férreos, materiales no metálicos y la mayoría de las aleaciones de alta temperatura.

**CG5** — Ideal para velocidades bajas. Apto para interrupciones y altas tasas de avance.

**CM1** — Para torneado pesado y cortes muy interrumpidos.

tenacidad = más suave

## C3–CM1 para aleaciones de alta temperatura




resistencia al desgaste = mayor

**C3 y C25** — Buena resistencia al desgaste con algo de tenacidad.

**C2** — Excepcional resistencia a la abrasión para el mecanizado de fundiciones, aceros inoxidables austeníticos, metales no férreos, materiales no metálicos y la mayoría de las aleaciones de alta temperatura.

**CG5** — Ideal para velocidades bajas. Apto para interrupciones y altos avances.

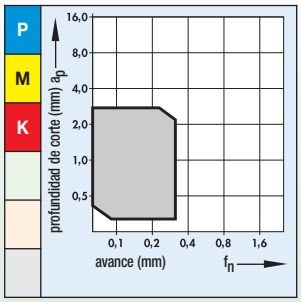
**CM1** — Para torneado pesado y cortes muy interrumpidos.

tenacidad = más suave

## Plaquitas positivas de una cara

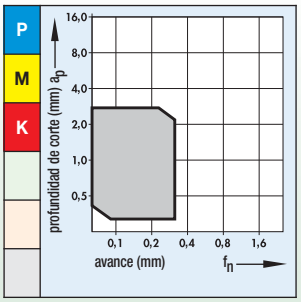
### ..HB

Plaquitas con parte plana. Rectificado periférico para la mejor calidad superficial y una reducción de la presión de corte. Un filo de corte muy estable ofrece la máxima rigidez.



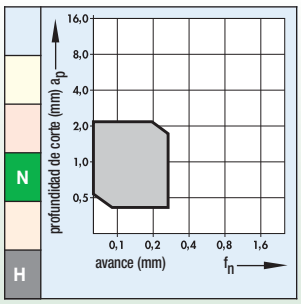

### ..HT

Rompevirutas de plaquitas para rectificado periférico. Buen control de virutas. Geometría para una aplicación de uso general.

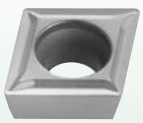



### ..HB-M

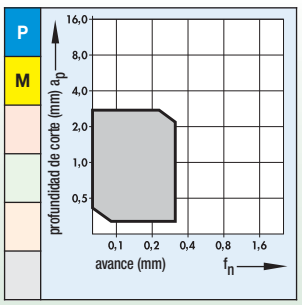
Punta de nitruro de boro cúbico (CBN) o diamante policristalino (PCD) para aleaciones de alta temperatura y materiales no férreos. Un filo de corte muy estable ofrece la máxima rigidez.




### ..LF



Geometría para una aplicación de uso general. Control de virutas muy bueno. Recomendada para un mecanizado de acabado general.




## Criterios de selección de geometrías

**Plaquitas con parte superior plana**
**Geometría del rompevirutas ..HB, ..HB-M, ..HW**

- Aptas para cortes interrumpidos.
- Para usar cuando el control de virutas no sea imprescindible.

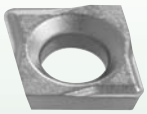
**Plaquitas de tipo rompevirutas prensadas**
**Geometría del rompevirutas ..LF**

- Aptas para cortes con interrupciones moderadas.
- Para usar cuando el control de virutas sea imprescindible.

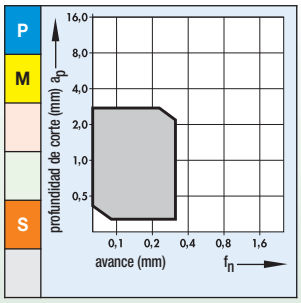
| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

## Plaquitas positivas de una cara

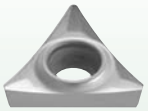
### ..HH



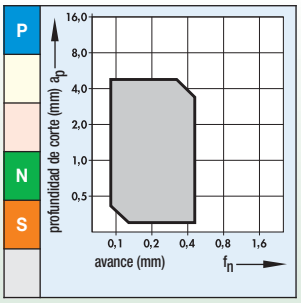
Rectificado periférico para la mejor calidad superficial y una reducción de la presión de corte. Para acabados de precisión y medios.




### HP

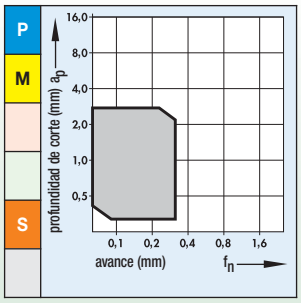


Rompevirutas de tipo muy positivo. Rectificado periférico para la mejor calidad superficial y una reducción de la presión de corte. Recomendada para el mecanizado de aleaciones de alta temperatura y materiales no férreos.



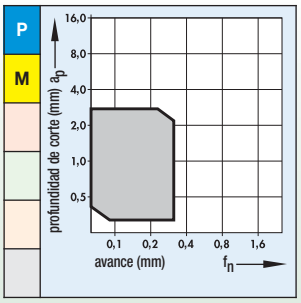

### ..HH-R/L

Rompevirutas rectificado. Rectificado periférico para la mejor calidad superficial y una reducción de la presión de corte. *Las plaquitas a derechas SÓLO se utilizan en barras a izquierdas. Las plaquitas a izquierdas SÓLO se utilizan en barras a derechas.




### ..HW

Plaquita con parte plana para perfilado. Un filo de corte muy estable ofrece la máxima rigidez.




**Plaquitas de tipo rompevirutas prensadas con periferia rectificada**

**Geometría del rompevirutas ..HH, ..HT, HP**

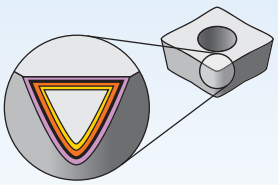
- Aptas para cortes con interrupciones ligeras y moderadas.
- Para usar cuando el control de virutas sea imprescindible.
- Un acabado superficial superior y una mayor tolerancia en la pieza de trabajo.

**Plaquitas de tipo rompevirutas rectificadas**

**Geometría del rompevirutas ..HH-R/L**

- Aptas para cortes suaves.
- Un acabado superficial superior y una mayor tolerancia en la pieza de trabajo.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

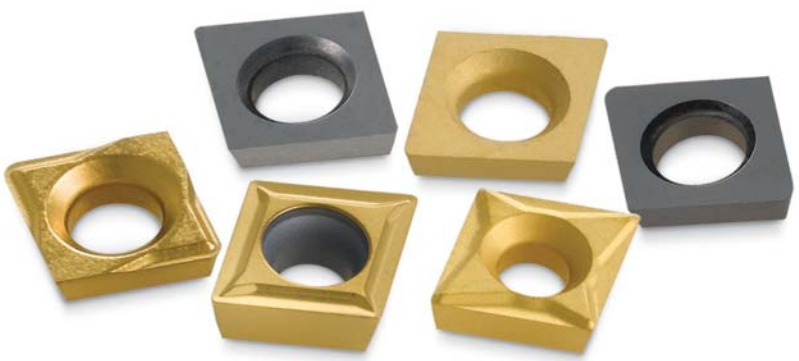


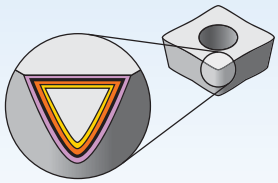
**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CM1 | HW-S25 | Metal duro sin recubrir. Sustrato sin alear de grano ultrafino y muy duro. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, hierros y materiales no ferrosos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. Utilizar cuando C2, C3 o C25 fallen por astillamiento o rotura. | P | P | P | P | P | P | | | |
| | | | M | M | M | M | M | M | | | |
| | | | K | K | K | K | K | K | | | |
| | | | N | N | N | N | N | N | | | |
| | | | S | S | S | S | S | S | | | |
| C2 | HW-N15 | Metal duro sin recubrir. Calidad de grano fino y duro WC/Co sin alear con bajo contenido en aglomerante. Calidad de uso general para materiales no férreos. Excepcional resistencia a la abrasión para el mecanizado de fundiciones, aceros inoxidables austeníticos, metales no férreos y la mayoría de las aleaciones de alta temperatura. | | | | | | | | | |
| | | | M | M | M | M | | | | | |
| | | | K | K | K | K | | | | | |
| | | | N | N | N | N | | | | | |
| | | | S | S | S | S | | | | | |
| C3 y C25 | HW-K15 | Metal duro sin recubrir. Excepcional resistencia a la abrasión para el mecanizado de fundiciones, aluminio y metales no férreos. Buena resistencia al desgaste con algo de tenacidad. Más dura que el modelo C2, con mayor resistencia al desgaste del filo. Apta operaciones de acabado. | | | | | | | | | |
| | | | M | M | M | M | | | | | |
| | | | K | K | K | K | | | | | |
| | | | N | N | N | N | | | | | |
| | | | S | S | S | S | | | | | |
| TN7 | HT-P15 | Calidad cermet con alta resistencia al desgaste (base de TiC/TiN). Un cermet resistente al desgaste con filo de gran fuerza proporciona una mejor vida de la herramienta en metales duros recubiertos y sin recubrir y resiste el recrecimiento de materiales en el filo de corte. Acabado y semiacabado de carbono, aleación y aceros inoxidables a velocidades medias y elevadas. También se puede utilizar en materiales no férreos. | P | P | P | P | P | | | | |
| | | | | | | | | | | | |
| | | | K | K | K | K | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| ALO | HC-K15 | Metal duro recubierto. CVD — TiCN-TiC-$Al_2O_3$. Un recubrimiento de alúmina fino en un sustrato duro resistente a las deformaciones. Acabado a alta velocidad de fundiciones grises y acabado a velocidad media de aceros de aleación en un rango de dureza de 35 a 50 HRC. Puede resistir interrupciones ligeras. Un recubrimiento de álumina permite mayores velocidades de corte. | P | P | P | P | | | | | |
| | | | M | M | M | M | | | | | |
| | | | K | K | K | K | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

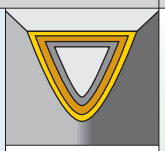
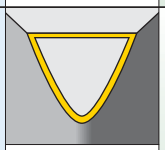
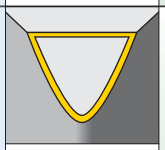
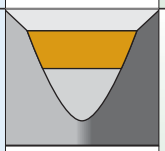
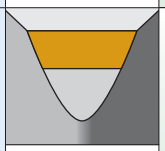


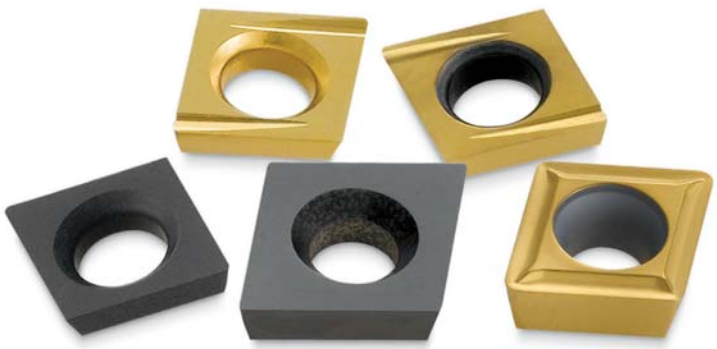


**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CG6 |  HC-P10 | Metal duro recubierto. CVD — TiC-TiCN-TiN. Un recubrimiento de fase triple en una calidad de grano fino duro con bajo contenido en aglomerado. Calidad de uso general y alta velocidad para todo tipo de aceros. Color dorado. | P, M, K | P, M, K | P, M, K | M | | | | | |
| CG5 |  HC-S25 | Es una calidad con recubrimiento de PVD TiN. Sustrato recto con 9,5% Co. Grano de submicrón. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. | | | | P, K, N, S | P, K, N, S | P, K, N, S | | | |
| CG55 |  HC-M20 | Un recubrimiento de PVD TiN en un sustrato de metal duro sin alear muy resistente al desgaste. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. La calidad proporciona una combinación de resistencia al desgaste y gran fuerza en el filo. El recubrimiento aumenta la resistencia al desgaste y reduce los problemas de recrecimiento del filo. El sustrato proporciona una resistencia superior a la deformación térmica y una resistencia a muescas de profundidad del corte. | P, K | P, M, K, S | P, M, K, S | P, M, K, S | M | | | | |
| CBN6 |  BN-H25 | Punta PCBN soldada en una plaquita de metal duro. Recomendada para el mecanizado de acero endurecido (45–65 HRC). Para acero de cojinetes, aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, hierros carburizados y nitrurados y algunos recubrimientos duros. Puede actuar tanto en condiciones sin como con refrigerante. | | | H | H | H | H | | | |
| CPD1 |  DP-N10 | Una calidad compacta de diamante policristalino (PCD) proporciona una dureza y una resistencia a la abrasión excepcionales. CPD1 es una calidad de mandrinado de acabado superior que mejorará de forma significativa las tolerancias de las piezas de trabajo, los acabados superficiales y la duración de las plaquitas en aluminio con alto contenido en silicio, cobre, grafito de carbono con aluminio, goma dura, materiales plásticos y/o madera. | N | N | N | | | | | | |



| ANSI ISO 513 | VDI 3323 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | ap [mm] | | | | | | | | | | 0,051 | — | 0,300 | 0,025 | — | 0,300 |
| | avance [mm/rev] | | | | | | | | | | 0,300 | — | 0,025 | 0,300 | — | 0,025 |
| | | C2 | | | C25 | | | C3 | | | CG5** | | | CG55** | | |
| | 1 | | | | | | | | | | 95 | **120** | 145 | 105 | **130** | 155 |
| | 2 | | | | | | | | | | 70 | **90** | 105 | 80 | **95** | 115 |
| | 3 | | | | | | | | | | 55 | **70** | 80 | 60 | **75** | 90 |
| | 4 | | | | | | | | | | 65 | **75** | 90 | 70 | **85** | 100 |
| | 5 | | | | | | | | | | 45 | **55** | 70 | 50 | **65** | 75 |
| | 6 | | | | | | | | | | 75 | **95** | 110 | 85 | **105** | 125 |
| P | 7 | | | | | | | | | | 50 | **60** | 75 | 55 | **70** | 80 |
| | 8 | | | | | | | | | | 45 | **55** | 70 | 50 | **65** | 75 |
| | 9 | | | | | | | | | | 40 | **50** | 60 | 45 | **55** | 65 |
| | 10 | | | | | | | | | | 70 | **85** | 100 | 75 | **95** | 110 |
| | 11 | | | | | | | | | | 45 | **55** | 65 | 50 | **60** | 70 |
| | 12 | | | | | | | | | | 70 | **85** | 100 | 75 | **95** | 110 |
| | 13.1 | | | | | | | | | | 55 | **70** | 85 | 65 | **80** | 95 |
| | 13.2 | | | | | | | | | | 45 | **55** | 65 | 50 | **60** | 70 |
| | ap [mm] | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 |
| | avance [mm/rev] | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 |
| | | C2** | | | C25** | | | C3** | | | CG5** | | | CG55 | | |
| | 14.1 | 55 | **70** | 85 | 60 | **75** | 90 | 65 | **80** | 95 | 75 | **95** | 110 | 85 | **105** | 125 |
| M | 14.2 | 45 | **55** | 70 | 50 | **60** | 75 | 50 | **65** | 75 | 60 | **75** | 90 | 65 | **80** | 100 |
| | 14.3 | 55 | **65** | 80 | 55 | **70** | 85 | 60 | **75** | 90 | 70 | **85** | 100 | 75 | **95** | 110 |
| | 14.4 | 35 | **40** | 50 | 35 | **45** | 55 | 40 | **45** | 55 | 45 | **55** | 65 | 50 | **60** | 70 |
| | ap [mm] | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 |
| | avance [mm/rev] | 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 |
| | | C2** | | | C25 | | | C3 | | | CG5** | | | CG55** | | |
| | 15 | 65 | **80** | 95 | 70 | **85** | 105 | 70 | **85** | 105 | 75 | **90** | 110 | 80 | **100** | 120 |
| | 16 | 45 | **55** | 65 | 50 | **60** | 75 | 50 | **60** | 75 | 50 | **65** | 75 | 55 | **70** | 85 |
| K | 17 | 75 | **90** | 110 | 80 | **95** | 115 | 80 | **95** | 115 | 80 | **100** | 120 | 90 | **110** | 135 |
| | 18 | 45 | **55** | 70 | 50 | **65** | 75 | 50 | **65** | 75 | 55 | **65** | 80 | 60 | **75** | 90 |
| | 19 | 90 | **110** | 130 | 95 | **120** | 145 | 95 | **120** | 145 | 100 | **125** | 145 | 110 | **135** | 165 |
| | 20 | 50 | **65** | 75 | 55 | **70** | 85 | 55 | **70** | 85 | 55 | **70** | 85 | 65 | **80** | 95 |
| | ap [mm] | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 |
| | avance [mm/rev] | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 |
| | | C2 | | | C25 | | | C3 | | | CG5** | | | CG55** | | |
| | 21 | 405 | **505** | 605 | 405 | **505** | 605 | 405 | **505** | 605 | 405 | **505** | 605 | 445 | **555** | 665 |
| | 22 | 245 | **305** | 365 | 245 | **305** | 365 | 245 | **305** | 365 | 245 | **305** | 365 | 270 | **335** | 400 |
| | 23 | 405 | **505** | 605 | 405 | **505** | 605 | 405 | **505** | 605 | 405 | **505** | 605 | 445 | **555** | 665 |
| | 24 | 245 | **305** | 370 | 245 | **305** | 370 | 245 | **305** | 370 | 245 | **305** | 370 | 270 | **340** | 405 |
| N | 25 | 70 | **90** | 105 | 70 | **90** | 105 | 70 | **90** | 105 | 85 | **105** | 125 | 95 | **115** | 140 |
| | 26 | 320 | **400** | 480 | 320 | **400** | 480 | 320 | **400** | 480 | 145 | **180** | 215 | 160 | **200** | 235 |
| | 27 | 295 | **370** | 440 | 295 | **370** | 440 | 295 | **370** | 440 | 135 | **170** | 205 | 150 | **185** | 225 |
| | 28 | 320 | **400** | 480 | 320 | **400** | 480 | 320 | **400** | 480 | 145 | **180** | 215 | 160 | **200** | 235 |
| | 29 | 150 | **185** | 220 | 150 | **185** | 220 | 150 | **185** | 220 | 180 | **220** | 265 | 200 | **245** | 295 |
| | 30 | 135 | **170** | 205 | 135 | **170** | 205 | 135 | **170** | 205 | 165 | **205** | 245 | 180 | **225** | 270 |
| | ap [mm] | 0,025 | — | 0,510 | 0,025 | — | 0,510 | 0,025 | — | 0,510 | 0,025 | — | 0,510 | 0,025 | — | 0,510 |
| | avance [mm/rev] | 0,127 | — | 0,025 | 0,127 | — | 0,025 | 0,127 | — | 0,025 | 0,127 | — | 0,025 | 0,127 | — | 0,025 |
| | | C2** | | | C25** | | | C3** | | | CG5 | | | CG55** | | |
| | 31 | 40 | **45** | 55 | 40 | **45** | 55 | 40 | **45** | 55 | 40 | **45** | 55 | 40 | **50** | 60 |
| | 32 | 25 | **35** | 40 | 25 | **35** | 40 | 25 | **35** | 40 | 25 | **35** | 40 | 30 | **35** | 45 |
| S | 33 | 30 | **40** | 45 | 30 | **40** | 45 | 30 | **40** | 45 | 30 | **40** | 45 | 35 | **40** | 50 |
| | 34 | 20 | **25** | 35 | 20 | **25** | 35 | 20 | **25** | 35 | 20 | **25** | 35 | 25 | **30** | 35 |
| | 35 | 25 | **30** | 35 | 25 | **30** | 35 | 25 | **30** | 35 | 25 | **30** | 35 | 25 | **35** | 40 |
| | 36 | — | — | — | — | — | — | — | — | — | 35 | **40** | 50 | 40 | **45** | 55 |
| | 37 | — | — | — | — | — | — | — | — | — | 25 | **35** | 40 | 30 | **35** | 45 |
| | ap [mm] | | | | | | | | | | | | | | | |
| | avance [mm/rev] | | | | | | | | | | | | | | | |
| | | C2 | | | C25 | | | C3 | | | CG5 | | | CG55 | | |
| | 38.1 | | | | | | | | | | | | | | | |
| | 38.2 | | | | | | | | | | | | | | | |
| | 39.1 | | | | | | | | | | | | | | | |
| H | 39.2 | | | | | | | | | | | | | | | |
| | 40.1 | | | | | | | | | | | | | | | |
| | 40.2 | | | | | | | | | | | | | | | |
| | 41.1 | | | | | | | | | | | | | | | |
| | 41.2 | | | | | | | | | | | | | | | |

*NOTA: Las tasas de avance y velocidad, así como la profundidad del corte, pueden variar dependiendo de los materiales y las condiciones de mecanizado, incluyendo, pero sin limitarse a, los requisitos de superficie acabada, el tamaño y el voladizo de la herramienta.*

*Un doble asterisco (**) después del nombre de la calidad de la plaquita indica las recomendaciones de calidad principales para el material mostrado. Los nombres de calidad de plaquita sin doble asterisco son opciones secundarias.*

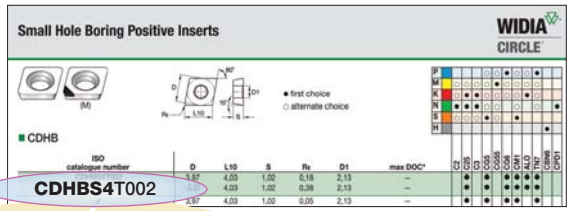
| | | | | | | | | | | | | | | | | | | VDI 3323 | ANSI ISO 513 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Velocidad de corte • vc m/min | | | | | | | | | | | | | | | | | | Grupo de materiales | |
| mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | | |
| | | | | | | | | | 0,051 | — | 0,300 | 0,025 | — | 0,300 | 0,025 | — | 0,300 | ap [mm] | |
| | | | | | | | | | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | avance [mm/rev] | |
| CG6 | | | CM1 | | | ALO | | | TN7 | | | CBN6 | | | CPD1 | | | | |
| | | | | | | | | | 95 | **120** | 145 | 105 | **130** | 155 | 105 | **130** | 155 | **1** | |
| | | | | | | | | | 70 | **90** | 105 | 80 | **95** | 115 | 80 | **95** | 115 | **2** | |
| | | | | | | | | | 55 | **70** | 80 | 60 | **75** | 90 | 60 | **75** | 90 | **3** | |
| | | | | | | | | | 65 | **75** | 90 | 70 | **85** | 100 | 70 | **85** | 100 | **4** | |
| | | | | | | | | | 45 | **55** | 70 | 50 | **65** | 75 | 50 | **65** | 75 | **5** | |
| | | | | | | | | | 75 | **95** | 110 | 85 | **105** | 125 | 85 | **105** | 125 | **6** | |
| | | | | | | | | | 50 | **60** | 75 | 55 | **70** | 80 | 55 | **70** | 80 | **7** | P |
| | | | | | | | | | 45 | **55** | 70 | 50 | **65** | 75 | 50 | **65** | 75 | **8** | |
| | | | | | | | | | 40 | **50** | 60 | 45 | **55** | 65 | 45 | **55** | 65 | **9** | |
| | | | | | | | | | 70 | **85** | 100 | 75 | **95** | 110 | 75 | **95** | 110 | **10** | |
| | | | | | | | | | 45 | **55** | 65 | 50 | **60** | 70 | 50 | **60** | 70 | **11** | |
| | | | | | | | | | 70 | **85** | 100 | 75 | **95** | 110 | 75 | **95** | 110 | **12** | |
| | | | | | | | | | 55 | **70** | 85 | 65 | **80** | 95 | 65 | **80** | 95 | **13.1** | |
| | | | | | | | | | 45 | **55** | 65 | 50 | **60** | 70 | 50 | **60** | 70 | **13.2** | |
| 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | ap [mm] | |
| 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | 0,300 | — | 0,025 | avance [mm/rev] | |
| CG6 | | | CM1 | | | ALO | | | TN7 | | | CBN6 | | | CPD1 | | | | |
| 95 | **120** | 145 | 55 | **70** | 85 | 110 | **135** | 160 | 105 | **130** | 155 | | | | | | | **14.1** | |
| 75 | **95** | 110 | 45 | **55** | 65 | 85 | **105** | 125 | 85 | **105** | 125 | | | | | | | **14.2** | M |
| 90 | **110** | 130 | 50 | **65** | 75 | 100 | **120** | 145 | 95 | **120** | 145 | | | | | | | **14.3** | |
| 55 | **65** | 80 | 35 | **40** | 45 | 65 | **75** | 90 | 60 | **75** | 90 | | | | | | | **14.4** | |
| 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | 0,051 | — | 0,300 | ap [mm] | |
| 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 | 0,250 | — | 0,025 | avance [mm/rev] | |
| CG6** | | | CM1** | | | ALO | | | TN7** | | | CBN6 | | | CPD1 | | | | |
| 90 | **110** | 130 | 55 | **70** | 85 | 150 | **185** | 220 | 100 | **125** | 150 | | | | | | | **15** | |
| 65 | **75** | 90 | 40 | **50** | 60 | 105 | **130** | 155 | 70 | **90** | 105 | | | | | | | **16** | |
| 100 | **125** | 150 | 65 | **80** | 95 | 165 | **210** | 250 | 110 | **140** | 165 | | | | | | | **17** | K |
| 65 | **80** | 100 | 40 | **50** | 60 | 110 | **135** | 165 | 75 | **90** | 110 | | | | | | | **18** | |
| 120 | **150** | 180 | 75 | **95** | 115 | 205 | **255** | 310 | 140 | **170** | 205 | | | | | | | **19** | |
| 70 | **85** | 105 | 45 | **55** | 65 | 120 | **145** | 175 | 80 | **100** | 120 | | | | | | | **20** | |
| | | | 0,051 | — | 0,510 | | | | 0,051 | — | 0,510 | | | | 0,051 | — | 0,510 | ap [mm] | |
| | | | 0,200 | — | 0,025 | | | | 0,200 | — | 0,025 | | | | 0,200 | — | 0,025 | avance [mm/rev] | |
| CG6 | | | CM1** | | | ALO | | | TN7** | | | CBN6 | | | CPD1 | | | | |
| | | | 405 | **505** | 605 | | | | 405 | **505** | 605 | | | | 855 | **1070** | 1285 | **21** | |
| | | | 245 | **305** | 365 | | | | 245 | **305** | 365 | | | | 735 | **915** | 1100 | **22** | |
| | | | 405 | **505** | 605 | | | | 405 | **505** | 605 | | | | 685 | **855** | 1025 | **23** | |
| | | | 245 | **305** | 370 | | | | 245 | **305** | 370 | | | | 540 | **675** | 805 | **24** | |
| | | | 70 | **90** | 105 | | | | 85 | **105** | 125 | | | | 370 | **460** | 550 | **25** | N |
| | | | 105 | **125** | 155 | | | | 200 | **245** | 295 | | | | 330 | **415** | 495 | **26** | |
| | | | 100 | **125** | 150 | | | | 195 | **240** | 290 | | | | 320 | **400** | 480 | **27** | |
| | | | 105 | **125** | 155 | | | | 200 | **245** | 295 | | | | 330 | **415** | 495 | **28** | |
| | | | 150 | **185** | 220 | | | | 200 | **245** | 295 | | | | 345 | **430** | 515 | **29** | |
| | | | 135 | **170** | 205 | | | | 160 | **200** | 240 | | | | 330 | **415** | 495 | **30** | |
| | | | 0,025 | — | 0,510 | | | | | | | | | | | | | ap [mm] | |
| | | | 0,127 | — | 0,025 | | | | | | | | | | | | | avance [mm/rev] | |
| CG6 | | | CM1 | | | ALO | | | TN7 | | | CBN6 | | | CPD1 | | | | |
| | | | 35 | **40** | 45 | | | | | | | | | | | | | **31** | |
| | | | 25 | **30** | 35 | | | | | | | | | | | | | **32** | |
| | | | 25 | **35** | 40 | | | | | | | | | | | | | **33** | S |
| | | | 20 | **25** | 30 | | | | | | | | | | | | | **34** | |
| | | | 20 | **25** | 30 | | | | | | | | | | | | | **35** | |
| | | | 30 | **35** | 45 | | | | | | | | | | | | | **36** | |
| | | | 25 | **30** | 35 | | | | | | | | | | | | | **37** | |
| | | | | | | | | | | | | 0,025 | — | 0,300 | | | | ap [mm] | |
| | | | | | | | | | | | | 0,127 | — | 0,025 | | | | avance [mm/rev] | |
| CG6 | | | CM1 | | | ALO | | | TN7 | | | CBN6 | | | CPD1 | | | | |
| | | | | | | | | | | | | 110 | **140** | 165 | | | | **38.1** | |
| | | | | | | | | | | | | 105 | **130** | 155 | | | | **38.2** | |
| | | | | | | | | | | | | 100 | **125** | 150 | | | | **39.1** | |
| | | | | | | | | | | | | 90 | **110** | 135 | | | | **39.2** | H |
| | | | | | | | | | | | | — | — | — | | | | **40.1** | |
| | | | | | | | | | | | | — | — | — | | | | **40.2** | |
| | | | | | | | | | | | | — | — | — | | | | **41.1** | |
| | | | | | | | | | | | | — | — | — | | | | **41.2** | |

*NOTA: Las tasas de avance y velocidad, así como la profundidad del corte, pueden variar dependiendo de los materiales y las condiciones de mecanizado, incluyendo, pero sin limitarse a, los requisitos de superficie acabada, el tamaño y el voladizo de la herramienta.*

*Un doble asterisco (**) después del nombre de la calidad de la plaquita indica las recomendaciones de calidad principales para el material mostrado. Los nombres de calidad de plaquita sin doble asterisco son opciones secundarias.*

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




## C
Forma de la plaquita

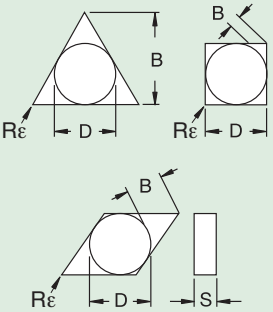
| | | |
|---|---|---|
| T | 60° | |
| C | 80° | 80° |
| G | 45° | 45° |
| W | 80° | |

## D
Ángulo de incidencia de la plaquita

| | |
|---|---|
| B | 5° |
| C | 7° |
| D | 15° |
| P | 11° |

## H
Clase de tolerancia

**Las tolerancias se aplican antes de la preparación y el recubrimiento de los filos**




D: Diámetro teórico del círculo inscrito en la plaquita
S: Grosor
B: Consulte las cifras que se expresan a continuación

## B
Características de la plaquita

| | | |
|---|---|---|
| W | Orificio parcialmente cilíndrico, avellanado de 40 a 60°, cara única | sin rompevirutas |
| T | | con rompevirutas |
| B | Orificio parcialmente cilíndrico, avellanado de 70 a 90°, cara única | sin rompevirutas |
| H | | con rompevirutas |

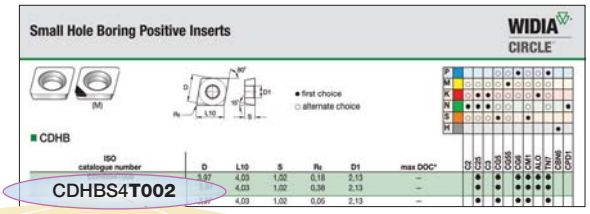
## S4
Plaquita

Código para longitud métrica del filo de corte "L10"

| "D" mm | C | G | T | W |
|---|---|---|---|---|
| 3,97 | S4 | 05 | 06 | — |
| 4,06 | — | — | 07 | — |
| 4,76 | 04 | 06 | 08 | S3 |
| 6,35 | 06 | — | 11 | 04 |
| 9,53 | 09 | — | 16 | 06 |
| 9,80 | — | — | 17 | — |

| Clase de tolerancia | tolerancia en "D" | tolerancia en "B" | tolerancia en "S" |
|---|---|---|---|
| H | ±0,013 | ±0,013 | ±0,025 |
| HG | ±0,025 | ±0,025 | ±0,013 |
| M | ±0,05 | ±0,11 | ±0,013 |

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## T0

Grosor

| símbolo | grosor |
|---|---|
| mm | mm |
| T0 | 1,00; 1,02 |
| 01 | 1,59; 1,58 |
| T1 | 1,98; 1,91 |
| 02 | 2,38; 2,36 |
| 03 | 3,18 |
| T3 | 3,97 |
| S1 | 1,19 |

## 02

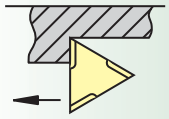
Radio de esquina "Rε"

| símbolo | radio de esquina |
|---|---|
| mm | mm |
| X0 | 0,04; 0,05 |
| 01 | 0,1 |
| 02 | 0,2; 0,18 |
| 04 | 0,4; 0,38 |
| 05 | 0,5 |
| 08 | 0,8 |
| 09 | 0,9 |
| 12 | 1,2 |
| 16 | 1,6 |

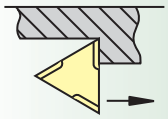
Dirección de la plaquita *(opcional)*

**R** = a derechas

**L** = a izquierdas



R



L

Características del control de virutas o condición del filo de corte *(opcional)*

**HP** Muy positiva

**LF** Acabado ligero

Estilo de punta *(opcional)*

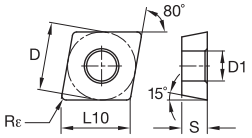
**Símbolo**

M

**Uso**

Minipunta

(M)



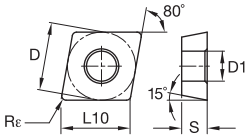

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ CDHB

| Número de catálogo ISO | D | L10 | S | Rε | D1 | max DOC* | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CDHBS4T002** | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | — | | ● | | ● | | ● | ● | ● | ● | | |
| **CDHBS4T004** | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | — | | ● | | ● | | ● | ● | ● | ● | | |
| **CDHBS4T0X0** | 3,97 | 4,03 | 1,02 | 0,05 | 2,13 | — | | ● | | ● | | ● | ● | | ● | | |
| **CDHBS4T002M** | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | 0,96 | | | | | | | | | | ● | ● |
| **CDHBS4T0X0M** | 3,97 | 4,03 | 1,02 | 0,05 | 2,13 | 0,96 | | | | | | | | | | ● | ● |
| **CDHBS4T004M** | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | 0,96 | | | | | | | | | | ● | ● |

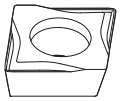
**la DOC máx. sólo se aplica a plaquitas con punta, designadas con una "M" al final del número de catálogo.*

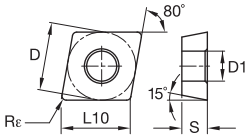



## ■ CDHH-R/L

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | | | | | | |
| **CDHHS4T002R** | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | | | | ● | | ● | ● | | | | |
| **CDHHS4T004R** | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | | | | ● | | | | | | | |
| **A izquierdas** | | | | | | | | | | | | | | | | |
| **CDHHS4T002L** | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | | | | ● | | ● | ● | | ● | | |
| **CDHHS4T004L** | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | | | | ● | | ● | ● | | | | |

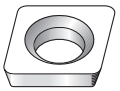
**la DOC máx. sólo se aplica a plaquitas con punta, designadas con una "M" al final del número de catálogo.*

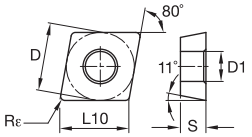





## ■ CDHH

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CDHHS4T002** | 3,97 | 4,03 | 1,02 | 0,18 | 2,13 | | | | ● | | | ● | | | | |
| **CDHHS4T004** | 3,97 | 4,03 | 1,02 | 0,38 | 2,13 | | | | ● | | | | | | | |



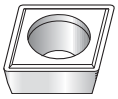


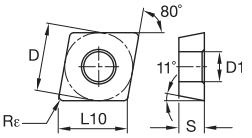

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ CPHB

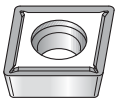
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPHB06T102 | 6,35 | 6,45 | 1,91 | 0,18 | 2,80 | | | | ● | | | ● | | | | |
| CPHB06T104 | 6,35 | 6,45 | 1,91 | 0,38 | 2,80 | | | | ● | | | | | | | |

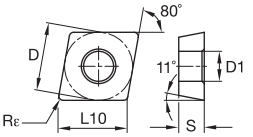





## ■ CPHH

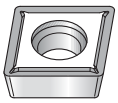
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPHH06T102 | 6,35 | 6,45 | 1,91 | 0,18 | 2,80 | | | | ● | | ● | ● | | | | |
| CPHH06T104 | 6,35 | 6,45 | 1,91 | 0,38 | 2,80 | | | | ● | | ● | ● | | | | |

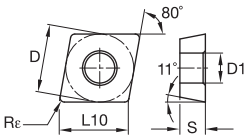





## ■ CPGT-LF

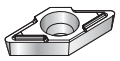
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPGT09T304LF | 9,53 | 9,67 | 3,97 | 0,40 | 4,40 | | | | ● | | | | | | | |

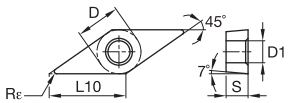





## ■ CPMT-LF

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CPMT09T302LF | 9,53 | 9,67 | 3,97 | 0,20 | 4,40 | | | | ● | | | | | | | |
| CPMT09T304LF | 9,53 | 9,67 | 3,97 | 0,40 | 4,40 | | | | ● | | | ● | | | | |
| CPMT09T308LF | 9,53 | 9,67 | 3,97 | 0,80 | 4,40 | | | | ● | | | | | | | |



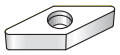


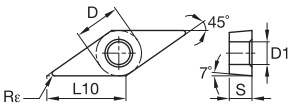

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ GCHW

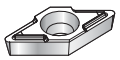
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GCHW060202 | 4,76 | 6,73 | 2,36 | 0,18 | 2,39 | | | | ● | | ● | ● | | | | |
| GCHW060204 | 4,76 | 6,73 | 2,36 | 0,38 | 2,39 | | | | ● | | ● | ● | | | | |

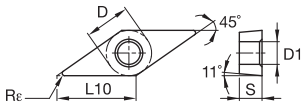





## ■ GCHT

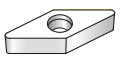
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GCHT060202 | 4,83 | 6,83 | 2,36 | 0,18 | 2,39 | | | | ● | | | ● | | | | |
| GCHT060204 | 4,83 | 6,83 | 2,36 | 0,38 | 2,39 | | | | ● | | | ● | | | | |

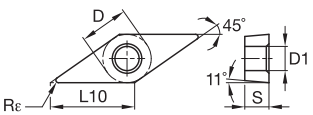





## ■ GPHW

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPHW050102 | 3,97 | 5,61 | 1,58 | 0,18 | 2,13 | | | | ● | | ● | ● | | | | |
| GPHW050104 | 3,97 | 5,61 | 1,58 | 0,38 | 2,13 | | | | ● | | ● | ● | | | | |

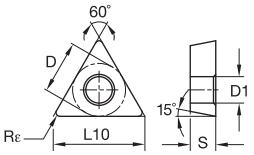





## ■ GPHT

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPHT050102 | 4,08 | 5,61 | 1,58 | 0,18 | 2,13 | | | | ● | | | ● | | | | |
| GPHT050104 | 4,08 | 5,61 | 1,58 | 0,38 | 2,13 | | | | ● | | | ● | | | | |

(M)



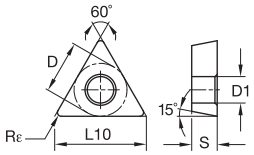

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ TDHB

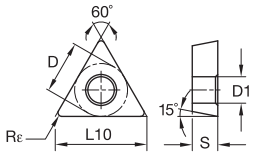
| Número de catálogo ISO | D | L10 | S | Rε | D1 | max DOC* | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TDHB07S1X0** | 4,06 | 7,04 | 1,19 | 0,05 | 2,39 | — | | ● | | ● | | ● | ● | | ● | | |
| **TDHB07S102** | 4,06 | 7,04 | 1,19 | 0,18 | 2,39 | — | | ● | | ● | | ● | ● | ● | ● | | |
| **TDHB07S104** | 4,06 | 7,04 | 1,19 | 0,38 | 2,39 | — | | ● | | ● | | ● | ● | | ● | | |
| **TDHB07S108** | 4,06 | 7,04 | 1,19 | 0,79 | 2,39 | — | | ● | | ● | | ● | ● | | | | |
| **TDHB07S1X0M** | 4,06 | 7,04 | 1,19 | 0,05 | 2,39 | 1,27 | | | | | | | | | | ● | ● |
| **TDHB07S102M** | 4,06 | 7,04 | 1,19 | 0,18 | 2,39 | 1,27 | | | | | | | | | | ● | ● |
| **TDHB07S104M** | 4,06 | 7,04 | 1,19 | 0,38 | 2,39 | 1,27 | | | | | | | | | | ● | ● |
| **TDHB07S108M** | 4,06 | 7,04 | 1,19 | 0,79 | 2,39 | 1,27 | | | | | | | | | | ● | ● |

**la DOC máx. sólo se aplica a plaquitas con punta, designadas con una "M" al final del número de catálogo.*



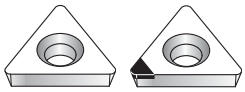

## ■ TDHH-R/L

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | | | | | | |
| **TDHH07S102R** | 4,06 | 7,04 | 1,19 | 0,18 | 2,39 | | | | ● | | | ● | | | | |
| **TDHH07S104R** | 4,06 | 7,04 | 1,19 | 0,38 | 2,39 | | | | ● | | | | | | | |
| **A izquierdas** | | | | | | | | | | | | | | | | |
| **TDHH07S102L** | 4,06 | 7,04 | 1,19 | 0,18 | 2,39 | | | | ● | | ● | ● | | ● | | |
| **TDHH07S104L** | 4,06 | 7,04 | 1,19 | 0,38 | 2,39 | | | | ● | | ● | ● | | ● | | |

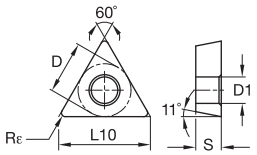



## ■ TDHH

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TDHH07S102** | 4,06 | 7,04 | 1,19 | 0,18 | 2,41 | | | | ● | | | ● | | | | |
| **TDHH07S104** | 4,06 | 7,04 | 1,19 | 0,38 | 2,41 | | | | ● | | | | | | | |



(M)



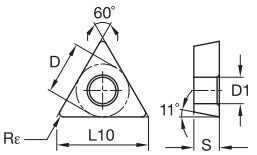

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ TPHB

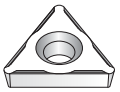
| Número de catálogo ISO | D | L10 | S | Rε | D1 | max DOC* | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPHB1102X0** | 6,35 | 11,00 | 2,38 | 0,05 | 3,30 | – | | | ● | ● | | ● | ● | | ● | | |
| **TPHB110202** | 6,35 | 11,00 | 2,38 | 0,18 | 3,30 | – | | | ● | ● | | ● | ● | | ● | | |
| **TPHB110204** | 6,35 | 11,00 | 2,38 | 0,40 | 3,30 | – | | | ● | ● | | ● | ● | ● | ● | | |
| **TPHB110208** | 6,35 | 11,00 | 2,38 | 0,79 | 3,30 | – | | | ● | ● | | ● | ● | | ● | | |
| **TPHB1603X0** | 9,53 | 16,50 | 3,18 | 0,05 | 3,30 | – | ● | | | ● | | ● | ● | ● | ● | | |
| **TPHB160302** | 9,53 | 16,50 | 3,18 | 0,18 | 3,30 | – | ● | | | ● | | ● | ● | | ● | | |
| **TPHB160304** | 9,53 | 16,50 | 3,18 | 0,38 | 3,30 | – | ● | | | ● | | ● | ● | ● | ● | | |
| **TPHB160308** | 9,53 | 16,50 | 3,18 | 0,79 | 3,30 | – | ● | | | ● | | ● | ● | | ● | | |
| **TPHB160316** | 9,53 | 16,50 | 3,18 | 1,60 | 3,30 | – | | | | ● | | | | | | | |
| **TPHB160304M** | 9,53 | 16,50 | 3,18 | 0,38 | 3,30 | 1,98 | | | | | | | | | | | ● |
| **TPHB160308M** | 9,53 | 16,50 | 3,18 | 0,79 | 3,30 | 1,98 | | | | | | | | | | | ● |
| **TPHB1102X0M** | 6,35 | 11,00 | 2,38 | 0,05 | 3,30 | 1,62 | | | | | | | | | | ● | ● |
| **TPHB110202M** | 6,35 | 11,00 | 2,38 | 0,18 | 3,30 | 1,62 | | | | | | | | | | ● | ● |
| **TPHB110204M** | 6,35 | 11,00 | 2,38 | 0,40 | 3,30 | 1,62 | | | | | | | | | | ● | ● |
| **TPHB110208M** | 6,35 | 11,00 | 2,38 | 0,79 | 3,30 | 1,62 | | | | | | | | | | | ● |

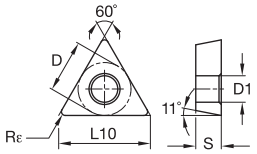
**la DOC máx. sólo se aplica a plaquitas con punta, designadas con una "M" al final del número de catálogo.*




## ■ TPHH-R/L

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | | | | | | |
| **TPHH110202R** | 6,35 | 11,00 | 2,38 | 0,18 | 3,30 | | | | ● | | | | | | | |
| **TPHH110204R** | 6,35 | 11,00 | 2,38 | 0,40 | 3,30 | | | | ● | | ● | | | | | |
| **TPHH110208R** | 6,35 | 11,00 | 2,38 | 0,79 | 3,30 | | | | ● | | | ● | | | | |
| **TPHH160302R** | 9,53 | 16,50 | 3,18 | 0,18 | 3,30 | | | | ● | | | ● | | | | |
| **TPHH160304R** | 9,53 | 16,50 | 3,18 | 0,40 | 3,30 | | | | ● | | ● | | | | | |
| **TPHH160308R** | 9,53 | 16,50 | 3,18 | 0,79 | 3,30 | | | | ● | | | | | | | |
| **A izquierdas** | | | | | | | | | | | | | | | | |
| **TPHH110202L** | 6,35 | 11,00 | 2,38 | 0,18 | 3,30 | | | | ● | | ● | ● | | ● | | |
| **TPHH110204L** | 6,35 | 11,00 | 2,38 | 0,40 | 3,30 | | | | ● | | ● | ● | | ● | | |
| **TPHH110208L** | 6,35 | 11,00 | 2,38 | 0,79 | 3,30 | | | | ● | | ● | | | | | |
| **TPHH160302L** | 9,53 | 16,50 | 3,18 | 0,18 | 3,30 | | | | ● | | ● | ● | | ● | | |
| **TPHH160304L** | 9,53 | 16,50 | 3,18 | 0,40 | 3,30 | | | | ● | | ● | ● | | ● | | |
| **TPHH160308L** | 9,53 | 16,50 | 3,18 | 0,79 | 0,33 | | | | ● | | ● | ● | | | | |



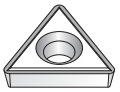


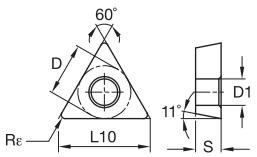

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ TPHH

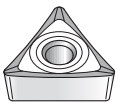
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPHH110202 | 6,50 | 11,00 | 2,38 | 0,18 | 3,30 | | | | ● | | ● | ● | | ● | | |
| TPHH110204 | 6,50 | 11,00 | 2,38 | 0,38 | 3,30 | ● | | | ● | | ● | ● | | ● | | |

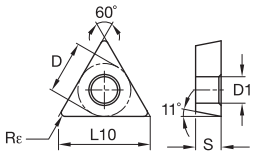





## ■ TPHH-LF

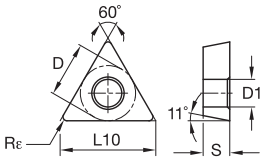
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPHH160304LF | 9,53 | 16,50 | 3,18 | 0,38 | 3,30 | | ● | | ● | | ● | ● | ● | | | |
| TPHH160308LF | 9,53 | 16,50 | 3,18 | 0,79 | 3,30 | | ● | | ● | | ● | ● | ● | ● | | |
| TPHH17T305LF | 9,80 | 16,98 | 3,96 | 0,53 | 3,30 | | | | | | ● | | | | | |
| TPHH17T309LF | 9,80 | 16,98 | 3,96 | 0,94 | 3,30 | | | | ● | | ● | | | | | |






## ■ TPGT-HP

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPGT110202HP | 6,35 | 11,00 | 2,38 | 0,20 | 2,90 | | | | ● | | | ● | | | | |
| TPGT110204HP | 6,35 | 11,00 | 2,38 | 0,40 | 2,90 | | | | ● | | | ● | | | | |
| TPGT16T304HP | 9,53 | 16,50 | 3,97 | 0,40 | 4,40 | | | | ● | | | ● | | | | |

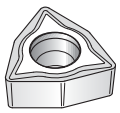


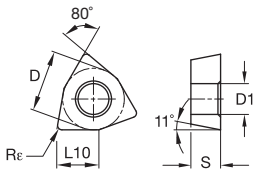

● primera elección
○ elección alternativa

| | | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | ○ | ○ | ● | ○ | ○ | ● | | |
| M | | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | | |
| K | | ○ | ● | ● | ○ | ○ | ○ | ○ | ● | ○ | | |
| N | | ● | ● | ● | ○ | ○ | | ○ | | ○ | | ● |
| S | | ○ | ○ | ○ | ● | ○ | | ● | | | | |
| H | | | | | | | | | | | ● | |

## ■ TPMT-LF

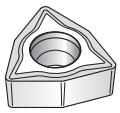
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TPMT110202LF** | 6,35 | 11,00 | 2,38 | 0,20 | 2,80 | | | | ● | | ● | | | | | |
| **TPMT110204LF** | 6,35 | 11,00 | 2,38 | 0,40 | 2,80 | | | | ● | | ● | | | | | |
| **TPMT160304LF** | 9,53 | 16,50 | 3,18 | 0,40 | 4,40 | | | | ● | | ● | | | | | |
| **TPMT160308LF** | 9,53 | 16,50 | 3,18 | 0,79 | 4,40 | | | | ● | | ● | | | | | |
| **TPMT160312LF** | 9,53 | 16,50 | 3,18 | 1,19 | 4,40 | | | | ● | | | | | | | |

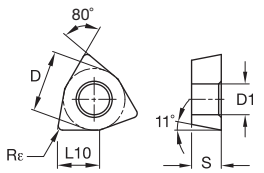





## ■ WPHT

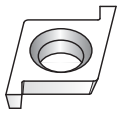
| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WPHTS30101** | 4,76 | 3,26 | 1,59 | 0,10 | 2,13 | | | | ● | | | ● | | | | |
| **WPHTS30102** | 4,76 | 3,26 | 1,59 | 0,20 | 2,13 | | | | ● | | | ● | | | | |
| **WPHTS30104** | 4,76 | 3,26 | 1,59 | 0,38 | 2,13 | | | | ● | | | ● | | | | |
| **WPHT040201** | 6,35 | 4,34 | 2,38 | 0,10 | 2,80 | | | | ● | | | ● | | | | |
| **WPHT040202** | 6,35 | 4,34 | 2,38 | 0,20 | 2,80 | | | | ● | | | ● | | | | |
| **WPHT040204** | 6,35 | 4,34 | 2,38 | 0,38 | 2,80 | | | | ● | | | ● | | | | |

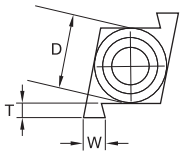


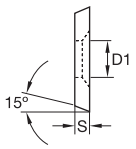


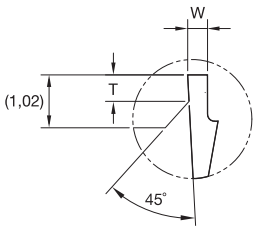

## ■ WPMT-LF

| Número de catálogo ISO | D | L10 | S | Rε | D1 | C2 | C25 | C3 | CG5 | CG55 | CG6 | CM1 | ALO | TN7 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WPMTS3T104LF** | 4,76 | 3,25 | 1,98 | 0,40 | 2,15 | | | | | ● | | | | | | |
| **WPMT040204LF** | 6,35 | 4,34 | 2,38 | 0,40 | 2,90 | | | | | ● | | | | | | |
| **WPMT06T304LF** | 9,53 | 6,52 | 3,97 | 0,40 | 4,40 | | | | | ● | | | | | | |
| **WPMT06T308LF** | 9,53 | 6,52 | 3,97 | 0,80 | 4,40 | | | | | ● | | | | | | |





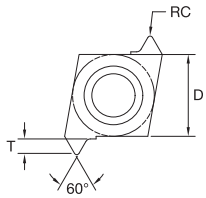

● primera elección
○ elección alternativa

| | | C25 | CG5 | CG6 | CM1 |
|---|---|---|---|---|---|
| P | | ○ | ● | ○ | |
| M | | ○ | ○ | ○ | |
| K | | ● | ○ | ○ | |
| N | | ● | ○ | | |
| S | | ○ | ● | | |
| H | | | | | |

NOTA: Detalle de plaquita de 0,38.

## ■ CDG-R/L

| Número de catálogo ISO | D | S | T | W | D1 | C25 | CG5 | CG6 | CM1 |
|---|---|---|---|---|---|---|---|---|---|
| **CDG50152R** | 3,97 | 1,27 | 0,51 | 0,38 | 2,13 | | ● | | ● |
| **CDG50252R** | 3,97 | 1,27 | 1,02 | 0,64 | 2,13 | | ● | | ● |
| **CDG50302R** | 3,97 | 1,27 | 1,02 | 0,76 | 2,13 | | ● | | ● |




## ■ CDT-R/L

| Número de catálogo ISO | D | S | T | RC | D1 | TP min | TP max | C25 | CG5 | CG6 | CM1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CDT50022R** | 3,97 | 1,27 | 0,76 | 0,05 | 2,11 | 0,5 | 1,0 | | ● | | ● |

| Número de catálogo WIDIA-CIRCLE™ | Nuevo número de catálogo ISO |
|---|---|
| CDCD | CDHB |
| CDCG | CDHH |
| CDCT | CDHH |
| CPCA | CPHB |
| CPCM | CPHH |
| GCCD | GCHW |
| GCCT | GCHT |
| GPCD | GPHW |
| GPCT | GPHT |
| TD6P | TPHB |
| TDAB | TDHB |
| TDAT | TDHH |
| TDCG | TDHH |
| TPCB | TPHB |
| TPCG | TPHH |
| TPCH | TPHH |
| TPGH | TPHH |
| TPMT | TPMT |
| WPGT | WPHT |

## Tornillos de plaquita

| Número de pedido | Número de catálogo ISO | Torx/hex. | rosca interior |
|---|---|---|---|
| 2840098 | MSM46 | 2mm | M4X0.7 |
| 2892513 | BS832 | 5/64 | #8-32 |
| 2840186 | AS832 | 5/64 | #8-32 |
| 2823227 | SC30 | T10 | #4-40 |
| 2823203 | STM31 | T15 | M3.5 X 0.6 |
| 2832641 | CT15 | T16 | #1-72 |
| 2820981 | LTM16 | T5 | M2X0.4 |
| 2832647 | CC11 | T6 | #1-72 |
| 2832635 | CT11 | T6 | #1-72 |
| 2832655 | CC09 | T6 | #1-72 |
| 2825948 | QTM26 | T7 | M2.5X0.45 |
| 2825941 | QTM20 | T7 | M2.5X0.45 |
| 2830477 | FC11 | T7 | #2-56 |
| 2828337 | GT21 | T7 | #2-56 |
| 2830471 | FC14 | T7 | #2-56 |
| 2826005 | QC15 | T8 | #3-48 |
| 2826031 | QC26 | T9 | #4-40 |
| 2826038 | QC21 | T9 | #4-40 |

## Llaves

| Número de pedido | Número de catálogo ISO | Torx/hex. |
|---|---|---|
| 2840174 | AKEY | 5/64 |
| 2840094 | MKEY | 2mm |
| 2823182 | SKEY | T10 |
| 2823189 | STKEY | T15 |
| 2828318 | GTKEY | T5 |
| 2832628 | CKEY | T6 |
| 2830492 | FKEY | T7 |
| 2825952 | QTKEY | T7 |
| 2825973 | Q8KEY | T8 |
| 2825982 | QKEY | T9 |

## Punteras de accionamiento

| Número de pedido | Número de catálogo ISO | Torx/hex. |
|---|---|---|
| 2840089 | MBIT | 2mm |
| 2823236 | SBIT | T10 |
| 2823196 | STBIT | T15 |
| 2828324 | GTBIT | T5 |
| 2832661 | CBIT | T6 |
| 2825963 | QTBIT | T7 |
| 2830497 | FBIT | T7 |
| 2825964 | Q8BIT | T8 |
| 2826045 | QBIT | T9 |

## Cuñas

| Número de pedido | Número de catálogo ISO |
|---|---|
| 2840192 | AW250 |
| 2836024 | BW312 |

# Herramientas para orificios pequeños de serie A/B

## *Gama de aplicaciones de barras de micro-mandrinado*

Disponible en mangos de acero y metal duro, la línea WIDIA™ de barras de micro-mandrinadoes una opción excelente y económica para una amplia gama de aplicaciones: desde la creación de orificios pequeños en piezas pequeñas hasta el micro-mandrinado de precisión que se suele encontrar en piezas de trabajo grandes, como las que se fabrican en los sectores aeroespacial, maquinaria pesada y de automoción.

## *Barra de micro-mandrinado de la serie A/B*

### Características:

- Amplitud de mandrinado de diámetro de 1,57 mm a 3,96 mm.
- Un sistema de bloqueo exclusivo que permite cambios de plaquita rápidos y precisos.
- Repetibilidad de plaquitas garantizada hasta ± 0,013 mm.

### Ventajas:

- Montajes de plaquita rápidos y precisos.
- Disponible en múltiples estilos para el mecanizado de una amplia gama de materiales.
- Mangos para plaquitas rectificadas y elípticas que aportan la máxima fuerza y rigidez.

Tipo ABD

Plaquita de mandrinado reemplazable con ranura para refrigeración.

Tipo ABD

Plaquita de mandrinado reemplazable disponible en metal duro recubierto y sin recubrir, punta de PCD y PCBN. La serie A tiene una ranura para refrigeración.

Tipo BB

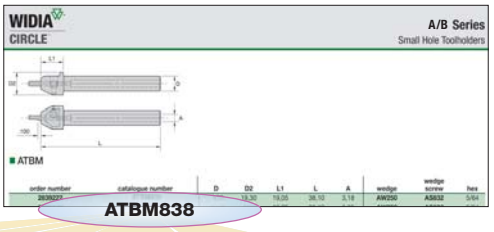
Plaquita de mandrinado reemplazable.

# Herramientas para orificios pequeños de serie A/B

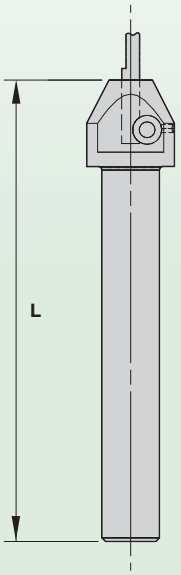
**Portaherramientas para orificios pequeños . . . . . C48–C55**
Sistema de numeración de catálogo: barras de mandrinar . . . . . C50
Portaherramientas . . . . . C51
Calidades y descripciones de calidades . . . . . C52
Tabla de velocidades y avances . . . . . C53
Sistema de numeración de catálogo . . . . . C55

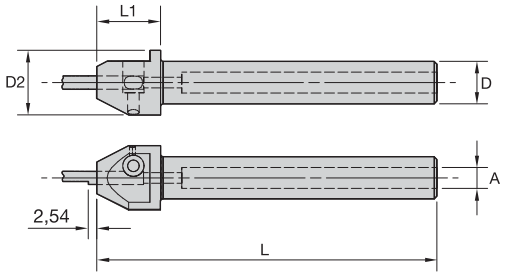
**Plaquitas de metal duro integral . . . . . C56–C59**
Plaquitas . . . . . C56–C58
Hardware . . . . . C59

# Barra de mandrinar de la serie A/B
# Sistema de identificación




| AT | B | M | 8 | 38 |
|---|---|---|---|---|
| Tipo de barra y estilo de la serie<br>*Características de construcción de la barra de mandrinar* | Barra de mandrinar | Tipo | Diámetro del mango<br>*aparece como "D"* | Especial<br>*aparece como "L"* |
| **AT** = Con refrigeración interna<br>**BS** = Sin refrigeración | | **M** = sistema métrico | 8 = 8,00 mm<br>10 = 10,00 mm<br>12 = 12,00 mm<br>16 = 16,00 mm<br>20 = 20,00 mm | 38 = 38,0 mm<br>100 = 100,0 mm<br>102 = 102,0 mm<br>152 = 152,0 mm |

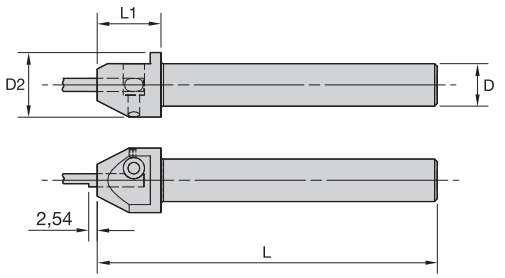





## ATBM

| Número de pedido | Número de catálogo | D | D2 | L | L1 | A | cuña | tornillo de cuña | hex. |
|---|---|---|---|---|---|---|---|---|---|
| **2839222** | **ATBM838** | 8,00 | 19,30 | 38 | 19 | 3,18 | **AW250** | **AS832** | 5/64 |
| **3896120** | **ATBM1038** | 10,00 | 19,30 | 38 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |
| **3896122** | **ATBM1238** | 12,00 | 19,30 | 38 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |
| **3896121** | **ATBM12100** | 12,00 | 19,30 | 102 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |
| **2839192** | **ATBM1638** | 16,00 | 19,30 | 38 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |
| **3896193** | **ATBM16100** | 16,00 | 19,30 | 102 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |
| **3896194** | **ATBM20102** | 20,00 | 19,30 | 102 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |
| **3896195** | **ATBM25102** | 25,00 | 19,30 | 102 | 19 | 6,25 | **AW250** | **AS832** | 5/64 |

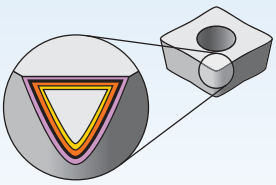
*NOTA: estas herramientas aceptan cualquier plaquita de serie A de metal duro integral (ABD, ABD-M, AGD, APD y ATD).*




## BSBM

| Número de pedido | Número de catálogo | D | D2 | L | L1 | cuña | tornillo de cuña | hex. |
|---|---|---|---|---|---|---|---|---|
| **3896196** | **BSBM20152** | 20,00 | 25,65 | 152 | 29 | **BW312** | **BS832** | 5/64 |

*NOTA: estas herramientas aceptan cualquier plaquita de serie B de metal duro integral (BB y BP).*



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CM1 | HW-S25 | Metal duro sin recubrir. Sustrato sin alear de grano ultrafino y muy duro. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. Utilizar cuando C2, C3 o C25 fallen por astillamiento o rotura. | | | | | | | | | |
| CG5 | HC-S25 | Una calidad con recubrimiento de PVD TiN. Sustrato recto con 9,5% Co. Grano de submicrón. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. | | | | | | | | | |
| CBN6 | BN-H25 | Recubrimiento de PVD-TiAlN sobre una punta de CBN soldada en una plaquita de metal duro. Recomendada para el mecanizado de acero endurecido (45–65 HRC). Para acero de cojinetes, aceros de herramientas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, hierros carburizados y nitrurados y algunos recubrimientos duros. Puede actuar tanto en condiciones con como sin refrigerante. | | | | | | | | | |
| CPD1 | DP-N10 | Una calidad compacta de diamante policristalino (PCD) proporciona una dureza y una resistencia a la abrasión excepcionales. CPD1 es una calidad de mandrinado de acabado superior que mejorará de forma significativa las tolerancias de las piezas de trabajo, los acabados superficiales y la duración de las plaquitas en aluminio con alto contenido en silicio, cobre, grafito de carbono con aluminio, goma dura, materiales plásticos y/o madera. | | | | | | | | | |

| ANSI ISO 513 | VDI 3323 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | ap [mm] | 0,025 | — | 0,200 | 0,025 | — | 0,200 | | | | | | |
| | avance [mm/rev] | 0,178 | — | 0,013 | 0,178 | — | 0,013 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 1 | 95 | **120** | 145 | 55 | **70** | 85 | | | | | | |
| | 2 | 70 | **90** | 105 | 40 | **50** | 60 | | | | | | |
| | 3 | 55 | **70** | 80 | 35 | **40** | 50 | | | | | | |
| | 4 | 65 | **75** | 90 | 40 | **45** | 55 | | | | | | |
| | 5 | 45 | **55** | 70 | 30 | **35** | 40 | | | | | | |
| | 6 | 75 | **95** | 110 | 45 | **55** | 65 | | | | | | |
| P | 7 | 50 | **60** | 75 | 30 | **40** | 45 | | | | | | |
| | 8 | 45 | **55** | 70 | 30 | **35** | 40 | | | | | | |
| | 9 | 40 | **50** | 60 | 25 | **30** | 35 | | | | | | |
| | 10 | 70 | **85** | 100 | 40 | **50** | 60 | | | | | | |
| | 11 | 45 | **55** | 65 | 25 | **30** | 40 | | | | | | |
| | 12 | 70 | **85** | 100 | 40 | **50** | 60 | | | | | | |
| | 13.1 | 55 | **70** | 85 | 35 | **40** | 50 | | | | | | |
| | 13.2 | 45 | **55** | 65 | 25 | **30** | 40 | | | | | | |
| | ap [mm] | 0,025 | — | 0,200 | 0,025 | — | 0,200 | | | | | | |
| | avance [mm/rev] | 0,178 | — | 0,013 | 0,178 | — | 0,013 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 14.1 | 75 | **95** | 110 | 55 | **70** | 85 | | | | | | |
| M | 14.2 | 60 | **75** | 90 | 45 | **55** | 65 | | | | | | |
| | 14.3 | 70 | **85** | 100 | 50 | **65** | 75 | | | | | | |
| | 14.4 | 45 | **55** | 65 | 35 | **40** | 45 | | | | | | |
| | ap [mm] | 0,001 | — | 0,010 | 0,001 | — | 0,010 | | | | | | |
| | avance [mm/rev] | 0,007 | — | 0,0005 | 0,007 | — | 0,0005 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 15 | 75 | **90** | 110 | 55 | **70** | 85 | | | | | | |
| | 16 | 50 | **65** | 75 | 40 | **50** | 60 | | | | | | |
| K | 17 | 80 | **100** | 120 | 65 | **80** | 95 | | | | | | |
| | 18 | 55 | **65** | 80 | 40 | **50** | 60 | | | | | | |
| | 19 | 100 | **125** | 145 | 75 | **95** | 115 | | | | | | |
| | 20 | 55 | **70** | 85 | 45 | **55** | 65 | | | | | | |
| | ap [mm] | 0,025 | — | 0,640 | 0,025 | — | 0,640 | | | | 0,013 | — | 0,760 |
| | avance [mm/rev] | 0,178 | — | 0,013 | 0,178 | — | 0,013 | | | | 0,178 | — | 0,013 |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 21 | 405 | **505** | 605 | 405 | **505** | 605 | | | | 855 | **1070** | 1285 |
| | 22 | 245 | **305** | 365 | 245 | **305** | 365 | | | | 735 | **915** | 1100 |
| | 23 | 405 | **505** | 605 | 405 | **505** | 605 | | | | 685 | **855** | 1025 |
| | 24 | 245 | **305** | 370 | 245 | **305** | 370 | | | | 540 | **675** | 805 |
| N | 25 | | | | 70 | **90** | 105 | | | | 370 | **460** | 550 |
| | 26 | 145 | **180** | 215 | 105 | **125** | 155 | | | | 330 | **415** | 495 |
| | 27 | 135 | **170** | 205 | 100 | **125** | 150 | | | | 320 | **400** | 480 |
| | 28 | 145 | **180** | 215 | 105 | **125** | 155 | | | | 330 | **415** | 495 |
| | 29 | — | — | — | — | — | — | | | | 345 | **430** | 515 |
| | 30 | — | — | — | — | — | — | | | | 330 | **415** | 495 |
| | ap [mm] | 0,025 | — | 0,20 | 0,025 | — | 0,20 | | | | | | |
| | avance [mm/rev] | 0,178 | — | 0,013 | 0,178 | — | 0,013 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 31 | 35 | **40** | 45 | 65 | **80** | 95 | | | | | | |
| | 32 | 25 | **30** | 35 | 45 | **55** | 70 | | | | | | |
| S | 33 | 25 | **35** | 40 | 50 | **65** | 75 | | | | | | |
| | 34 | 20 | **25** | 30 | 40 | **45** | 55 | | | | | | |
| | 35 | 20 | **25** | 30 | 40 | **50** | 60 | | | | | | |
| | 36 | 35 | **40** | 50 | 30 | **35** | 45 | | | | | | |
| | 37 | 25 | **35** | 40 | 25 | **30** | 35 | | | | | | |
| | ap [mm] | | | | | | | 0,025 | — | 0,200 | | | |
| | avance [mm/rev] | | | | | | | 0,004 | — | 0,0005 | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 38.1 | | | | | | | 110 | **140** | 165 | | | |
| | 38.2 | | | | | | | 105 | **130** | 155 | | | |
| | 39.1 | | | | | | | 100 | **125** | 150 | | | |
| H | 39.2 | | | | | | | 90 | **110** | 135 | | | |
| | 40.1 | | | | | | | — | — | — | | | |
| | 40.2 | | | | | | | — | — | — | | | |
| | 41.1 | | | | | | | — | — | — | | | |
| | 41.2 | | | | | | | — | — | — | | | |

# Nuestra completa gama de productos. Su satisfacción total.

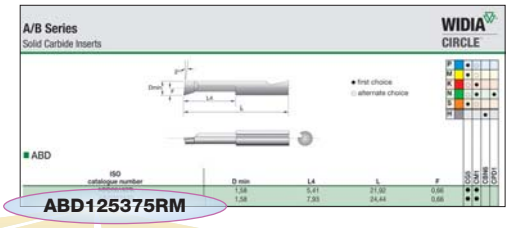
Desde torneado, taladrado y fresado intercambiable a fresado con fresas de mangos de metal duro integral, taladrado con brocas de metal duro integral y roscado: ahora las herramientas más potentes del sector llevan con orgullo la marca WIDIA™. Al adquirir productos WIDIA, no sólo está comprando velocidad, potencia y precisión, sino que invierte en calidad y una satisfacción total.

La gama más amplia de productos diseñados con precisión y servicios de soluciones a medida que hay disponible en la actualidad están acompañados de una red internacional especializada de socios distribuidores autorizados; esto le proporcionará las herramientas que necesita… y la potencia que sólo se consigue con las marcas WIDIA. Para obtener información sobre los productos o programar una demostración in situ, visite www.widia.com.

WIDIA™
www.widia.com

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

# Serie A/B (sistema métrico)
# Sistema de identificación de barras de mandrinar




## ABD
Estilo de plaquita

**Serie A** = Con refrigeración interna

**ABC** = Mandrinado intercambiable

**ABD** = Mandrinado

**AGD** = Ranurado

**APD** = Perfilado

**ATD** = Roscado

**Serie B** = Sin refrigeración

**BB** = Mandrinado

**BP** = Perfilado

## 125
Mandrinado mínimo
*aparece como "D min"*

**Serie A**

| | | |
|---|---|---|
| 06 | = | 1,58 mm |
| 09 | = | 2,39 mm |
| 125 | = | 3,18 mm |
| 156 | = | 3,96 mm |

**(sólo estilo AGD)**

| | | |
|---|---|---|
| 095 | = | 2,79 mm |
| 125 | = | 3,56 mm |
| 156 | = | 4,45 mm |

**(sólo estilo ATD)**

| | | |
|---|---|---|
| 095 | = | 2,79 mm |
| 125 | = | 3,56 mm |
| 156 | = | 4,45 mm |

**Serie B**

| | | |
|---|---|---|
| 187 | = | 4,75 mm |
| 250 | = | 6,35 mm |
| 312 | = | 7,93 mm |

## 375
Dimensiones
*aparece como "L4"*

**Profundidad del mandrinado**

| | | |
|---|---|---|
| 187 | = | 4,75 mm |
| 281 | = | 7,14 mm |
| 312 | = | 7,93 mm |
| 375 | = | 9,53 mm |
| 500 | = | 12,70 mm |
| 600 | = | 15,24 mm |
| 625 | = | 15,88 mm |
| 750 | = | 19,05 mm |
| 825 | = | 20,96 mm |
| 875 | = | 22,23 mm |
| 1000 | = | 25,40 mm |
| 1250 | = | 31,75 mm |
| 1500 | = | 38,10 mm |
| 1750 | = | 44,45 mm |
| 2125 | = | 53,98 mm |

**Ancho de la ranura**

**(sólo estilo AGD)**

| | | |
|---|---|---|
| 03 | = | 0,76 mm |
| 04 | = | 1,02 mm |
| 05 | = | 1,27 mm |

**Rosca**

**(sólo estilo ATD)**

F2 = 0,05 mm

Rosca con parte plana

## R
Dirección de la herramienta

**R** =

A derechas

**L** =

A izquierdas

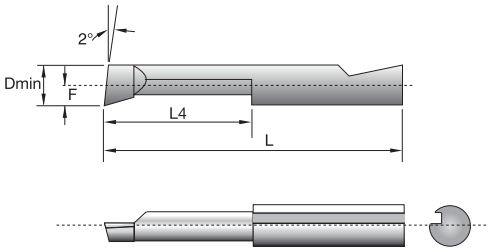
## M
Estilo de punta
*(opcional)*

**Símbolo**

M

**Uso**

Minipunta

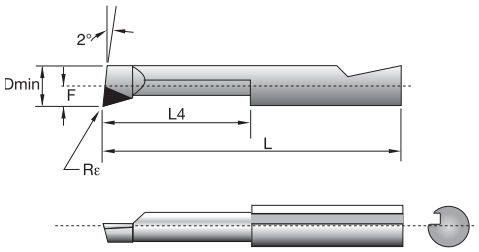



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

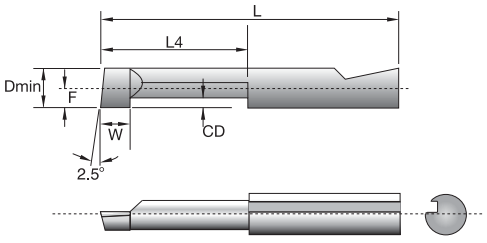
## ■ ABD

| Número de catálogo ISO | D min | L4 | L | F | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|
| **ABD06187R** | 1,58 | 5,41 | 21,92 | 0,66 | ● | ● | | |
| **ABD06312R** | 1,58 | 7,93 | 24,44 | 0,66 | ● | ● | | |
| **ABD09281R** | 2,39 | 7,14 | 23,65 | 1,04 | ● | ● | | |
| **ABD09500R** | 2,39 | 12,70 | 29,21 | 1,04 | ● | ● | | |
| **ABD125375R** | 3,18 | 9,53 | 26,04 | 1,45 | ● | ● | | |
| **ABD125625R** | 3,18 | 15,88 | 32,39 | 1,45 | ● | ● | | |
| **ABD156500R** | 3,96 | 12,70 | 29,21 | 1,85 | ● | ● | | |
| **ABD156875R** | 3,96 | 22,23 | 38,74 | 1,85 | ● | ● | | |



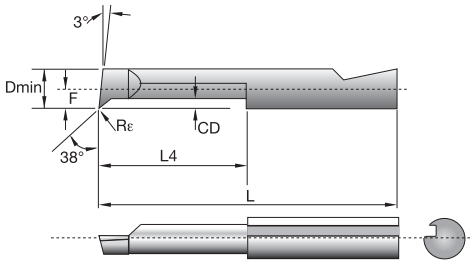

## ■ ABD-M

| Número de catálogo ISO | D min | L4 | L | F | Rε | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ABD09500RM** | 2,39 | 12,70 | 29,21 | 1,04 | 0,18 | | | ● | ● |
| **ABD125625RM** | 3,18 | 15,88 | 32,39 | 1,45 | 0,18 | | | ● | |
| **ABD156875RM** | 3,96 | 22,23 | 38,74 | 1,85 | 0,18 | | | ● | |




## ■ AGD

| Número de catálogo ISO | D min | L4 | L | F | CD | W | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **AGD09503** | 2,79 | 7,93 | 24,44 | 1,17 | 0,76 | 0,76 | ● | ● | | |
| **AGD12504** | 3,56 | 9,53 | 26,04 | 1,55 | 0,89 | 1,02 | ● | ● | | |
| **AGD15605** | 4,45 | 12,70 | 29,21 | 1,93 | 1,27 | 1,27 | ● | ● | | |

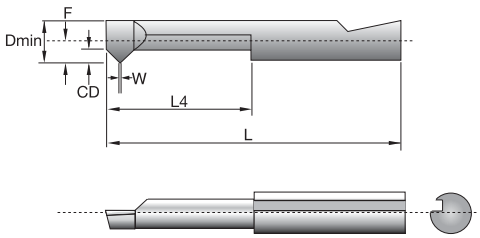



● primera elección
○ elección alternativa

| | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|
| P | ● | ○ | | |
| M | ● | ○ | | |
| K | ○ | ● | | |
| N | ○ | ● | | ● |
| S | ● | ○ | | |
| H | | | ● | |

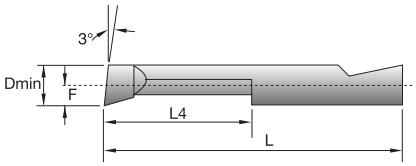
## ■ APD

| Número de catálogo ISO | D min | L4 | L | F | CD | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **APD06187R** | 1,58 | 4,75 | 21,26 | 0,66 | 0,43 | 0,18 | ● | | | |
| **APD09281R** | 2,39 | 7,14 | 23,65 | 1,07 | 0,71 | 0,18 | ● | ● | | |
| **APD125375R** | 3,18 | 9,53 | 26,04 | 1,45 | 1,02 | 0,18 | ● | ● | | |
| **APD156500R** | 3,96 | 12,70 | 29,21 | 1,85 | 1,27 | 0,18 | ● | ● | | |




## ■ ATD

| Número de catálogo ISO | D min | L4 | L | F | CD | W | TP min | TP max | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ATD09560F2** | 2,79 | 7,93 | 24,44 | 1,17 | 0,56 | 0,05 | 0,80 | 0,53 | ● | ● | | |
| **ATD12560F2** | 3,56 | 9,53 | 26,04 | 1,55 | 0,69 | 0,05 | 1,06 | 0,53 | ● | ● | | |
| **ATD15660F2** | 4,45 | 12,70 | 29,21 | 1,93 | 0,81 | 0,05 | 1,27 | 0,53 | ● | ● | | |

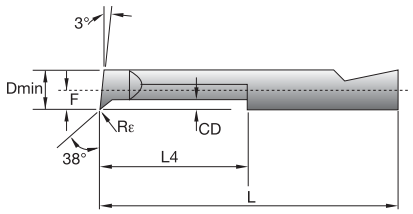



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ BB

| Número de catálogo ISO | D min | L4 | L | F | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|
| **BB187750R** | 4,75 | 19,05 | 45,72 | 2,24 | ● | ● | | |
| **BB1871250R** | 4,75 | 31,75 | 58,42 | 2,24 | ● | | | |
| **BB2501000R** | 6,35 | 25,40 | 52,07 | 3,05 | ● | ● | | |
| **BB2501750R** | 6,35 | 44,45 | 71,12 | 3,05 | ● | ● | | |
| **BB3121250R** | 7,93 | 53,98 | 80,65 | 3,84 | ● | ● | | |




## ■ BP

| Número de catálogo ISO | D min | L4 | L | F | CD | Rε | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **BP187600R** | 4,75 | 15,24 | 41,91 | 2,24 | 1,58 | 0,18 | ● | | | |
| **BP250825R** | 6,35 | 20,96 | 47,63 | 3,05 | 1,98 | 0,18 | ● | ● | | |
| **BP3121000R** | 7,93 | 25,40 | 52,07 | 3,84 | 2,39 | 0,18 | ● | ● | | |

## Tornillos de plaquita

| Número de pedido | Número de catálogo ISO | Torx/hex. | rosca interior |
|---|---|---|---|
| 2840098 | MSM46 | 2mm | M4X0.7 |
| 2892513 | BS832 | 5/64 | #8-32 |
| 2840186 | AS832 | 5/64 | #8-32 |
| 2823227 | SC30 | T10 | #4-40 |
| 2823203 | STM31 | T15 | M3.5 X 0.6 |
| 2832641 | CT15 | T16 | #1-72 |
| 2820981 | LTM16 | T5 | M2X0.4 |
| 2832647 | CC11 | T6 | #1-72 |
| 2832635 | CT11 | T6 | #1-72 |
| 2832655 | CC09 | T6 | #1-72 |
| 2825948 | QTM26 | T7 | M2.5X0.45 |
| 2825941 | QTM20 | T7 | M2.5X0.45 |
| 2830477 | FC11 | T7 | #2-56 |
| 2828337 | GT21 | T7 | #2-56 |
| 2830471 | FC14 | T7 | #2-56 |
| 2826005 | QC15 | T8 | #3-48 |
| 2826031 | QC26 | T9 | #4-40 |
| 2826038 | QC21 | T9 | #4-40 |

## Llaves

| Número de pedido | Número de catálogo ISO | Torx/hex. |
|---|---|---|
| 2840174 | AKEY | 5/64 |
| 2840094 | MKEY | 2mm |
| 2823182 | SKEY | T10 |
| 2823189 | STKEY | T15 |
| 2828318 | GTKEY | T5 |
| 2832628 | CKEY | T6 |
| 2830492 | FKEY | T7 |
| 2825952 | QTKEY | T7 |
| 2825973 | Q8KEY | T8 |
| 2825982 | QKEY | T9 |

## Punteras de accionamiento

| Número de pedido | Número de catálogo ISO | Torx/hex. |
|---|---|---|
| 2840089 | MBIT | 2mm |
| 2823236 | SBIT | T10 |
| 2823196 | STBIT | T15 |
| 2828324 | GTBIT | T5 |
| 2832661 | CBIT | T6 |
| 2825963 | QTBIT | T7 |
| 2830497 | FBIT | T7 |
| 2825964 | Q8BIT | T8 |
| 2826045 | QBIT | T9 |

## Cuñas

| Número de pedido | Número de catálogo ISO |
|---|---|
| 2840192 | AW250 |
| 2836024 | BW312 |

# Quadralock™

*Productos de alta precisión para aplicaciones de diámetro interior*

Las plaquitas y portaherramientas de acceso sencillo y cambio rápido llevan a cabo múltiples aplicaciones de diámetro interior para lograr la máxima productividad con un solo portaherramientas.

La punta de corte exclusiva del sistema Quadralock™ de herramientas de cambio rápido para diámetro interior se puede bloquear en cuatro posiciones distintas, permitiendo trabajar tanto en máquinas de estilo suizo como convencionales. Cuatro pasos de montaje rápidos y sencillos con una repetibilidad de plaquitas garantizada hasta ± 0,013 mm que asegura un rendimiento superior.

*Herramientas de ultraprecisión Quadralock*

## Características:

- Parada de límite fijo para un posicionamiento preciso y repetible del filo de corte.
- Un alojamiento ajustado del asiento de la plaquita asegura un apoyo seguro.
- Ranuras en V y tornillos límite para aumentar la posibilidad de cambio.

## Ventajas:

- Suministro de refrigerante interno que lubrica directamente el filo de corte.
- Capacidad de rotar la herramienta con aumentos de 90°.
- Para todas las aplicaciones de mandrinado, ranurado, perfilado y roscado.

**Mandrinado**
Orificios de mandrinado de hasta 0,25 mm.

**Ranurado**
Ranura en un orificio de diámetro de 2,79 mm.

**Perfilado**
Perfil en diámetros de hasta 1,57 mm.

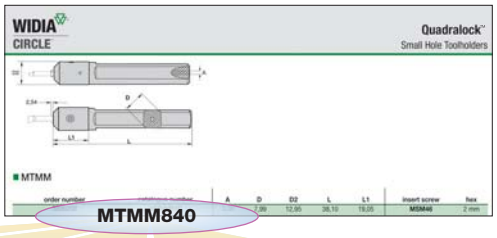
**Roscado**
Rosca de hasta un nº 5; 2,54 mm.

# Herramientas Quadralock™ para orificios pequeños

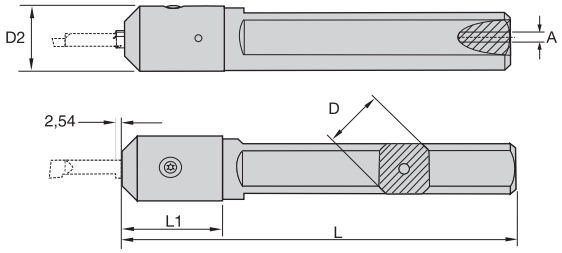
**Portaherramientas Quadralock para orificios pequeños ..... C60–C65**
Sistema de numeración de catálogo ..... C62
Portaherramientas ..... C63
Calidades y descripciones de calidades ..... C64
Tabla de velocidades y avances ..... C65

**Plaquitas Quadralock para orificios pequeños ..... C66–C69**
Sistema de numeración de catálogo ..... C66
Plaquitas ..... C67–C68
Hardware ..... C69

# Barra de mandrinar Quadralock
# Sistema de identificación

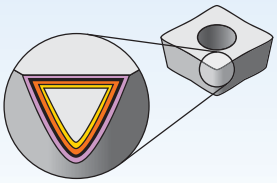



| MTM | M | 8 | 40 |
|---|---|---|---|
| Sistema de mandrinado Quadralock | Tipo | Diámetro del mango *aparece como "D"* | Especial *aparece como "L"* |
| | **M** = Sistema métrico | **Sistema métrico**<br>8 = 8,00 mm<br>10 = 10,00 mm<br>12 = 12,00 mm<br>16 = 16,00 mm<br>22 = 22,00 mm | **Sistema métrico**<br>40 = 38,1 mm<br>100 = 101,6 mm<br>127 = 127,0 mm |




## MTMM

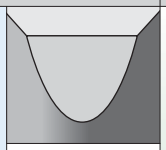
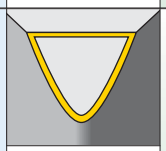
| Número de pedido | Número de catálogo | D | D2 | L | L1 | A | tornillo de plaquita | hex. |
|---|---|---|---|---|---|---|---|---|
| **3896202** | **MTMM840** | 8,00 | 12,95 | 38 | 19 | 3,00 | **MSM46** | 2mm |
| **3896198** | **MTMM1040** | 10,00 | 12,95 | 38 | 19 | 3,00 | **MSM46** | 2mm |
| **3896200** | **MTMM1240** | 12,00 | 12,95 | 38 | 19 | 3,00 | **MSM46** | 2mm |
| **3896199** | **MTMM12100** | 12,00 | 12,95 | 102 | 19 | 3,00 | **MSM46** | 2mm |
| **3831788** | **MTMM16100** | 16,00 | 12,95 | 102 | 19 | 3,00 | **MSM46** | 2mm |
| **3896201** | **MTMM22127** | 22,00 | 12,95 | 127 | 19 | 3,00 | **MSM46** | 2mm |



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

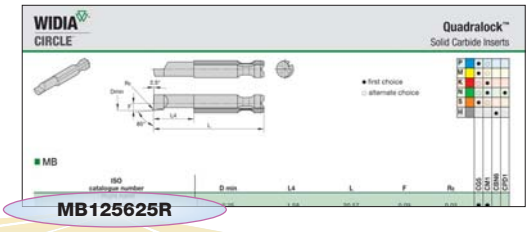
| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

**Calidad**

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CM1 |  HW-S25 | Metal duro sin recubrir. Sustrato sin alear de grano ultrafino y muy duro. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. Utilizar cuando C2, C3 o C25 fallen por astillamiento o rotura. | | | | | | | | | |
| CG5 |  HC-S25 | Es una calidad con recubrimiento de PVD TiN. Sustrato recto con 9,5% Co. Grano de submicrón. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. | | | | | | | | | |

| ANSI ISO 513 | VDI 3323 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| P | ap [mm] | 0,02 | — | 0,20 | 0,02 | — | 0,20 | | | | | | |
| | avance [mm/rev] | 0,07 | — | 0,02 | 0,07 | — | 0,02 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 1 | 105 | **130** | 155 | 65 | **80** | 100 | | | | | | |
| | 2 | 80 | **100** | 120 | 50 | **65** | 75 | | | | | | |
| | 3 | 65 | **75** | 90 | 40 | **50** | 60 | | | | | | |
| | 4 | 70 | **90** | 105 | 45 | **55** | 65 | | | | | | |
| | 5 | 55 | **65** | 80 | 35 | **40** | 50 | | | | | | |
| | 6 | 85 | **105** | 125 | 55 | **70** | 80 | | | | | | |
| | 7 | 55 | **70** | 85 | 40 | **45** | 55 | | | | | | |
| | 8 | 55 | **65** | 80 | 35 | **40** | 50 | | | | | | |
| | 9 | 45 | **55** | 65 | 30 | **35** | 45 | | | | | | |
| | 10 | 75 | **95** | 115 | 50 | **60** | 75 | | | | | | |
| | 11 | 50 | **60** | 75 | 35 | **40** | 45 | | | | | | |
| | 12 | 75 | **95** | 115 | 50 | **60** | 75 | | | | | | |
| | 13.1 | 65 | **80** | 95 | 40 | **50** | 60 | | | | | | |
| | 13.2 | 50 | **60** | 70 | 35 | **40** | 45 | | | | | | |
| M | ap [mm] | 0,02 | — | 0,20 | 0,02 | — | 0,20 | | | | | | |
| | avance [mm/rev] | 0,07 | — | 0,02 | 0,07 | — | 0,02 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 14.1 | 75 | **95** | 110 | 55 | **70** | 85 | | | | | | |
| | 14.2 | 60 | **75** | 90 | 45 | **55** | 65 | | | | | | |
| | 14.3 | 70 | **85** | 100 | 50 | **65** | 75 | | | | | | |
| | 14.4 | 45 | **55** | 65 | 35 | **40** | 45 | | | | | | |
| K | ap [mm] | 0,02 | — | 0,20 | 0,02 | — | 0,20 | | | | | | |
| | avance [mm/rev] | 0,07 | — | 0,02 | 0,07 | — | 0,02 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 15 | 75 | **90** | 110 | 55 | **70** | 85 | | | | | | |
| | 16 | 50 | **65** | 75 | 40 | **50** | 60 | | | | | | |
| | 17 | 80 | **100** | 120 | 65 | **80** | 95 | | | | | | |
| | 18 | 55 | **65** | 80 | 40 | **50** | 60 | | | | | | |
| | 19 | 100 | **125** | 145 | 75 | **95** | 115 | | | | | | |
| | 20 | 55 | **70** | 85 | 45 | **55** | 65 | | | | | | |
| N | ap [mm] | 0,02 | — | 0,51 | 0,02 | — | 0,51 | | | | 0,02 | — | 0,51 |
| | avance [mm/rev] | 0,09 | — | 0,01 | 0,09 | — | 0,01 | | | | 0,09 | — | 0,01 |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 21 | 405 | **505** | 605 | 405 | **505** | 605 | | | | 855 | **1070** | 1285 |
| | 22 | 245 | **305** | 365 | 245 | **305** | 365 | | | | 735 | **915** | 1100 |
| | 23 | 405 | **505** | 605 | 405 | **505** | 605 | | | | 685 | **855** | 1025 |
| | 24 | 245 | **305** | 370 | 245 | **305** | 370 | | | | 540 | **675** | 805 |
| | 25 | — | — | — | 70 | **90** | 105 | | | | 370 | **460** | 550 |
| | 26 | 145 | **180** | 215 | 105 | **125** | 155 | | | | 330 | **415** | 495 |
| | 27 | 135 | **170** | 205 | 100 | **125** | 150 | | | | 320 | **400** | 480 |
| | 28 | 145 | **180** | 215 | 105 | **125** | 155 | | | | 330 | **415** | 495 |
| | 29 | — | — | — | — | — | — | | | | 345 | **430** | 515 |
| | 30 | — | — | — | — | — | — | | | | 330 | **415** | 495 |
| S | ap [mm] | 0,02 | — | 0,51 | 0,02 | — | 0,51 | | | | | | |
| | avance [mm/rev] | 0,06 | — | 0,02 | 0,06 | — | 0,02 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 31 | 35 | **40** | 45 | 65 | **80** | 95 | | | | | | |
| | 32 | 25 | **30** | 35 | 45 | **55** | 70 | | | | | | |
| | 33 | 25 | **35** | 40 | 50 | **65** | 75 | | | | | | |
| | 34 | 20 | **25** | 30 | 40 | **45** | 55 | | | | | | |
| | 35 | 20 | **25** | 30 | 40 | **50** | 60 | | | | | | |
| | 36 | 35 | **40** | 50 | 30 | **35** | 45 | | | | | | |
| | 37 | 25 | **35** | 40 | 25 | **30** | 35 | | | | | | |
| H | ap [mm] | | | | | | | 0,02 | — | 0,20 | | | |
| | avance [mm/rev] | | | | | | | 0,0024 | — | 0,0008 | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 38.1 | | | | | | | 110 | **140** | 165 | | | |
| | 38.2 | | | | | | | 105 | **130** | 155 | | | |
| | 39.1 | | | | | | | 100 | **125** | 150 | | | |
| | 39.2 | | | | | | | 90 | **110** | 135 | | | |
| | 40.1 | | | | | | | — | — | — | | | |
| | 40.2 | | | | | | | — | — | — | | | |
| | 41.1 | | | | | | | — | — | — | | | |
| | 41.2 | | | | | | | — | — | — | | | |

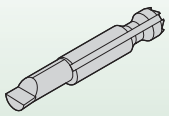
# Barra de mandrinar Quadralock
# Sistema de identificación de plaquita



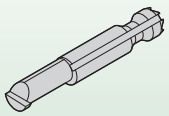

## MB

Estilo de plaquita

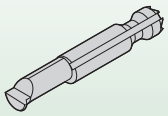
**MB** = Mandrinado



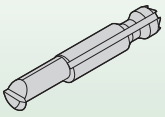
**MG** = Ranurado



**MP** = Perfilado



**MT** = Roscado



## 125

Mandrinado mínimo
*aparece como "D min"*

| | | |
|---|---|---|
| 010 | = | 0,25 mm |
| 030 | = | 0,76 mm |
| 062 | = | 1,58 mm |
| 094 | = | 2,39 mm |
| 125 | = | 3,18 mm |
| 156 | = | 3,96 mm |

**(sólo para estilos MG y MT)**

| | | |
|---|---|---|
| 095 | = | 2,79 mm |
| 125 | = | 3,56 mm |
| 156 | = | 4,45 mm |

## 625

Profundidad de mandrinado, ancho de la ranura, rosca con parte plana
*aparece como "L4, W"*

**Profundidad del mandrinado**

| | | |
|---|---|---|
| 062 | = | 1,58 mm |
| 187 | = | 4,75 mm |
| 281 | = | 7,14 mm |
| 312 | = | 7,93 mm |
| 375 | = | 9,53 mm |
| 500 | = | 12,70 mm |
| 625 | = | 15,88 mm |
| 875 | = | 22,23 mm |

**Ancho de la ranura (sólo para MG)**

| | | |
|---|---|---|
| 030 | = | 0,76 mm |
| 040 | = | 1,02 mm |
| 050 | = | 1,27 mm |

**Rosca (sólo para estilo MT)**

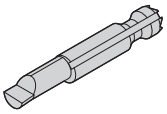
60F2 = 0,05
plano en rosca de 60º

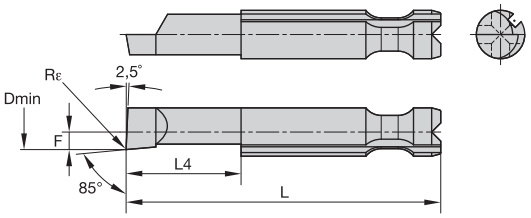
## R

Dirección de la plaquita

**R** = a derechas

**L** = a izquierdas



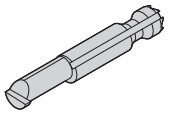


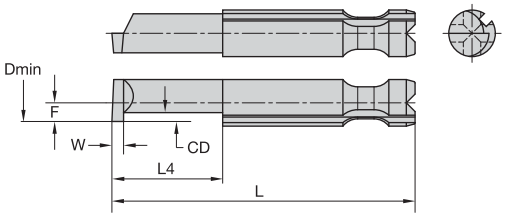

● primera elección
○ elección alternativa

| | | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ MB

| Número de catálogo ISO | D min | L4 | L | F | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **MB010062R** | 0,25 | 1,58 | 20,57 | 0,09 | 0,03 | ● | ● | | |
| **MB030187R** | 0,76 | 4,75 | 21,26 | 0,34 | 0,03 | ● | ● | | |
| **MB062187R** | 1,58 | 5,41 | 21,92 | 0,66 | 0,05 | ● | ● | | |
| **MB062312R** | 1,58 | 7,93 | 24,44 | 0,66 | 0,05 | ● | ● | | |
| **MB094281R** | 2,39 | 7,14 | 23,65 | 1,04 | 0,05 | ● | ● | | |
| **MB094500R** | 2,39 | 12,70 | 29,21 | 1,04 | 0,05 | ● | ● | | |
| **MB125375R** | 3,18 | 9,53 | 26,04 | 1,45 | 0,10 | ● | ● | | |
| **MB125625R** | 3,18 | 15,88 | 32,39 | 1,45 | 0,10 | ● | ● | | |
| **MB156500R** | 3,96 | 12,70 | 29,21 | 1,85 | 0,10 | ● | ● | | |
| **MB156875R** | 3,96 | 22,23 | 38,74 | 1,85 | 0,10 | ● | ● | | |
| **A izquierdas** | | | | | | | | | |
| **MB010062L** | 0,25 | 1,58 | 20,57 | 0,09 | 0,03 | ● | ● | | |
| **MB030187L** | 0,76 | 4,75 | 21,26 | 0,34 | 0,03 | ● | ● | | |
| **MB062187L** | 1,58 | 5,41 | 21,92 | 0,66 | 0,05 | ● | ● | | |
| **MB062312L** | 1,58 | 7,93 | 24,44 | 0,66 | 0,05 | ● | ● | | |
| **MB094281L** | 2,39 | 7,14 | 23,65 | 1,04 | 0,05 | ● | ● | | |
| **MB094500L** | 2,39 | 12,70 | 29,21 | 1,04 | 0,05 | ● | ● | | |
| **MB125375L** | 3,18 | 9,53 | 26,04 | 1,45 | 0,10 | ● | ● | | |
| **MB125625L** | 3,18 | 15,88 | 32,39 | 1,45 | 0,10 | ● | ● | | |
| **MB156500L** | 3,96 | 12,70 | 29,21 | 1,85 | 0,10 | ● | ● | | |
| **MB156875L** | 3,96 | 22,23 | 38,74 | 1,85 | 0,10 | ● | ● | | |



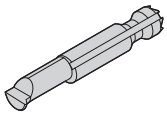


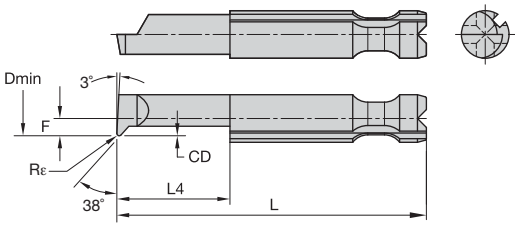

● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | ● | ○ | | | | |
| M | ● | ○ | | | | |
| K | ○ | ● | | | | |
| N | ○ | ● | | | ● | |
| S | ● | ○ | | | | |
| H | | | | ● | | |

## ■ MG

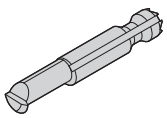
| Número de catálogo ISO | D min | L4 | L | F | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **MG095030R** | 2,79 | 7,93 | 24,44 | 1,17 | 0,76 | 0,76 | ● | ● | | |
| **MG125040R** | 3,56 | 9,53 | 26,04 | 1,55 | 0,89 | 1,02 | ● | ● | | |
| **MG156050R** | 4,45 | 12,70 | 29,21 | 1,93 | 1,27 | 1,27 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **MG095030L** | 2,79 | 7,93 | 24,44 | 1,17 | 0,76 | 0,76 | ● | ● | | |
| **MG125040L** | 3,56 | 9,53 | 26,04 | 1,55 | 0,89 | 1,02 | ● | ● | | |
| **MG156050L** | 4,45 | 12,70 | 29,21 | 1,93 | 1,27 | 1,27 | ● | ● | | |

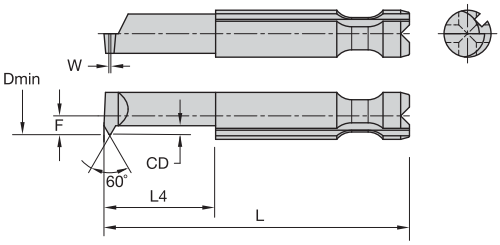





## ■ MP

| Número de catálogo ISO | D min | L4 | L | F | CD | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **MP062187R** | 1,58 | 4,75 | 21,26 | 0,66 | 0,43 | 0,10 | ● | ● | | |
| **MP094281R** | 2,39 | 7,14 | 23,65 | 1,07 | 0,71 | 0,10 | ● | ● | | |
| **MP125375R** | 3,18 | 9,53 | 26,04 | 1,45 | 1,02 | 0,20 | ● | ● | | |
| **MP156500R** | 3,96 | 12,70 | 29,21 | 1,85 | 1,27 | 0,20 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **MP062187L** | 1,58 | 4,75 | 21,26 | 0,66 | 0,43 | 0,10 | ● | ● | | |
| **MP094281L** | 2,39 | 7,14 | 23,65 | 1,07 | 0,71 | 0,10 | ● | ● | | |
| **MP125375L** | 3,18 | 9,53 | 26,04 | 1,45 | 1,02 | 0,20 | ● | ● | | |
| **MP156500L** | 3,96 | 12,70 | 29,21 | 1,85 | 1,27 | 0,20 | ● | ● | | |






## ■ MT

| Número de catálogo ISO | D min | L4 | L | F | CD | W | TP min | TP max | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | | |
| **MT09560F2R** | 2,79 | 7,93 | 24,44 | 1,17 | 0,56 | 0,05 | 0,50 | 0,80 | ● | ● | | |
| **MT12560F2R** | 3,56 | 9,53 | 26,04 | 1,55 | 0,69 | 0,05 | 0,50 | 1,05 | ● | ● | | |
| **MT15660F2R** | 4,45 | 12,70 | 29,21 | 1,93 | 0,81 | 0,05 | 0,50 | 1,27 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | | | |
| **MT09560F2L** | 2,79 | 7,93 | 24,44 | 1,17 | 0,56 | 0,05 | 0,50 | 0,80 | ● | ● | | |
| **MT12560F2L** | 3,56 | 9,53 | 26,04 | 1,55 | 0,69 | 0,05 | 0,50 | 1,05 | ● | ● | | |
| **MT15660F2L** | 4,45 | 12,70 | 29,21 | 1,93 | 0,81 | 0,05 | 0,50 | 1,27 | ● | ● | | |

## Tornillos de plaquita

| Número de pedido | Número de catálogo ISO | Torx/hex. | rosca interior |
|---|---|---|---|
| 2840098 | MSM46 | 2mm | M4X0.7 |
| 2892513 | BS832 | 5/64 | #8-32 |
| 2840186 | AS832 | 5/64 | #8-32 |
| 2823227 | SC30 | T10 | #4-40 |
| 2823203 | STM31 | T15 | M3.5 X 0.6 |
| 2832641 | CT15 | T16 | #1-72 |
| 2820981 | LTM16 | T5 | M2X0.4 |
| 2832647 | CC11 | T6 | #1-72 |
| 2832635 | CT11 | T6 | #1-72 |
| 2832655 | CC09 | T6 | #1-72 |
| 2825948 | QTM26 | T7 | M2.5X0.45 |
| 2825941 | QTM20 | T7 | M2.5X0.45 |
| 2830477 | FC11 | T7 | #2-56 |
| 2828337 | GT21 | T7 | #2-56 |
| 2830471 | FC14 | T7 | #2-56 |
| 2826005 | QC15 | T8 | #3-48 |
| 2826031 | QC26 | T9 | #4-40 |
| 2826038 | QC21 | T9 | #4-40 |

## Llaves

| Número de pedido | Número de catálogo ISO | Torx/hex. |
|---|---|---|
| 2840174 | AKEY | 5/64 |
| 2840094 | MKEY | 2mm |
| 2823182 | SKEY | T10 |
| 2823189 | STKEY | T15 |
| 2828318 | GTKEY | T5 |
| 2832628 | CKEY | T6 |
| 2830492 | FKEY | T7 |
| 2825952 | QTKEY | T7 |
| 2825973 | Q8KEY | T8 |
| 2825982 | QKEY | T9 |

## Punteras de accionamiento

| Número de pedido | Número de catálogo ISO | Torx/hex. |
|---|---|---|
| 2840089 | MBIT | 2mm |
| 2823236 | SBIT | T10 |
| 2823196 | STBIT | T15 |
| 2828324 | GTBIT | T5 |
| 2832661 | CBIT | T6 |
| 2825963 | QTBIT | T7 |
| 2830497 | FBIT | T7 |
| 2825964 | Q8BIT | T8 |
| 2826045 | QBIT | T9 |

## Cuñas

| Número de pedido | Número de catálogo ISO |
|---|---|
| 2840192 | AW250 |
| 2836024 | BW312 |

# Barras de metal duro integral

*Herramientas para orificios pequeños*

Las barras de metal duro integral WIDIA™, duras y económicas, están diseñadas para unos resultados espectaculares en la mayoría de aplicaciones de mecanizado, con un rendimiento excepcional en la mayoría de aceros, aceros inoxidables, fundición y materiales no férreos.

## Características:

- Las herramientas y portaherramientas precisos y de cambio rápido son ideales para las aplicaciones de mecanizado de piezas pequeñas.
- Sustrato de micrograno fuerte y disponible en calidades con y sin recubrimiento.
- Una opción excelente para aplicaciones de ranurado de radio completo, planeado y entallado.

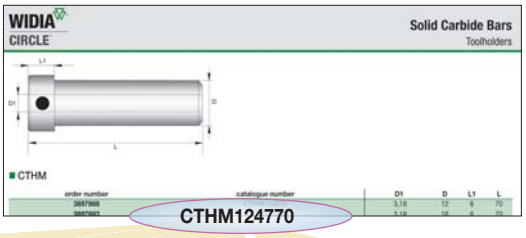
## Ventajas:

- Excepcional versatilidad de mecanizado y resistencia a la ruptura.
- Herramientas con recubrimiento para una mayor vida de la herramienta.
- Diseñadas especialmente para un rendimiento excelente y unos resultados consistentes.

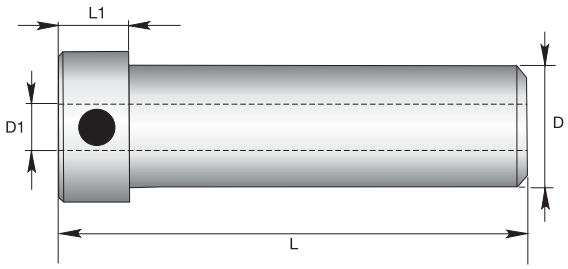
# Barras de metal duro integral

**Barras de metal duro integral ..... C70–C124**
Sistema de numeración de catálogo ..... C72
Portaherramientas ..... C73
Calidades y descripciones de calidades ..... C74
Tabla de velocidades y avances ..... C75
Sistema de numeración de catálogo ..... C76–C77
Plaquitas de mandrinado de metal duro integral ..... C79–C99
Barras de mandrinar helicoidales de metal duro ..... C100
Elección de la plaquita de ranurado correcta ..... C101
Sistema de numeración de catálogo ..... C102–C103
Plaquitas de metal duro para ranurado frontal ..... C105
Plaquitas de metal duro para radio completo ..... C106–C108
Plaquitas de metal duro para junta tórica ..... C109
Plaquitas de metal duro para anillo de retención ..... C110–C112
Plaquitas de metal duro para ranurado destalonado ..... C113
Plaquitas de metal duro para ranurado destalonado perfilado ..... C114
Sistema de numeración de catálogo ..... C116–C117
Plaquitas de roscado de metal duro Acme ..... C118
Plaquitas de roscado de metal duro Acme extracortas ..... C119
Plaquitas de roscado de punto único de 60° ..... C120–C123
Plaquitas de metal duro para desahogo de rosca ..... C124

# Barra de metal duro integral
# Sistema de identificación

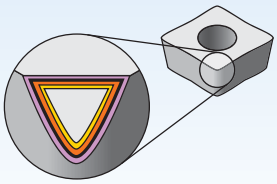



| CTH | M | 12 | 47 | 70 |
|---|---|---|---|---|
| Sistema de micro-mandrinado | Tipo | Diámetro del mango *aparece como "D"* | Diámetro de mandrinado de plaquitas *aparece como "D1"* | Longitud de herramienta *aparece como "L"* |
| | **M** = Sistema métrico | 12 = 12,00 mm<br>16 = 16,00 mm<br>20 = 20,00 mm | 32 = 3,18 mm<br>47 = 4,76 mm<br>64 = 6,35 mm<br>79 = 7,94 mm<br>95 = 9,53 mm<br>127 = 12,70 mm | 70 = 70,0 mm |




## CTHM

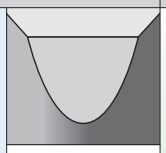
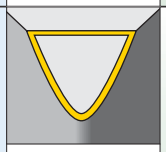
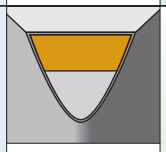
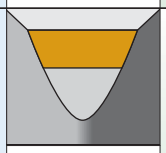
| Número de pedido | Número de catálogo | D1 | D | L1 | L |
|---|---|---|---|---|---|
| 3897868 | CTHM123270 | 3,18 | 12 | 6 | 70 |
| 3897883 | CTHM163270 | 3,18 | 16 | 6 | 70 |
| 3897889 | CTHM203270 | 3,18 | 20 | 6 | 70 |
| 3897869 | CTHM124770 | 4,76 | 12 | 6 | 70 |
| 3897884 | CTHM164770 | 4,76 | 16 | 6 | 70 |
| 3897890 | CTHM204770 | 4,76 | 20 | 6 | 70 |
| 3897870 | CTHM126470 | 6,35 | 12 | 6 | 70 |
| 3897885 | CTHM166470 | 6,35 | 16 | 6 | 70 |
| 3897891 | CTHM206470 | 6,35 | 20 | 6 | 70 |
| 3897871 | CTHM127970 | 7,94 | 12 | 6 | 70 |
| 3897886 | CTHM167970 | 7,94 | 16 | 6 | 70 |
| 3897892 | CTHM207970 | 7,94 | 20 | 6 | 70 |
| 3897872 | CTHM129570 | 9,53 | 12 | 6 | 70 |
| 3897887 | CTHM169570 | 9,53 | 16 | 6 | 70 |
| 3897893 | CTHM209570 | 9,53 | 20 | 6 | 70 |
| 3897888 | CTHM2012770 | 12,70 | 20 | 6 | 70 |



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

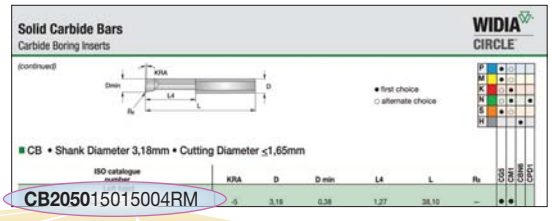
Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CM1 |  HW-S25 | Metal duro sin recubrir. Sustrato sin alear de grano ultrafino y muy duro. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. Utilizar cuando C2, C3 o C25 fallen por astillamiento o rotura. | | | | P | P | P | | | |
| | | | | | | M | M | M | | | |
| | | | | | | K | K | K | | | |
| | | | | | | N | N | N | | | |
| | | | | | | S | S | S | | | |
| CG5 |  HC-S25 | Una calidad con recubrimiento de PVD TiN. Sustrato recto con 9,5% Co. Grano de submicrón. Para el mecanizado general de la mayoría de los aceros, aceros inoxidables, aleaciones de alta temperatura, titanio, fundición y materiales no férreos. Sus mejores resultados se producen con velocidades bajas; apta para interrupciones y altas tasas de avance. | | | | P | P | P | | | |
| | | | | | | M | M | M | | | |
| | | | | | | K | K | K | | | |
| | | | | | | N | N | N | | | |
| | | | | | | S | S | S | | | |
| CBN6 |  BN-H25 | Punta PCBN soldada en una plaquita de metal duro. Recomendada para el mecanizado de acero endurecido (45–65 HRC). Para acero de cojinetes, aceros de piezas de trabajo calientes y frías, aceros de alta velocidad, aceros para matrices, aceros de cementación, fundición carburizada y nitrurada y algunos recubrimientos duros. Puede actuar tanto en condiciones secas como húmedas. | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | H | H | H | | | |
| CPD1 |  DP-N10 | Una calidad compacta de diamante policristalino (PCD) proporciona una dureza y una resistencia a la abrasión excepcionales. CPD1 es una calidad de mandrinado de acabado superior que mejorará de forma significativa las tolerancias de las piezas de trabajo, los acabados superficiales y la duración de las plaquitas en aluminio con alto contenido en silicio, cobre, grafito de carbono con aluminio, goma dura, materiales plásticos y/o madera. | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | N | N | N | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| ANSI ISO 513 | VDI 3323 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | ap [mm] | 0,025 | — | 0,300 | 0,025 | — | 0,300 | | | | | | |
| | avance [mm/rev] | 0,127 | — | 0,025 | 0,127 | — | 0,025 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 1 | 105 | **130** | 155 | 65 | **80** | 100 | | | | | | |
| | 2 | 80 | **100** | 120 | 50 | **65** | 75 | | | | | | |
| | 3 | 65 | **75** | 90 | 40 | **50** | 60 | | | | | | |
| | 4 | 70 | **90** | 105 | 45 | **55** | 65 | | | | | | |
| | 5 | 55 | **65** | 80 | 35 | **40** | 50 | | | | | | |
| | 6 | 85 | **105** | 125 | 55 | **70** | 80 | | | | | | |
| P | 7 | 55 | **70** | 85 | 40 | **45** | 55 | | | | | | |
| | 8 | 55 | **65** | 80 | 35 | **40** | 50 | | | | | | |
| | 9 | 45 | **55** | 65 | 30 | **35** | 45 | | | | | | |
| | 10 | 75 | **95** | 115 | 50 | **60** | 75 | | | | | | |
| | 11 | 50 | **60** | 75 | 35 | **40** | 45 | | | | | | |
| | 12 | 75 | **95** | 115 | 50 | **60** | 75 | | | | | | |
| | 13.1 | 65 | **80** | 95 | 40 | **50** | 60 | | | | | | |
| | 13.2 | 50 | **60** | 70 | 35 | **40** | 45 | | | | | | |
| | ap [mm] | 0,025 | — | 0,300 | 0,025 | — | 0,300 | | | | | | |
| | avance [mm/rev] | 0,127 | — | 0,025 | 0,127 | — | 0,025 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 14.1 | 75 | **95** | 110 | 55 | **70** | 85 | | | | | | |
| M | 14.2 | 60 | **75** | 90 | 45 | **55** | 65 | | | | | | |
| | 14.3 | 70 | **85** | 100 | 50 | **65** | 75 | | | | | | |
| | 14.4 | 45 | **55** | 65 | 35 | **40** | 45 | | | | | | |
| | ap [mm] | 0,025 | — | 0,300 | 0,025 | — | 0,300 | | | | | | |
| | avance [mm/rev] | 0,127 | — | 0,025 | 0,127 | — | 0,025 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 15 | 75 | **90** | 110 | 55 | **70** | 85 | | | | | | |
| | 16 | 50 | **65** | 75 | 40 | **50** | 60 | | | | | | |
| K | 17 | 80 | **100** | 120 | 65 | **80** | 95 | | | | | | |
| | 18 | 55 | **65** | 80 | 40 | **50** | 60 | | | | | | |
| | 19 | 100 | **125** | 145 | 75 | **95** | 115 | | | | | | |
| | 20 | 55 | **70** | 85 | 45 | **55** | 65 | | | | | | |
| | ap [mm] | 0,025 | — | 0,300 | 0,025 | — | 0,300 | | | | 0,025 | — | 0,300 |
| | avance [mm/rev] | 0,127 | — | 0,025 | 0,127 | — | 0,025 | | | | 0,127 | — | 0,025 |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 21 | 440 | **550** | 660 | 405 | **505** | 605 | | | | 855 | **1070** | 1285 |
| | 22 | 440 | **550** | 660 | 245 | **305** | 365 | | | | 735 | **915** | 1100 |
| | 23 | 415 | **520** | 625 | 405 | **505** | 605 | | | | 685 | **855** | 1025 |
| | 24 | 415 | **520** | 625 | 245 | **305** | 370 | | | | 540 | **675** | 805 |
| N | 25 | — | — | — | 70 | **90** | 105 | | | | 370 | **460** | 550 |
| | 26 | 185 | **230** | 275 | 105 | **125** | 155 | | | | 330 | **415** | 495 |
| | 27 | 200 | **245** | 295 | 100 | **125** | 150 | | | | 320 | **400** | 480 |
| | 28 | 200 | **245** | 295 | 105 | **125** | 155 | | | | 330 | **415** | 495 |
| | 29 | — | — | — | — | — | — | | | | 345 | **430** | 515 |
| | 30 | — | — | — | — | — | — | | | | 330 | **415** | 495 |
| | ap [mm] | 0,025 | — | 0,300 | 0,025 | — | 0,300 | | | | | | |
| | avance [mm/rev] | 0,127 | — | 0,025 | 0,127 | — | 0,025 | | | | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 31 | 35 | **40** | 45 | 65 | **80** | 95 | | | | | | |
| | 32 | 25 | **30** | 35 | 45 | **55** | 70 | | | | | | |
| S | 33 | 25 | **35** | 40 | 50 | **65** | 75 | | | | | | |
| | 34 | 20 | **25** | 30 | 40 | **45** | 55 | | | | | | |
| | 35 | 20 | **25** | 30 | 40 | **50** | 60 | | | | | | |
| | 36 | 35 | **40** | 50 | 30 | **35** | 45 | | | | | | |
| | 37 | 25 | **35** | 40 | 25 | **30** | 35 | | | | | | |
| | ap [mm] | | | | | | | 0,025 | — | 0,300 | | | |
| | avance [mm/rev] | | | | | | | 0,127 | — | 0,025 | | | |
| | | CG5 | | | CM1 | | | CBN6 | | | CPD1 | | |
| | 38.1 | | | | | | | 35 | **40** | 45 | | | |
| | 38.2 | | | | | | | 35 | **40** | 50 | | | |
| | 39.1 | | | | | | | 40 | **45** | 55 | | | |
| H | 39.2 | | | | | | | 40 | **50** | 55 | | | |
| | 40.1 | | | | | | | — | — | — | | | |
| | 40.2 | | | | | | | — | — | — | | | |
| | 41.1 | | | | | | | — | — | — | | | |
| | 41.2 | | | | | | | — | — | — | | | |

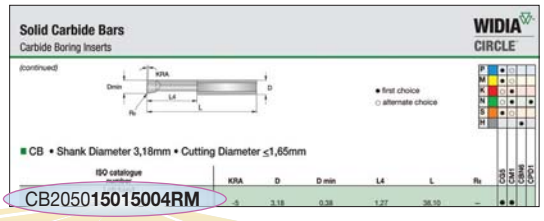
## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




| C | B | 2 | 050 |
|---|---|---|---|
| Material | Aplicación | Diámetro del mango *aparece como "D"* | Mandrinado mínimo *aparece como "D min"* |
| **C** = Metal duro | **B** = Mandrinado<br>**H** = Mandrinado helicoidal | 2 = 3,18 mm<br>3 = 4,76 mm<br>4 = 6,35 mm<br>5 = 7,94 mm<br>6 = 9,53 mm<br>8 = 12,70 mm | 015 = 0,38 mm<br>020 = 0,51 mm<br>025 = 0,64 mm<br>030 = 0,76 mm<br>035 = 0,89 mm<br>040 = 1,02 mm<br>045 = 1,14 mm<br>050 = 1,27 mm<br>060 = 1,52 mm<br>070 = 1,78 mm<br>080 = 2,03 mm<br>090 = 2,29 mm<br>100 = 2,54 mm<br>110 = 2,79 mm<br>120 = 3,05 mm<br>135 = 3,43 mm<br>140 = 3,56 mm<br>150 = 3,81 mm<br>160 = 4,06 mm<br>180 = 4,57 mm<br>200 = 5,08 mm<br>210 = 5,33 mm<br>230 = 5,84 mm<br>240 = 6,10 mm<br>290 = 7,37 mm<br>300 = 7,62 mm<br>320 = 8,13 mm<br>360 = 9,14 mm<br>480 = 12,19 mm<br>490 = 12,45 mm |

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## 150

Profundidad del mandrinado
*aparece como "L4"*

| | | |
|---|---|---|
| 050 | = | 1,27 mm |
| 075 | = | 1,91 mm |
| 100 | = | 2,54 mm |
| 150 | = | 3,81 mm |
| 200 | = | 5,08 mm |
| 250 | = | 6,35 mm |
| 300 | = | 7,62 mm |
| 350 | = | 8,89 mm |
| 400 | = | 10,16 mm |
| 500 | = | 12,70 mm |
| 600 | = | 15,24 mm |
| 700 | = | 17,78 mm |
| 750 | = | 19,05 mm |
| 800 | = | 20,32 mm |
| 900 | = | 22,86 mm |
| 1000 | = | 25,40 mm |
| 1100 | = | 27,94 mm |
| 1150 | = | 29,21 mm |
| 1200 | = | 30,48 mm |
| 1250 | = | 31,75 mm |
| 1300 | = | 33,02 mm |
| 1350 | = | 34,29 mm |
| 1400 | = | 35,56 mm |
| 1500 | = | 38,10 mm |
| 1600 | = | 40,64 mm |
| 1750 | = | 44,45 mm |
| 1800 | = | 45,72 mm |
| 2000 | = | 50,80 mm |
| 2500 | = | 63,50 mm |
| 2600 | = | 66,04 mm |
| 2750 | = | 69,85 mm |
| 3000 | = | 76,20 mm |
| 4000 | = | 101,60 mm |
| 4500 | = | 114,30 mm |

## 1500

Longitud total
*aparece como "L"*

| | | |
|---|---|---|
| 1500 | = | 38,10 mm |
| 2000 | = | 50,80 mm |
| 2500 | = | 63,50 mm |
| 3000 | = | 76,20 mm |
| 4000 | = | 101,60 mm |
| 6000 | = | 387,09 mm |

## 4

Radio de la herramienta
*aparece como "Rε"*

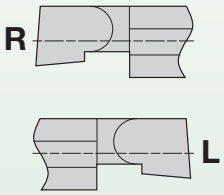
| | | |
|---|---|---|
| 0 | = | 0,00 mm |
| 4 | = | 0,10 mm |
| 6 | = | 0,15 mm |

## R

Dirección de la plaquita

**R** = a derechas

**L** = a izquierdas




## M

Denominación de la punta

**M** = Minipunta

# WIN WITH WIDIA™

## Serie WIDIA-CIRCLE™ de herramientas para orificios pequeños

La línea WIDIA™ de herramientas de mandrinado de orificios pequeños es una opción excelente y económica para una amplia gama de aplicaciones. Nuestras barras de metal duro integral proporcionan una versatilidad de mecanizado y resistencia a la ruptura. Las plaquitas intercambiables están disponibles tanto en mangos de acero como de metal duro.

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- Acción de corte libre, mejores acabados superficiales y mayor evacuación de virutas.

**Barras de metal duro integral**

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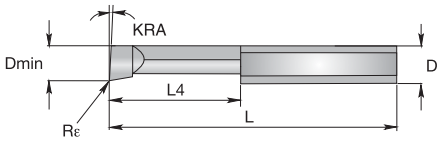



● primera elección
○ elección alternativa

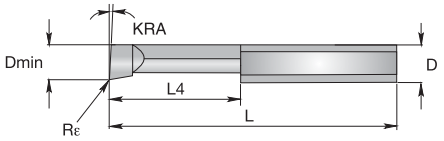
| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ CB • Diámetro de mango de 3,18 mm • Diámetro de corte ≤1,65 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB201505015000R** | -5 | 3,18 | 0,38 | 1,27 | 38,10 | – | ● | ● | | |
| **CB202007515000R** | -5 | 3,18 | 0,51 | 1,91 | 38,10 | – | ● | ● | | |
| **CB202510015000R** | -5 | 3,18 | 0,64 | 2,54 | 38,10 | – | ● | ● | | |
| **CB203010015000R** | -5 | 3,18 | 0,76 | 2,54 | 38,10 | – | ● | ● | | |
| **CB203510015000R** | -5 | 3,18 | 0,89 | 2,54 | 38,10 | – | ● | ● | | |
| **CB203515015000R** | -5 | 3,18 | 0,89 | 3,81 | 38,10 | – | ● | ● | | |
| **CB204010015000R** | -5 | 3,18 | 1,02 | 2,54 | 38,10 | – | ● | ● | | |
| **CB204015015000R** | -5 | 3,18 | 1,02 | 3,81 | 38,10 | – | ● | ● | | |
| **CB204510015000R** | -5 | 3,18 | 1,14 | 2,54 | 38,10 | – | ● | ● | | |
| **CB204515015000R** | -5 | 3,18 | 1,14 | 3,81 | 38,10 | – | ● | ● | | |
| **CB205015015004R** | -3 | 3,18 | 1,27 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB205015015000R** | -3 | 3,18 | 1,27 | 3,81 | 38,10 | – | ● | ● | | |
| **CB205020015004R** | -3 | 3,18 | 1,27 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB205020015000R** | -3 | 3,18 | 1,27 | 5,08 | 38,10 | – | ● | ● | | |
| **CB205030015004R** | -3 | 3,18 | 1,27 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB205030015000R** | -3 | 3,18 | 1,27 | 7,62 | 38,10 | – | ● | ● | | |
| **CB205040015000R** | -3 | 3,18 | 1,27 | 10,16 | 38,10 | – | ● | ● | | |
| **CB206015015004R** | -3 | 3,18 | 1,52 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB206015015000R** | -3 | 3,18 | 1,52 | 3,81 | 38,10 | – | ● | ● | | |
| **CB206020015004R** | -3 | 3,18 | 1,52 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB206020015000R** | -3 | 3,18 | 1,52 | 5,08 | 38,10 | – | ● | ● | | |
| **CB206030015004R** | -3 | 3,18 | 1,52 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB206030015000R** | -3 | 3,18 | 1,52 | 7,62 | 38,10 | – | ● | ● | | |
| **CB206040015004R** | -3 | 3,18 | 1,52 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB205040015004R** | -3 | 3,18 | 1,27 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB206040015000R** | -3 | 3,18 | 1,52 | 10,16 | 38,10 | – | ● | ● | | |
| **CB206050015004R** | -3 | 3,18 | 1,52 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB206050015000R** | -3 | 3,18 | 1,52 | 12,70 | 38,10 | – | ● | ● | | |

*(continuación)*

*(continuación)*

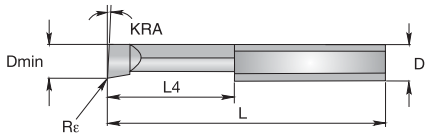



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 3,18 mm • Diámetro de corte ≤1,65 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | |
| **CB201505015000L** | -5 | 3,18 | 0,38 | 1,27 | 38,10 | – | ● | ● | | |
| **CB202007515000L** | -5 | 3,18 | 0,51 | 1,91 | 38,10 | – | ● | ● | | |
| **CB202510015000L** | -5 | 3,18 | 0,64 | 2,54 | 38,10 | – | ● | ● | | |
| **CB203010015000L** | -5 | 3,18 | 0,76 | 2,54 | 38,10 | – | ● | ● | | |
| **CB203510015000L** | -5 | 3,18 | 0,89 | 2,54 | 38,10 | – | ● | ● | | |
| **CB203515015000L** | -5 | 3,18 | 0,89 | 3,81 | 38,10 | – | ● | ● | | |
| **CB204010015000L** | -5 | 3,18 | 1,02 | 2,54 | 38,10 | – | ● | ● | | |
| **CB204015015000L** | -5 | 3,18 | 1,02 | 3,81 | 38,10 | – | ● | ● | | |
| **CB204510015000L** | -5 | 3,18 | 1,14 | 2,54 | 38,10 | – | ● | ● | | |
| **CB204515015000L** | -5 | 3,18 | 1,14 | 3,81 | 38,10 | – | ● | ● | | |
| **CB205015015004L** | -3 | 3,18 | 1,27 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB205015015000L** | -3 | 3,18 | 1,27 | 3,81 | 38,10 | – | ● | ● | | |
| **CB205020015004L** | -3 | 3,18 | 1,27 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB205020015000L** | -3 | 3,18 | 1,27 | 5,08 | 38,10 | – | ● | ● | | |
| **CB205030015004L** | -3 | 3,18 | 1,27 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB205030015000L** | -3 | 3,18 | 1,27 | 7,62 | 38,10 | – | ● | ● | | |
| **CB205040015004L** | -3 | 3,18 | 1,27 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB205040015000L** | -3 | 3,18 | 1,27 | 10,16 | 38,10 | – | ● | ● | | |
| **CB206015015004L** | -3 | 3,18 | 1,52 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB206015015000L** | -3 | 3,18 | 1,52 | 3,81 | 38,10 | – | ● | ● | | |
| **CB206020015004L** | -3 | 3,18 | 1,52 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB206020015000L** | -3 | 3,18 | 1,52 | 5,08 | 38,10 | – | ● | ● | | |
| **CB206030015004L** | -3 | 3,18 | 1,52 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB206030015000L** | -3 | 3,18 | 1,52 | 7,62 | 38,10 | – | ● | ● | | |
| **CB206040015004L** | -3 | 3,18 | 1,52 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB206040015000L** | -3 | 3,18 | 1,52 | 10,16 | 38,10 | – | ● | ● | | |
| **CB206050015004L** | -3 | 3,18 | 1,52 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB206050015000L** | -3 | 3,18 | 1,52 | 12,70 | 38,10 | – | ● | ● | | |




● primera elección
○ elección alternativa

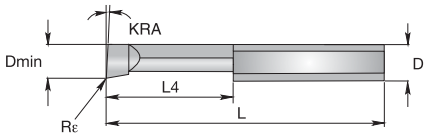
| | | | | |
|---|---|---|---|---|
| P | ● | ○ | | |
| M | ● | ○ | | |
| K | ○ | ● | | |
| N | ○ | ● | | ● |
| S | ● | ○ | | |
| H | | | ● | |

## ■ CB • Diámetro de mango de 3,18 mm • Diámetro de corte >1,65 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB208015015004R** | -3 | 3,18 | 2,03 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB208015015000R** | -3 | 3,18 | 2,03 | 3,81 | 38,10 | – | ● | ● | | |
| **CB208020015004R** | -3 | 3,18 | 2,03 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB208020015000R** | -3 | 3,18 | 2,03 | 5,08 | 38,10 | – | ● | ● | | |
| **CB208030015004R** | -3 | 3,18 | 2,03 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB208030015000R** | -3 | 3,18 | 2,03 | 7,62 | 38,10 | – | ● | ● | | |
| **CB208040015004R** | -3 | 3,18 | 2,03 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB208040015000R** | -3 | 3,18 | 2,03 | 10,16 | 38,10 | – | ● | ● | | |
| **CB208050015004R** | -3 | 3,18 | 2,03 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB208050015000R** | -3 | 3,18 | 2,03 | 12,70 | 38,10 | – | ● | ● | | |
| **CB208060015004R** | -3 | 3,18 | 2,03 | 15,24 | 38,10 | 0,10 | ● | ● | | |
| **CB208060015000R** | -3 | 3,18 | 2,03 | 15,24 | 38,10 | – | ● | ● | | |
| **CB210015015004R** | -3 | 3,18 | 2,54 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB210015015000R** | -3 | 3,18 | 2,54 | 3,81 | 38,10 | – | ● | ● | | |
| **CB210020015004R** | -3 | 3,18 | 2,54 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB210020015000R** | -3 | 3,18 | 2,54 | 5,08 | 38,10 | – | ● | ● | | |
| **CB210030015004R** | -3 | 3,18 | 2,54 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB210030015000R** | -3 | 3,18 | 2,54 | 7,62 | 38,10 | – | ● | ● | | |
| **CB210040015004R** | -3 | 3,18 | 2,54 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB210040015000R** | -3 | 3,18 | 2,54 | 10,16 | 38,10 | – | ● | ● | | |
| **CB210050015004R** | -3 | 3,18 | 2,54 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB210050015000R** | -3 | 3,18 | 2,54 | 12,70 | 38,10 | – | ● | ● | | |
| **CB210060015004R** | -3 | 3,18 | 2,54 | 15,24 | 38,10 | 0,10 | ● | ● | | |
| **CB210060015000R** | -3 | 3,18 | 2,54 | 15,24 | 38,10 | – | ● | ● | | |
| **CB210070015004R** | -3 | 3,18 | 2,54 | 17,78 | 38,10 | 0,10 | ● | ● | | |
| **CB210070015000R** | -3 | 3,18 | 2,54 | 17,78 | 38,10 | – | ● | ● | | |
| **CB211015015004R** | -3 | 3,18 | 2,79 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB211015015000R** | -3 | 3,18 | 2,79 | 3,81 | 38,10 | – | ● | ● | | |
| **CB211020015004R** | -3 | 3,18 | 2,79 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB211020015000R** | -3 | 3,18 | 2,79 | 5,08 | 38,10 | – | ● | ● | | |
| **CB211030015004R** | -3 | 3,18 | 2,79 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB211030015000R** | -3 | 3,18 | 2,79 | 7,62 | 38,10 | – | ● | ● | | |
| **CB211040015004R** | -3 | 3,18 | 2,79 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB211040015000R** | -3 | 3,18 | 2,79 | 10,16 | 38,10 | – | ● | ● | | |
| **CB211050015004R** | -3 | 3,18 | 2,79 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB211050015000R** | -3 | 3,18 | 2,79 | 12,70 | 38,10 | – | ● | ● | | |
| **CB211060015004R** | -3 | 3,18 | 2,79 | 15,24 | 38,10 | 0,10 | ● | ● | | |
| **CB211060015000R** | -3 | 3,18 | 2,79 | 15,24 | 38,10 | – | ● | ● | | |
| **CB211070015004R** | -3 | 3,18 | 2,79 | 17,78 | 38,10 | 0,10 | ● | ● | | |
| **CB211070015000R** | -3 | 3,18 | 2,79 | 17,78 | 38,10 | – | ● | ● | | |

*(continuación)*

*(continuación)*



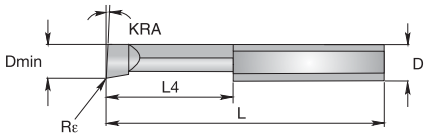

● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |



## ■ CB • Diámetro de mango de 3,18 mm • Diámetro de corte >1,65 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | |
| **CB208015015004L** | -3 | 3,18 | 2,03 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB208015015000L** | -3 | 3,18 | 2,03 | 3,81 | 38,10 | – | ● | ● | | |
| **CB208020015004L** | -3 | 3,18 | 2,03 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB208020015000L** | -3 | 3,18 | 2,03 | 5,08 | 38,10 | – | ● | ● | | |
| **CB208030015004L** | -3 | 3,18 | 2,03 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB208030015000L** | -3 | 3,18 | 2,03 | 7,62 | 38,10 | – | ● | ● | | |
| **CB208040015004L** | -3 | 3,18 | 2,03 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB208040015000L** | -3 | 3,18 | 2,03 | 10,16 | 38,10 | – | ● | ● | | |
| **CB208050015004L** | -3 | 3,18 | 2,03 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB208050015000L** | -3 | 3,18 | 2,03 | 12,70 | 38,10 | – | ● | ● | | |
| **CB208060015004L** | -3 | 3,18 | 2,03 | 15,24 | 38,10 | 0,10 | ● | ● | | |
| **CB208060015000L** | -3 | 3,18 | 2,03 | 15,24 | 38,10 | – | ● | ● | | |
| **CB210015015004L** | -3 | 3,18 | 2,54 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB210015015000L** | -3 | 3,18 | 2,54 | 3,81 | 38,10 | – | ● | ● | | |
| **CB210020015004L** | -3 | 3,18 | 2,54 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB210020015000L** | -3 | 3,18 | 2,54 | 5,08 | 38,10 | – | ● | ● | | |
| **CB210030015004L** | -3 | 3,18 | 2,54 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB210030015000L** | -3 | 3,18 | 2,54 | 7,62 | 38,10 | – | ● | ● | | |
| **CB210040015004L** | -3 | 3,18 | 2,54 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB210040015000L** | -3 | 3,18 | 2,54 | 10,16 | 38,10 | – | ● | ● | | |
| **CB210050015004L** | -3 | 3,18 | 2,54 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB210050015000L** | -3 | 3,18 | 2,54 | 12,70 | 38,10 | – | ● | ● | | |
| **CB210060015004L** | -3 | 3,18 | 2,54 | 15,24 | 38,10 | 0,10 | ● | ● | | |
| **CB210060015000L** | -3 | 3,18 | 2,54 | 15,24 | 38,10 | – | ● | ● | | |
| **CB210070015004L** | -3 | 3,18 | 2,54 | 17,78 | 38,10 | 0,10 | ● | ● | | |
| **CB210070015000L** | -3 | 3,18 | 2,54 | 17,78 | 38,10 | – | ● | ● | | |
| **CB211015015004L** | -3 | 3,18 | 2,79 | 3,81 | 38,10 | 0,10 | ● | ● | | |
| **CB211015015000L** | -3 | 3,18 | 2,79 | 3,81 | 38,10 | – | ● | ● | | |
| **CB211020015004L** | -3 | 3,18 | 2,79 | 5,08 | 38,10 | 0,10 | ● | ● | | |
| **CB211020015000L** | -3 | 3,18 | 2,79 | 5,08 | 38,10 | – | ● | ● | | |
| **CB211030015004L** | -3 | 3,18 | 2,79 | 7,62 | 38,10 | 0,10 | ● | ● | | |
| **CB211030015000L** | -3 | 3,18 | 2,79 | 7,62 | 38,10 | – | ● | ● | | |
| **CB211040015004L** | -3 | 3,18 | 2,79 | 10,16 | 38,10 | 0,10 | ● | ● | | |
| **CB211040015000L** | -3 | 3,18 | 2,79 | 10,16 | 38,10 | – | ● | ● | | |
| **CB211050015004L** | -3 | 3,18 | 2,79 | 12,70 | 38,10 | 0,10 | ● | ● | | |
| **CB211050015000L** | -3 | 3,18 | 2,79 | 12,70 | 38,10 | – | ● | ● | | |
| **CB211060015004L** | -3 | 3,18 | 2,79 | 15,24 | 38,10 | 0,10 | ● | ● | | |
| **CB211060015000L** | -3 | 3,18 | 2,79 | 15,24 | 38,10 | – | ● | ● | | |
| **CB211070015004L** | -3 | 3,18 | 2,79 | 17,78 | 38,10 | 0,10 | ● | ● | | |
| **CB211070015000L** | -3 | 3,18 | 2,79 | 17,78 | 38,10 | – | ● | ● | | |




● primera elección
○ elección alternativa

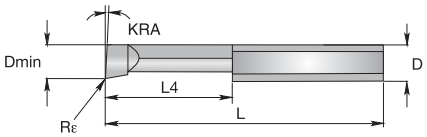
| | | | | | | |
|---|---|---|---|---|---|---|
| P | ● | ○ | | | | |
| M | ● | ○ | | | | |
| K | ○ | ● | | | | |
| N | ○ | ● | | | | ● |
| S | ● | ○ | | | | |
| H | | | | ● | | |

## ■ CB • Diámetro de mango de 4,76 mm • Diámetro de corte ≤3,56 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB312025020006R** | -3 | 4,76 | 3,05 | 6,35 | 50,80 | 0,15 | ● | ● | | |
| **CB312025020000R** | -3 | 4,76 | 3,05 | 6,35 | 50,80 | – | ● | ● | | |
| **CB312035020006R** | -3 | 4,76 | 3,05 | 8,89 | 50,80 | 0,15 | ● | ● | | |
| **CB312035020000R** | -3 | 4,76 | 3,05 | 8,89 | 50,80 | – | ● | ● | | |
| **CB312050020006R** | -3 | 4,76 | 3,05 | 12,70 | 50,80 | 0,15 | ● | ● | | |
| **CB312050020000R** | -3 | 4,76 | 3,05 | 12,70 | 50,80 | – | ● | ● | | |
| **CB312060020006R** | -3 | 4,76 | 3,05 | 15,24 | 50,80 | 0,15 | ● | ● | | |
| **CB312060020000R** | -3 | 4,76 | 3,05 | 15,24 | 50,80 | – | ● | ● | | |
| **CB312070020006R** | -3 | 4,76 | 3,05 | 17,78 | 50,80 | 0,15 | ● | ● | | |
| **CB312070020000R** | -3 | 4,76 | 3,05 | 17,78 | 50,80 | – | ● | ● | | |
| **CB312080020006R** | -3 | 4,76 | 3,05 | 20,32 | 50,80 | 0,15 | ● | ● | | |
| **CB312080020000R** | -3 | 4,76 | 3,05 | 20,32 | 50,80 | – | ● | ● | | |
| **CB314025020006R** | -3 | 4,76 | 3,56 | 6,35 | 50,80 | 0,15 | ● | ● | | |
| **CB314025020000R** | -3 | 4,76 | 3,56 | 6,35 | 50,80 | – | ● | ● | | |
| **CB314040020006R** | -3 | 4,76 | 3,56 | 10,16 | 50,80 | 0,15 | ● | ● | | |
| **CB314040020000R** | -3 | 4,76 | 3,56 | 10,16 | 50,80 | – | ● | ● | | |
| **CB314050020006R** | -3 | 4,76 | 3,56 | 12,70 | 50,80 | 0,15 | ● | ● | | |
| **CB314050020000R** | -3 | 4,76 | 3,56 | 12,70 | 50,80 | – | ● | ● | | |
| **CB314060020006R** | -3 | 4,76 | 3,56 | 15,24 | 50,80 | 0,15 | ● | ● | | |
| **CB314060020000R** | -3 | 4,76 | 3,56 | 15,24 | 50,80 | – | ● | ● | | |
| **CB314070020006R** | -3 | 4,76 | 3,56 | 17,78 | 50,80 | 0,15 | ● | ● | | |
| **CB314070020000R** | -3 | 4,76 | 3,56 | 17,78 | 50,80 | – | ● | ● | | |
| **CB314075020006R** | -3 | 4,76 | 3,56 | 19,05 | 50,80 | 0,15 | ● | ● | | |
| **CB314075020000R** | -3 | 4,76 | 3,56 | 19,05 | 50,80 | – | ● | ● | | |
| **CB314080020006R** | -3 | 4,76 | 3,56 | 20,32 | 50,80 | 0,15 | ● | ● | | |
| **CB314080020000R** | -3 | 4,76 | 3,56 | 20,32 | 50,80 | – | ● | ● | | |

*(continuación)*

*(continuación)*

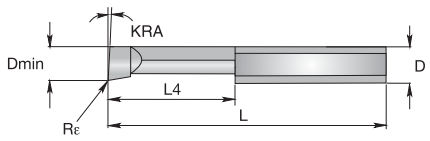



● primera elección
○ elección alternativa

| | | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 4,76 mm • Diámetro de corte ≤3,56 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | |
| **CB3120250200 06L** | -3 | 4,76 | 3,05 | 6,35 | 50,80 | 0,15 | ● | ● | | |
| **CB3120250200 00L** | -3 | 4,76 | 3,05 | 6,35 | 50,80 | – | ● | ● | | |
| **CB3120350200 06L** | -3 | 4,76 | 3,05 | 8,89 | 50,80 | 0,15 | ● | ● | | |
| **CB3120350200 00L** | -3 | 4,76 | 3,05 | 8,89 | 50,80 | – | ● | ● | | |
| **CB3120500200 06L** | -3 | 4,76 | 3,05 | 12,70 | 50,80 | 0,15 | ● | ● | | |
| **CB3120500200 00L** | -3 | 4,76 | 3,05 | 12,70 | 50,80 | – | ● | ● | | |
| **CB3120600200 06L** | -3 | 4,76 | 3,05 | 15,24 | 50,80 | 0,15 | ● | ● | | |
| **CB3120600200 00L** | -3 | 4,76 | 3,05 | 15,24 | 50,80 | – | ● | ● | | |
| **CB3120700200 06L** | -3 | 4,76 | 3,05 | 17,78 | 50,80 | 0,15 | ● | ● | | |
| **CB3120700200 00L** | -3 | 4,76 | 3,05 | 17,78 | 50,80 | – | ● | ● | | |
| **CB3120800200 06L** | -3 | 4,76 | 3,05 | 20,32 | 50,80 | 0,15 | ● | ● | | |
| **CB3120800200 00L** | -3 | 4,76 | 3,05 | 20,32 | 50,80 | – | ● | ● | | |
| **CB3140250200 06L** | -3 | 4,76 | 3,56 | 6,35 | 50,80 | 0,15 | ● | ● | | |
| **CB3140250200 00L** | -3 | 4,76 | 3,56 | 6,35 | 50,80 | – | ● | ● | | |
| **CB3140400200 06L** | -3 | 4,76 | 3,56 | 10,16 | 50,80 | 0,15 | ● | ● | | |
| **CB3140400200 00L** | -3 | 4,76 | 3,56 | 10,16 | 50,80 | – | ● | ● | | |
| **CB3140500200 06L** | -3 | 4,76 | 3,56 | 12,70 | 50,80 | 0,15 | ● | ● | | |
| **CB3140500200 00L** | -3 | 4,76 | 3,56 | 12,70 | 50,80 | – | ● | ● | | |
| **CB3140600200 06L** | -3 | 4,76 | 3,56 | 15,24 | 50,80 | 0,15 | ● | ● | | |
| **CB3140600200 00L** | -3 | 4,76 | 3,56 | 15,24 | 50,80 | – | ● | ● | | |
| **CB3140700200 06L** | -3 | 4,76 | 3,56 | 17,78 | 50,80 | 0,15 | ● | ● | | |
| **CB3140700200 00L** | -3 | 4,76 | 3,56 | 17,78 | 50,80 | – | ● | ● | | |
| **CB3140750200 06L** | -3 | 4,76 | 3,56 | 19,05 | 50,80 | 0,15 | ● | ● | | |
| **CB3140750200 00L** | -3 | 4,76 | 3,56 | 19,05 | 50,80 | – | ● | ● | | |
| **CB3140800200 06L** | -3 | 4,76 | 3,56 | 20,32 | 50,80 | 0,15 | ● | ● | | |
| **CB3140800200 00L** | -3 | 4,76 | 3,56 | 20,32 | 50,80 | – | ● | ● | | |

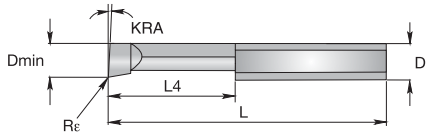



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ CB • Diámetro de mango de 4,76 mm • Diámetro de corte >3,81 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB316025020006R** | -3 | 4,76 | 4,06 | 6,35 | 50,80 | 0,15 | ● | ● | | |
| **CB316025020000R** | -3 | 4,76 | 4,06 | 6,35 | 50,80 | – | ● | ● | | |
| **CB316040020006R** | -3 | 4,76 | 4,06 | 10,16 | 50,80 | 0,15 | ● | ● | | |
| **CB316040020000R** | -3 | 4,76 | 4,06 | 10,16 | 50,80 | – | ● | ● | | |
| **CB316050020006R** | -3 | 4,76 | 4,06 | 12,70 | 50,80 | 0,15 | ● | ● | | |
| **CB316050020000R** | -3 | 4,76 | 4,06 | 12,70 | 50,80 | – | ● | ● | | |
| **CB316060020006R** | -3 | 4,76 | 4,06 | 15,24 | 50,80 | 0,15 | ● | ● | | |
| **CB316060020000R** | -3 | 4,76 | 4,06 | 15,24 | 50,80 | – | ● | ● | | |
| **CB316075020006R** | -3 | 4,76 | 4,06 | 19,05 | 50,80 | 0,15 | ● | ● | | |
| **CB316075020000R** | -3 | 4,76 | 4,06 | 19,05 | 50,80 | – | ● | ● | | |
| **CB316090020006R** | -3 | 4,76 | 4,06 | 22,86 | 50,80 | 0,15 | ● | ● | | |
| **CB316090020000R** | -3 | 4,76 | 4,06 | 22,86 | 50,80 | – | ● | ● | | |
| **CB3160100020006R** | -3 | 4,76 | 4,06 | 25,40 | 50,80 | 0,15 | ● | ● | | |
| **CB3160100020000R** | -3 | 4,76 | 4,06 | 25,40 | 50,80 | – | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **CB316025020006L** | -3 | 4,76 | 4,06 | 6,35 | 50,80 | 0,15 | ● | ● | | |
| **CB316025020000L** | -3 | 4,76 | 4,06 | 6,35 | 50,80 | – | ● | ● | | |
| **CB316040020006L** | -3 | 4,76 | 4,06 | 10,16 | 50,80 | 0,15 | ● | ● | | |
| **CB316040020000L** | -3 | 4,76 | 4,06 | 10,16 | 50,80 | – | ● | ● | | |
| **CB316050020006L** | -3 | 4,76 | 4,06 | 12,70 | 50,80 | 0,15 | ● | ● | | |
| **CB316050020000L** | -3 | 4,76 | 4,06 | 12,70 | 50,80 | – | ● | ● | | |
| **CB316060020006L** | -3 | 4,76 | 4,06 | 15,24 | 50,80 | 0,15 | ● | ● | | |
| **CB316060020000L** | -3 | 4,76 | 4,06 | 15,24 | 50,80 | – | ● | ● | | |
| **CB316075020006L** | -3 | 4,76 | 4,06 | 19,05 | 50,80 | 0,15 | ● | ● | | |
| **CB316075020000L** | -3 | 4,76 | 4,06 | 19,05 | 50,80 | – | ● | ● | | |
| **CB316090020006L** | -3 | 4,76 | 4,06 | 22,86 | 50,80 | 0,15 | ● | ● | | |
| **CB316090020000L** | -3 | 4,76 | 4,06 | 22,86 | 50,80 | – | ● | ● | | |
| **CB3160100020006L** | -3 | 4,76 | 4,06 | 25,40 | 50,80 | 0,15 | ● | ● | | |
| **CB3160100020000L** | -3 | 4,76 | 4,06 | 25,40 | 50,80 | – | ● | ● | | |



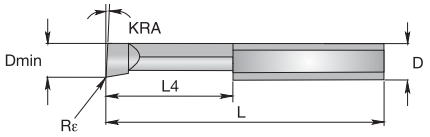

● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |



## ■ CB • Diámetro de mango de 6,35 mm • Diámetro de corte ≤4,57 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB4180350250006R** | -3 | 6,35 | 4,57 | 8,89 | 63,50 | 0,15 | ● | ● | | |
| **CB4180350250000R** | -3 | 6,35 | 4,57 | 8,89 | 63,50 | – | ● | ● | | |
| **CB4180500250006R** | -3 | 6,35 | 4,57 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB4180500250000R** | -3 | 6,35 | 4,57 | 12,70 | 63,50 | – | ● | ● | | |
| **CB4180600250006R** | -3 | 6,35 | 4,57 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB4180600250000R** | -3 | 6,35 | 4,57 | 15,24 | 63,50 | – | ● | ● | | |
| **CB4180750250006R** | -3 | 6,35 | 4,57 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB4180750250000R** | -3 | 6,35 | 4,57 | 19,05 | 63,50 | – | ● | ● | | |
| **CB4180900250006R** | -3 | 6,35 | 4,57 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB4180900250000R** | -3 | 6,35 | 4,57 | 22,86 | 63,50 | – | ● | ● | | |
| **CB4181000250006R** | -3 | 6,35 | 4,57 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB4181000250000R** | -3 | 6,35 | 4,57 | 25,40 | 63,50 | – | ● | ● | | |
| **CB4181100250006R** | -3 | 6,35 | 4,57 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB4181100250000R** | -3 | 6,35 | 4,57 | 27,94 | 63,50 | – | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **CB4180350250006L** | -3 | 6,35 | 4,57 | 8,89 | 63,50 | 0,15 | ● | ● | | |
| **CB4180350250000L** | -3 | 6,35 | 4,57 | 8,89 | 63,50 | – | ● | ● | | |
| **CB4180500250006L** | -3 | 6,35 | 4,57 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB4180500250000L** | -3 | 6,35 | 4,57 | 12,70 | 63,50 | – | ● | ● | | |
| **CB4180600250006L** | -3 | 6,35 | 4,57 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB4180600250000L** | -3 | 6,35 | 4,57 | 15,24 | 63,50 | – | ● | ● | | |
| **CB4180750250006L** | -3 | 6,35 | 4,57 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB4180750250000L** | -3 | 6,35 | 4,57 | 19,05 | 63,50 | – | ● | ● | | |
| **CB4180900250006L** | -3 | 6,35 | 4,57 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB4180900250000L** | -3 | 6,35 | 4,57 | 22,86 | 63,50 | – | ● | ● | | |
| **CB4181000250006L** | -3 | 6,35 | 4,57 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB4181000250000L** | -3 | 6,35 | 4,57 | 25,40 | 63,50 | – | ● | ● | | |
| **CB4181100250006L** | -3 | 6,35 | 4,57 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB4181100250000L** | -3 | 6,35 | 4,57 | 27,94 | 63,50 | – | ● | ● | | |

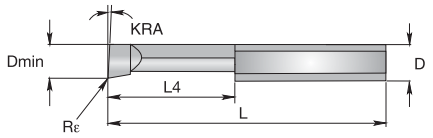



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 6,35 mm • Diámetro de corte ≥5,08 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB4200400250006R** | -3 | 6,35 | 5,08 | 10,16 | 63,50 | 0,15 | ● | ● | | |
| **CB4200400250000R** | -3 | 6,35 | 5,08 | 10,16 | 63,50 | – | ● | ● | | |
| **CB4200500250006R** | -3 | 6,35 | 5,08 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB4200500250000R** | -3 | 6,35 | 5,08 | 12,70 | 63,50 | – | ● | ● | | |
| **CB4200600250006R** | -3 | 6,35 | 5,08 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB4200600250000R** | -3 | 6,35 | 5,08 | 15,24 | 63,50 | – | ● | ● | | |
| **CB4200700250006R** | -3 | 6,35 | 5,08 | 17,78 | 63,50 | 0,15 | ● | ● | | |
| **CB4200700250000R** | -3 | 6,35 | 5,08 | 17,78 | 63,50 | – | ● | ● | | |
| **CB4200800250006R** | -3 | 6,35 | 5,08 | 20,32 | 63,50 | 0,15 | ● | ● | | |
| **CB4200800250000R** | -3 | 6,35 | 5,08 | 20,32 | 63,50 | – | ● | ● | | |
| **CB4200900250006R** | -3 | 6,35 | 5,08 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB4200900250000R** | -3 | 6,35 | 5,08 | 22,86 | 63,50 | – | ● | ● | | |
| **CB4201000250006R** | -3 | 6,35 | 5,08 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB4201000250000R** | -3 | 6,35 | 5,08 | 25,40 | 63,50 | – | ● | ● | | |
| **CB4201100250006R** | -3 | 6,35 | 5,08 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB4201100250000R** | -3 | 6,35 | 5,08 | 27,94 | 63,50 | – | ● | ● | | |
| **CB4201200250006R** | -3 | 6,35 | 5,08 | 30,48 | 63,50 | 0,15 | ● | ● | | |
| **CB4201200250000R** | -3 | 6,35 | 5,08 | 30,48 | 63,50 | – | ● | ● | | |
| **CB4201300250006R** | -3 | 6,35 | 5,08 | 33,02 | 63,50 | 0,15 | ● | ● | | |
| **CB4201300250000R** | -3 | 6,35 | 5,08 | 33,02 | 63,50 | – | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **CB4200400250006L** | -3 | 6,35 | 5,08 | 10,16 | 63,50 | 0,15 | ● | ● | | |
| **CB4200400250000L** | -3 | 6,35 | 5,08 | 10,16 | 63,50 | – | ● | ● | | |
| **CB4200500250006L** | -3 | 6,35 | 5,08 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB4200500250000L** | -3 | 6,35 | 5,08 | 12,70 | 63,50 | – | ● | ● | | |
| **CB4200600250006L** | -3 | 6,35 | 5,08 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB4200600250000L** | -3 | 6,35 | 5,08 | 15,24 | 63,50 | – | ● | ● | | |
| **CB4200700250006L** | -3 | 6,35 | 5,08 | 17,78 | 63,50 | 0,15 | ● | ● | | |
| **CB4200700250000L** | -3 | 6,35 | 5,08 | 17,78 | 63,50 | – | ● | ● | | |
| **CB4200800250006L** | -3 | 6,35 | 5,08 | 20,32 | 63,50 | 0,15 | ● | ● | | |
| **CB4200800250000L** | -3 | 6,35 | 5,08 | 20,32 | 63,50 | – | ● | ● | | |
| **CB4200900250006L** | -3 | 6,35 | 5,08 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB4200900250000L** | -3 | 6,35 | 5,08 | 22,86 | 63,50 | – | ● | ● | | |
| **CB4201000250006L** | -3 | 6,35 | 5,08 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB4201000250000L** | -3 | 6,35 | 5,08 | 25,40 | 63,50 | – | ● | ● | | |
| **CB4201100250006L** | -3 | 6,35 | 5,08 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB4201100250000L** | -3 | 6,35 | 5,08 | 27,94 | 63,50 | – | ● | ● | | |
| **CB4201200250006L** | -3 | 6,35 | 5,08 | 30,48 | 63,50 | 0,15 | ● | ● | | |
| **CB4201200250000L** | -3 | 6,35 | 5,08 | 30,48 | 63,50 | – | ● | ● | | |
| **CB4201300250006L** | -3 | 6,35 | 5,08 | 33,02 | 63,50 | 0,15 | ● | ● | | |
| **CB4201300250000L** | -3 | 6,35 | 5,08 | 33,02 | 63,50 | – | ● | ● | | |




● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | | ● | ○ | | | |
| M | | ● | ○ | | | |
| K | | ○ | ● | | | |
| N | | ○ | ● | | | ● |
| S | | ● | ○ | | | |
| H | | | | ● | | |

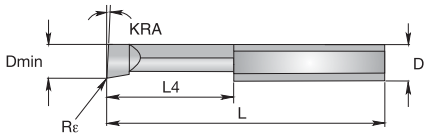


## ■ CB • Diámetro de mango de 7,94 mm • Diámetro de corte ≤5,84 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **a derechas** | | | | | | | | | | |
| **CB5230400250006R** | -3 | 7,94 | 5,84 | 10,16 | 63,50 | 0,15 | ● | ● | | |
| **CB5230400250000R** | -3 | 7,94 | 5,84 | 10,16 | 63,50 | – | ● | ● | | |
| **CB5230500250006R** | -3 | 7,94 | 5,84 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB5230500250000R** | -3 | 7,94 | 5,84 | 12,70 | 63,50 | – | ● | ● | | |
| **CB5230600250006R** | -3 | 7,94 | 5,84 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB5230600250000R** | -3 | 7,94 | 5,84 | 15,24 | 63,50 | – | ● | ● | | |
| **CB5230700250006R** | -3 | 7,94 | 5,84 | 17,78 | 63,50 | 0,15 | ● | ● | | |
| **CB5230700250000R** | -3 | 7,94 | 5,84 | 17,78 | 63,50 | – | ● | ● | | |
| **CB5230800250006R** | -3 | 7,94 | 5,84 | 20,32 | 63,50 | 0,15 | ● | ● | | |
| **CB5230800250000R** | -3 | 7,94 | 5,84 | 20,32 | 63,50 | – | ● | ● | | |
| **CB5230900250006R** | -3 | 7,94 | 5,84 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB5230900250000R** | -3 | 7,94 | 5,84 | 22,86 | 63,50 | – | ● | ● | | |
| **CB52301000250006R** | -3 | 7,94 | 5,84 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB52301000250000R** | -3 | 7,94 | 5,84 | 25,40 | 63,50 | – | ● | ● | | |
| **CB52301150250006R** | -3 | 7,94 | 5,84 | 29,21 | 63,50 | 0,15 | ● | ● | | |
| **CB52301150250000R** | -3 | 7,94 | 5,84 | 29,21 | 63,50 | – | ● | ● | | |
| **CB52301200250006R** | -3 | 7,94 | 5,84 | 30,48 | 63,50 | 0,15 | ● | ● | | |
| **CB52301200250000R** | -3 | 7,94 | 5,84 | 30,48 | 63,50 | – | ● | ● | | |
| **CB52301250250006R** | -3 | 7,94 | 5,84 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB52301250250000R** | -3 | 7,94 | 5,84 | 31,75 | 63,50 | – | ● | ● | | |
| **CB52301400250006R** | -3 | 7,94 | 5,84 | 35,56 | 63,50 | 0,15 | ● | ● | | |
| **CB52301400250000R** | -3 | 7,94 | 5,84 | 35,56 | 63,50 | – | ● | ● | | |
| **CB52301500250006R** | -3 | 7,94 | 5,84 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB52301500250000R** | -3 | 7,94 | 5,84 | 38,10 | 63,50 | – | ● | ● | | |
| **CB52301600250006R** | -3 | 7,94 | 5,84 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB52301600250000R** | -3 | 7,94 | 5,84 | 40,64 | 63,50 | – | ● | ● | | |


*(continuación)*

*(continuación)*

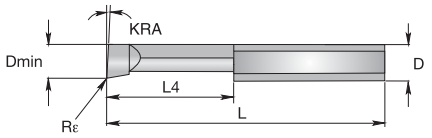



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 7,94 mm • Diámetro de corte ≤5,84 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **a izquierdas** | | | | | | | | | | |
| **CB5230400250006L** | -3 | 7,94 | 5,84 | 10,16 | 63,50 | 0,15 | ● | ● | | |
| **CB5230400250000L** | -3 | 7,94 | 5,84 | 10,16 | 63,50 | – | ● | ● | | |
| **CB5230500250006L** | -3 | 7,94 | 5,84 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB5230500250000L** | -3 | 7,94 | 5,84 | 12,70 | 63,50 | – | ● | ● | | |
| **CB5230600250006L** | -3 | 7,94 | 5,84 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB5230600250000L** | -3 | 7,94 | 5,84 | 15,24 | 63,50 | – | ● | ● | | |
| **CB5230700250006L** | -3 | 7,94 | 5,84 | 17,78 | 63,50 | 0,15 | ● | ● | | |
| **CB5230700250000L** | -3 | 7,94 | 5,84 | 17,78 | 63,50 | – | ● | ● | | |
| **CB5230800250006L** | -3 | 7,94 | 5,84 | 20,32 | 63,50 | 0,15 | ● | ● | | |
| **CB5230800250000L** | -3 | 7,94 | 5,84 | 20,32 | 63,50 | – | ● | ● | | |
| **CB5230900250006L** | -3 | 7,94 | 5,84 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB5230900250000L** | -3 | 7,94 | 5,84 | 22,86 | 63,50 | – | ● | ● | | |
| **CB5231000250006L** | -3 | 7,94 | 5,84 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB5231000250000L** | -3 | 7,94 | 5,84 | 25,40 | 63,50 | – | ● | ● | | |
| **CB5231150250006L** | -3 | 7,94 | 5,84 | 29,21 | 63,50 | 0,15 | ● | ● | | |
| **CB5231150250000L** | -3 | 7,94 | 5,84 | 29,21 | 63,50 | – | ● | ● | | |
| **CB5231200250006L** | -3 | 7,94 | 5,84 | 30,48 | 63,50 | 0,15 | ● | ● | | |
| **CB5231200250000L** | -3 | 7,94 | 5,84 | 30,48 | 63,50 | – | ● | ● | | |
| **CB5231250250006L** | -3 | 7,94 | 5,84 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB5231250250000L** | -3 | 7,94 | 5,84 | 31,75 | 63,50 | – | ● | ● | | |
| **CB5231400250006L** | -3 | 7,94 | 5,84 | 35,56 | 63,50 | 0,15 | ● | ● | | |
| **CB5231400250000L** | -3 | 7,94 | 5,84 | 35,56 | 63,50 | – | ● | ● | | |
| **CB5231500250006L** | -3 | 7,94 | 5,84 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB5231500250000L** | -3 | 7,94 | 5,84 | 38,10 | 63,50 | – | ● | ● | | |
| **CB5231600250006L** | -3 | 7,94 | 5,84 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB5231600250000L** | -3 | 7,94 | 5,84 | 40,64 | 63,50 | – | ● | ● | | |



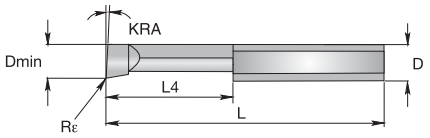

● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |



## ■ CB • Diámetro de mango de 7,94 mm • Diámetro de corte ≥7,37 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB5290500250006R** | -3 | 7,94 | 7,37 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB5290500250000R** | -3 | 7,94 | 7,37 | 12,70 | 63,50 | – | ● | ● | | |
| **CB5290600250006R** | -3 | 7,94 | 7,37 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB5290600250000R** | -3 | 7,94 | 7,37 | 15,24 | 63,50 | – | ● | ● | | |
| **CB5290750250006R** | -3 | 7,94 | 7,37 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB5290750250000R** | -3 | 7,94 | 7,37 | 19,05 | 63,50 | – | ● | ● | | |
| **CB5290900250006R** | -3 | 7,94 | 7,37 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB5290900250000R** | -3 | 7,94 | 7,37 | 22,86 | 63,50 | – | ● | ● | | |
| **CB5291000250006R** | -3 | 7,94 | 7,37 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB5291000250000R** | -3 | 7,94 | 7,37 | 25,40 | 63,50 | – | ● | ● | | |
| **CB5291100250006R** | -3 | 7,94 | 7,37 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB5291100250000R** | -3 | 7,94 | 7,37 | 27,94 | 63,50 | – | ● | ● | | |
| **CB5291250250006R** | -3 | 7,94 | 7,37 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB5291250250000R** | -3 | 7,94 | 7,37 | 31,75 | 63,50 | – | ● | ● | | |
| **CB5291350250006R** | -3 | 7,94 | 7,37 | 34,29 | 63,50 | 0,15 | ● | ● | | |
| **CB5291350250000R** | -3 | 7,94 | 7,37 | 34,29 | 63,50 | – | ● | ● | | |
| **CB5291500250006R** | -3 | 7,94 | 7,37 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB5291500250000R** | -3 | 7,94 | 7,37 | 38,10 | 63,50 | – | ● | ● | | |
| **CB5291600250006R** | -3 | 7,94 | 7,37 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB5291600250000R** | -3 | 7,94 | 7,37 | 40,64 | 63,50 | – | ● | ● | | |
| **CB5291750250006R** | -3 | 7,94 | 7,37 | 44,45 | 63,50 | 0,15 | ● | ● | | |
| **CB5291750250000R** | -3 | 7,94 | 7,37 | 44,45 | 63,50 | – | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **CB5290500250006L** | -3 | 7,94 | 7,37 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB5290500250000L** | -3 | 7,94 | 7,37 | 12,70 | 63,50 | – | ● | ● | | |
| **CB5290600250006L** | -3 | 7,94 | 7,37 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB5290600250000L** | -3 | 7,94 | 7,37 | 15,24 | 63,50 | – | ● | ● | | |
| **CB5290750250006L** | -3 | 7,94 | 7,37 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB5290750250000L** | -3 | 7,94 | 7,37 | 19,05 | 63,50 | – | ● | ● | | |
| **CB5290900250006L** | -3 | 7,94 | 7,37 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB5290900250000L** | -3 | 7,94 | 7,37 | 22,86 | 63,50 | – | ● | ● | | |
| **CB5291000250006L** | -3 | 7,94 | 7,37 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB5291000250000L** | -3 | 7,94 | 7,37 | 25,40 | 63,50 | – | ● | ● | | |
| **CB5291100250006L** | -3 | 7,94 | 7,37 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB5291100250000L** | -3 | 7,94 | 7,37 | 27,94 | 63,50 | – | ● | ● | | |
| **CB5291250250006L** | -3 | 7,94 | 7,37 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB5291250250000L** | -3 | 7,94 | 7,37 | 31,75 | 63,50 | – | ● | ● | | |
| **CB5291350250006L** | -3 | 7,94 | 7,37 | 34,29 | 63,50 | 0,15 | ● | ● | | |
| **CB5291350250000L** | -3 | 7,94 | 7,37 | 34,29 | 63,50 | – | ● | ● | | |
| **CB5291500250006L** | -3 | 7,94 | 7,37 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB5291500250000L** | -3 | 7,94 | 7,37 | 38,10 | 63,50 | – | ● | ● | | |
| **CB5291600250006L** | -3 | 7,94 | 7,37 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB5291600250000L** | -3 | 7,94 | 7,37 | 40,64 | 63,50 | – | ● | ● | | |
| **CB5291750250006L** | -3 | 7,94 | 7,37 | 44,45 | 63,50 | 0,15 | ● | ● | | |
| **CB5291750250000L** | -3 | 7,94 | 7,37 | 44,45 | 63,50 | – | ● | ● | | |




● primera elección
○ elección alternativa

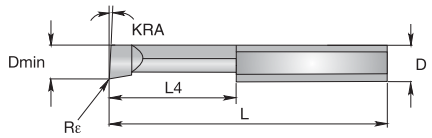
| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ CB • Diámetro de mango de 9,53 mm • Diámetro de corte ≥8,13 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB632050025006R** | -3 | 9,53 | 8,13 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB632050025000R** | -3 | 9,53 | 8,13 | 12,70 | 63,50 | – | ● | ● | | |
| **CB632060025006R** | -3 | 9,53 | 8,13 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB632060025000R** | -3 | 9,53 | 8,13 | 15,24 | 63,50 | – | ● | ● | | |
| **CB632075025006R** | -3 | 9,53 | 8,13 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB632075025000R** | -3 | 9,53 | 8,13 | 19,05 | 63,50 | – | ● | ● | | |
| **CB632090025006R** | -3 | 9,53 | 8,13 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB632090025000R** | -3 | 9,53 | 8,13 | 22,86 | 63,50 | – | ● | ● | | |
| **CB6320100025006R** | -3 | 9,53 | 8,13 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB6320100025000R** | -3 | 9,53 | 8,13 | 25,40 | 63,50 | – | ● | ● | | |
| **CB6320110025006R** | -3 | 9,53 | 8,13 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB6320110025000R** | -3 | 9,53 | 8,13 | 27,94 | 63,50 | – | ● | ● | | |
| **CB6320125025006R** | -3 | 9,53 | 8,13 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB6320125025000R** | -3 | 9,53 | 8,13 | 31,75 | 63,50 | – | ● | ● | | |
| **CB6320150025006R** | -3 | 9,53 | 8,13 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB6320150025000R** | -3 | 9,53 | 8,13 | 38,10 | 63,50 | – | ● | ● | | |
| **CB6320160025006R** | -3 | 9,53 | 8,13 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB6320160025000R** | -3 | 9,53 | 8,13 | 40,64 | 63,50 | – | ● | ● | | |
| **CB6320180025006R** | -3 | 9,53 | 8,13 | 45,72 | 63,50 | 0,15 | | ● | | |
| **CB6320180025000R** | -3 | 9,53 | 8,13 | 45,72 | 63,50 | 0,15 | ● | | | |
| | -3 | 9,53 | 8,13 | 45,72 | 63,50 | – | ● | ● | | |
| **CB6320200040006R** | -3 | 9,53 | 8,13 | 50,80 | 101,60 | 0,15 | ● | ● | | |
| **CB6320200040000R** | -3 | 9,53 | 8,13 | 50,80 | 101,60 | – | ● | ● | | |
| **CB6320250040006R** | -3 | 9,53 | 8,13 | 63,50 | 101,60 | 0,15 | ● | ● | | |
| **CB6320250040000R** | -3 | 9,53 | 8,13 | 63,50 | 101,60 | – | ● | ● | | |
| **CB6320300040006R** | -3 | 9,53 | 8,13 | 76,20 | 101,60 | 0,15 | ● | ● | | |
| **CB6320300040000R** | -3 | 9,53 | 8,13 | 76,20 | 101,60 | – | ● | ● | | |

*(continuación)*

*(continuación)*

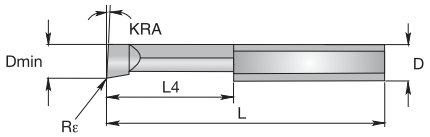



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 9,53 mm • Diámetro de corte ≥8,13 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | |
| **CB6320500250006L** | -3 | 9,53 | 8,13 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB6320500250000L** | -3 | 9,53 | 8,13 | 12,70 | 63,50 | – | ● | ● | | |
| **CB6320600250006L** | -3 | 9,53 | 8,13 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB6320600250000L** | -3 | 9,53 | 8,13 | 15,24 | 63,50 | – | ● | ● | | |
| **CB6320750250006L** | -3 | 9,53 | 8,13 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB6320750250000L** | -3 | 9,53 | 8,13 | 19,05 | 63,50 | – | ● | ● | | |
| **CB6320900250006L** | -3 | 9,53 | 8,13 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB6320900250000L** | -3 | 9,53 | 8,13 | 22,86 | 63,50 | – | ● | ● | | |
| **CB63201000250006L** | -3 | 9,53 | 8,13 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB63201000250000L** | -3 | 9,53 | 8,13 | 25,40 | 63,50 | – | ● | ● | | |
| **CB63201100250006L** | -3 | 9,53 | 8,13 | 27,94 | 63,50 | 0,15 | ● | ● | | |
| **CB63201100250000L** | -3 | 9,53 | 8,13 | 27,94 | 63,50 | – | ● | ● | | |
| **CB63201250250006L** | -3 | 9,53 | 8,13 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB63201250250000L** | -3 | 9,53 | 8,13 | 31,75 | 63,50 | – | ● | ● | | |
| **CB63201500250006L** | -3 | 9,53 | 8,13 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB63201500250000L** | -3 | 9,53 | 8,13 | 38,10 | 63,50 | – | ● | ● | | |
| **CB63201600250006L** | -3 | 9,53 | 8,13 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB63201600250000L** | -3 | 9,53 | 8,13 | 40,64 | 63,50 | – | ● | ● | | |
| **CB63201800250006L** | -3 | 9,53 | 8,13 | 45,72 | 63,50 | 0,15 | ● | ● | | |
| **CB63201800250000L** | -3 | 9,53 | 8,13 | 45,72 | 63,50 | – | ● | ● | | |
| **CB63202000400006L** | -3 | 9,53 | 8,13 | 50,80 | 101,60 | 0,15 | ● | ● | | |
| **CB63202000400000L** | -3 | 9,53 | 8,13 | 50,80 | 101,60 | – | ● | ● | | |
| **CB63202500400006L** | -3 | 9,53 | 8,13 | 63,50 | 101,60 | 0,15 | ● | ● | | |
| **CB63202500400000L** | -3 | 9,53 | 8,13 | 63,50 | 101,60 | – | ● | ● | | |
| **CB63203000400006L** | -3 | 9,53 | 8,13 | 76,20 | 101,60 | 0,15 | ● | ● | | |
| **CB63203000400000L** | -3 | 9,53 | 8,13 | 76,20 | 101,60 | – | ● | ● | | |




● primera elección
○ elección alternativa

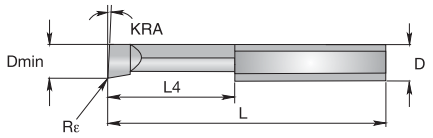
| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ CB • Diámetro de mango de 9,53 mm • Diámetro de corte ≥9,14 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB636050025006R** | -3 | 9,53 | 9,14 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB636050025000R** | -3 | 9,53 | 9,14 | 12,70 | 63,50 | – | ● | ● | | |
| **CB636060025006R** | -3 | 9,53 | 9,14 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB636060025000R** | -3 | 9,53 | 9,14 | 15,24 | 63,50 | – | ● | ● | | |
| **CB636075025006R** | -3 | 9,53 | 9,14 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB636075025000R** | -3 | 9,53 | 9,14 | 19,05 | 63,50 | – | ● | ● | | |
| **CB636090025006R** | -3 | 9,53 | 9,14 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB636090025000R** | -3 | 9,53 | 9,14 | 22,86 | 63,50 | – | ● | ● | | |
| **CB6360100025006R** | -3 | 9,53 | 9,14 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB6360100025000R** | -3 | 9,53 | 9,14 | 25,40 | 63,50 | – | ● | ● | | |
| **CB6360115025006R** | -3 | 9,53 | 9,14 | 29,21 | 63,50 | 0,15 | ● | ● | | |
| **CB6360115025000R** | -3 | 9,53 | 9,14 | 29,21 | 63,50 | – | ● | ● | | |
| **CB6360125025006R** | -3 | 9,53 | 9,14 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB6360125025000R** | -3 | 9,53 | 9,14 | 31,75 | 63,50 | – | ● | ● | | |
| **CB6360150025006R** | -3 | 9,53 | 9,14 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB6360150025000R** | -3 | 9,53 | 9,14 | 38,10 | 63,50 | – | ● | ● | | |
| **CB6360160025006R** | -3 | 9,53 | 9,14 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB6360160025000R** | -3 | 9,53 | 9,14 | 40,64 | 63,50 | – | ● | ● | | |
| **CB6360180025006R** | -3 | 9,53 | 9,14 | 45,72 | 63,50 | 0,15 | ● | ● | | |
| **CB6360180025000R** | -3 | 9,53 | 9,14 | 45,72 | 63,50 | – | ● | ● | | |
| **CB6360200040006R** | -3 | 9,53 | 9,14 | 50,80 | 101,60 | 0,15 | ● | ● | | |
| **CB6360200040000R** | -3 | 9,53 | 9,14 | 50,80 | 101,60 | – | ● | ● | | |
| **CB6360250040006R** | -3 | 9,53 | 9,14 | 63,50 | 101,60 | 0,15 | ● | ● | | |
| **CB6360250040000R** | -3 | 9,53 | 9,14 | 63,50 | 101,60 | – | ● | ● | | |
| **CB6360300040006R** | -3 | 9,53 | 9,14 | 76,20 | 101,60 | 0,15 | ● | ● | | |
| **CB6360300040000R** | -3 | 9,53 | 9,14 | 76,20 | 101,60 | – | ● | ● | | |

*(continuación)*

*(continuación)*

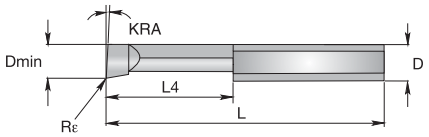



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 9,53 mm • Diámetro de corte ≥9,14 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **a izquierdas** | | | | | | | | | | |
| **CB636050025006L** | -3 | 9,53 | 9,14 | 12,70 | 63,50 | 0,15 | ● | ● | | |
| **CB636050025000L** | -3 | 9,53 | 9,14 | 12,70 | 63,50 | – | ● | ● | | |
| **CB636060025006L** | -3 | 9,53 | 9,14 | 15,24 | 63,50 | 0,15 | ● | ● | | |
| **CB636060025000L** | -3 | 9,53 | 9,14 | 15,24 | 63,50 | – | ● | ● | | |
| **CB636075025006L** | -3 | 9,53 | 9,14 | 19,05 | 63,50 | 0,15 | ● | ● | | |
| **CB636075025000L** | -3 | 9,53 | 9,14 | 19,05 | 63,50 | – | ● | ● | | |
| **CB636090025006L** | -3 | 9,53 | 9,14 | 22,86 | 63,50 | 0,15 | ● | ● | | |
| **CB636090025000L** | -3 | 9,53 | 9,14 | 22,86 | 63,50 | – | ● | ● | | |
| **CB6360100025006L** | -3 | 9,53 | 9,14 | 25,40 | 63,50 | 0,15 | ● | ● | | |
| **CB6360100025000L** | -3 | 9,53 | 9,14 | 25,40 | 63,50 | – | ● | ● | | |
| **CB6360115025006L** | -3 | 9,53 | 9,14 | 29,21 | 63,50 | 0,15 | ● | ● | | |
| **CB6360115025000L** | -3 | 9,53 | 9,14 | 29,21 | 63,50 | – | ● | ● | | |
| **CB6360125025006L** | -3 | 9,53 | 9,14 | 31,75 | 63,50 | 0,15 | ● | ● | | |
| **CB6360125025000L** | -3 | 9,53 | 9,14 | 31,75 | 63,50 | – | ● | ● | | |
| **CB6360150025006L** | -3 | 9,53 | 9,14 | 38,10 | 63,50 | 0,15 | ● | ● | | |
| **CB6360150025000L** | -3 | 9,53 | 9,14 | 38,10 | 63,50 | – | ● | ● | | |
| **CB6360160025006L** | -3 | 9,53 | 9,14 | 40,64 | 63,50 | 0,15 | ● | ● | | |
| **CB6360160025000L** | -3 | 9,53 | 9,14 | 40,64 | 63,50 | – | ● | ● | | |
| **CB6360180025006L** | -3 | 9,53 | 9,14 | 45,72 | 63,50 | 0,15 | ● | ● | | |
| **CB6360180025000L** | -3 | 9,53 | 9,14 | 45,72 | 63,50 | – | ● | ● | | |
| **CB6360200040006L** | -3 | 9,53 | 9,14 | 50,80 | 101,60 | 0,15 | ● | ● | | |
| **CB6360200040000L** | -3 | 9,53 | 9,14 | 50,80 | 101,60 | – | ● | ● | | |
| **CB6360250040006L** | -3 | 9,53 | 9,14 | 63,50 | 101,60 | 0,15 | ● | ● | | |
| **CB6360250040000L** | -3 | 9,53 | 9,14 | 63,50 | 101,60 | – | ● | ● | | |
| **CB6360300040006L** | -3 | 9,53 | 9,14 | 76,20 | 101,60 | 0,15 | ● | ● | | |
| **CB6360300040000L** | -3 | 9,53 | 9,14 | 76,20 | 101,60 | – | ● | ● | | |




● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 12,70 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **a derechas** | | | | | | | | | | |
| **CB849075030006R** | -3 | 12,70 | 12,45 | 19,05 | 76,20 | 0,15 | ● | ● | | |
| **CB849075030000R** | -3 | 12,70 | 12,45 | 19,05 | 76,20 | – | ● | ● | | |
| **CB8490100030006R** | -3 | 12,70 | 12,45 | 25,40 | 76,20 | 0,15 | ● | ● | | |
| **CB8490100030000R** | -3 | 12,70 | 12,45 | 25,40 | 76,20 | – | ● | ● | | |
| **CB8490125030006R** | -3 | 12,70 | 12,45 | 31,75 | 76,20 | 0,15 | ● | ● | | |
| **CB8490125030000R** | -3 | 12,70 | 12,45 | 31,75 | 76,20 | – | ● | ● | | |
| **CB8490150030006R** | -3 | 12,70 | 12,45 | 38,10 | 76,20 | 0,15 | ● | ● | | |
| **CB8490150030000R** | -3 | 12,70 | 12,45 | 38,10 | 76,20 | – | ● | ● | | |
| **CB8490200040006R** | -3 | 12,70 | 12,45 | 50,80 | 101,60 | 0,15 | ● | ● | | |
| **CB8490200040000R** | -3 | 12,70 | 12,45 | 50,80 | 101,60 | – | ● | ● | | |
| **CB8490250040006R** | -3 | 12,70 | 12,45 | 63,50 | 101,60 | 0,15 | ● | ● | | |
| **CB8490250040000R** | -3 | 12,70 | 12,45 | 63,50 | 101,60 | – | ● | ● | | |
| **CB8490260040006R** | -3 | 12,70 | 12,45 | 66,04 | 101,60 | 0,15 | ● | ● | | |
| **CB8490260040000R** | -3 | 12,70 | 12,45 | 66,04 | 101,60 | – | ● | ● | | |
| **CB8490275040006R** | -3 | 12,70 | 12,45 | 69,85 | 101,60 | 0,15 | ● | ● | | |
| **CB8490275040000R** | -3 | 12,70 | 12,45 | 69,85 | 101,60 | – | ● | ● | | |
| **CB8490300060006R** | -3 | 12,70 | 12,45 | 76,20 | 152,40 | 0,15 | ● | ● | | |
| **CB8490300060000R** | -3 | 12,70 | 12,45 | 76,20 | 152,40 | – | ● | ● | | |
| **CB8490350060006R** | -3 | 12,70 | 12,45 | 88,90 | 152,40 | 0,15 | ● | ● | | |
| **CB8490350060000R** | -3 | 12,70 | 12,45 | 88,90 | 152,40 | – | ● | ● | | |
| **CB8490400060006R** | -3 | 12,70 | 12,45 | 101,60 | 152,40 | 0,15 | ● | ● | | |
| **CB8490400060000R** | -3 | 12,70 | 12,45 | 101,60 | 152,40 | – | ● | ● | | |
| **CB8490450060006R** | -3 | 12,70 | 12,45 | 114,30 | 152,40 | 0,15 | ● | ● | | |
| **CB8490450060000R** | -3 | 12,70 | 12,45 | 114,30 | 152,40 | – | ● | ● | | |

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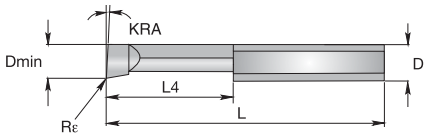
*(continuación)*

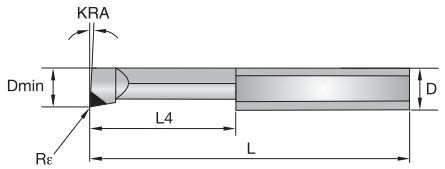



● primera elección
○ elección alternativa

| | | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CB • Diámetro de mango de 12,70 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **a izquierdas** | | | | | | | | | | |
| **CB849075030006L** | -3 | 12,70 | 12,45 | 19,05 | 76,20 | 0,15 | ● | ● | | |
| **CB849075030000L** | -3 | 12,70 | 12,45 | 19,05 | 76,20 | – | ● | ● | | |
| **CB8490100030006L** | -3 | 12,70 | 12,45 | 25,40 | 76,20 | 0,15 | ● | ● | | |
| **CB8490100030000L** | -3 | 12,70 | 12,45 | 25,40 | 76,20 | – | ● | ● | | |
| **CB8490125030006L** | -3 | 12,70 | 12,45 | 31,75 | 76,20 | 0,15 | ● | ● | | |
| **CB8490125030000L** | -3 | 12,70 | 12,45 | 31,75 | 76,20 | – | ● | ● | | |
| **CB8490150030006L** | -3 | 12,70 | 12,45 | 38,10 | 76,20 | 0,15 | ● | ● | | |
| **CB8490150030000L** | -3 | 12,70 | 12,45 | 38,10 | 76,20 | – | ● | ● | | |
| **CB8490200040006L** | -3 | 12,70 | 12,45 | 50,80 | 101,60 | 0,15 | ● | ● | | |
| **CB8490200040000L** | -3 | 12,70 | 12,45 | 50,80 | 101,60 | – | ● | ● | | |
| **CB8490250040006L** | -3 | 12,70 | 12,45 | 63,50 | 101,60 | 0,15 | ● | ● | | |
| **CB8490250040000L** | -3 | 12,70 | 12,45 | 63,50 | 101,60 | – | ● | ● | | |
| **CB8490260040006L** | -3 | 12,70 | 12,45 | 66,04 | 101,60 | 0,15 | ● | ● | | |
| **CB8490260040000L** | -3 | 12,70 | 12,45 | 66,04 | 101,60 | – | ● | ● | | |
| **CB8490275040006L** | -3 | 12,70 | 12,45 | 69,85 | 101,60 | 0,15 | ● | ● | | |
| **CB8490275040000L** | -3 | 12,70 | 12,45 | 69,85 | 101,60 | – | ● | ● | | |
| **CB8490300060006L** | -3 | 12,70 | 12,45 | 76,20 | 152,40 | 0,15 | ● | ● | | |
| **CB8490300060000L** | -3 | 12,70 | 12,45 | 76,20 | 152,40 | – | ● | ● | | |
| **CB8490350060006L** | -3 | 12,70 | 12,45 | 88,90 | 152,40 | 0,15 | ● | ● | | |
| **CB8490350060000L** | -3 | 12,70 | 12,45 | 88,90 | 152,40 | – | ● | ● | | |
| **CB8490400060006L** | -3 | 12,70 | 12,45 | 101,60 | 152,40 | 0,15 | ● | ● | | |
| **CB8490400060000L** | -3 | 12,70 | 12,45 | 101,60 | 152,40 | – | ● | ● | | |
| **CB8490450060006L** | -3 | 12,70 | 12,45 | 114,30 | 152,40 | 0,15 | ● | ● | | |
| **CB8490450060000L** | -3 | 12,70 | 12,45 | 114,30 | 152,40 | – | ● | ● | | |

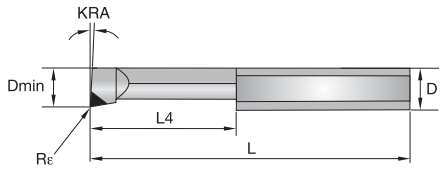



● primera elección
○ elección alternativa

| | | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CB-M • Diámetro de mango de 3,18 mm–4,76 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB210015015004RM** | -3 | 3,18 | 2,54 | 3,81 | 38,10 | 0,10 | | | ● | ● |
| **CB210020015004RM** | -3 | 3,18 | 2,54 | 5,08 | 38,10 | 0,10 | | | ● | ● |
| **CB210030015004RM** | -3 | 3,18 | 2,54 | 7,62 | 38,10 | 0,10 | | | ● | ● |
| **CB210040015004RM** | -3 | 3,18 | 2,54 | 10,16 | 38,10 | 0,10 | | | ● | ● |
| **CB210050015004RM** | -3 | 3,18 | 2,54 | 12,70 | 38,10 | 0,10 | | | ● | ● |
| **CB210060015004RM** | -3 | 3,18 | 2,54 | 15,24 | 38,10 | 0,10 | | | ● | ● |
| **CB210070015004RM** | -3 | 3,18 | 2,54 | 17,78 | 38,10 | 0,10 | | | ● | ● |
| **CB211015015004RM** | -3 | 3,18 | 2,79 | 3,81 | 38,10 | 0,10 | | | ● | ● |
| **CB211020015004RM** | -3 | 3,18 | 2,79 | 5,08 | 38,10 | 0,10 | | | ● | ● |
| **CB211030015004RM** | -3 | 3,18 | 2,79 | 7,62 | 38,10 | 0,10 | | | ● | ● |
| **CB211040015004RM** | -3 | 3,18 | 2,79 | 10,16 | 38,10 | 0,10 | | | ● | ● |
| **CB211050015004RM** | -3 | 3,18 | 2,79 | 12,70 | 38,10 | 0,10 | | | ● | ● |
| **CB211060015004RM** | -3 | 3,18 | 2,79 | 15,24 | 38,10 | 0,10 | | | ● | ● |
| **CB211070015004RM** | -3 | 3,18 | 2,79 | 17,78 | 38,10 | 0,10 | | | ● | ● |
| **CB312025020006RM** | -3 | 4,76 | 3,05 | 6,35 | 50,80 | 0,15 | | | ● | ● |
| **CB312035020006RM** | -3 | 4,76 | 3,05 | 8,89 | 50,80 | 0,15 | | | ● | ● |
| **CB312050020006RM** | -3 | 4,76 | 3,05 | 12,70 | 50,80 | 0,15 | | | ● | ● |
| **CB312060020006RM** | -3 | 4,76 | 3,05 | 15,24 | 50,80 | 0,15 | | | ● | ● |
| **CB312070020006RM** | -3 | 4,76 | 3,05 | 17,78 | 50,80 | 0,15 | | | ● | ● |
| **CB312080020006RM** | -3 | 4,76 | 3,05 | 20,32 | 50,80 | 0,15 | | | ● | ● |
| **CB314025020006RM** | -3 | 4,76 | 3,56 | 6,35 | 50,80 | 0,15 | | | ● | ● |
| **CB314040020006RM** | -3 | 4,76 | 3,56 | 10,16 | 50,80 | 0,15 | | | ● | ● |
| **CB314050020006RM** | -3 | 4,76 | 3,56 | 12,70 | 50,80 | 0,15 | | | ● | ● |
| **CB314060020006RM** | -3 | 4,76 | 3,56 | 15,24 | 50,80 | 0,15 | | | ● | ● |
| **CB314070020006RM** | -3 | 4,76 | 3,56 | 17,78 | 50,80 | 0,15 | | | ● | ● |
| **CB314075020006RM** | -3 | 4,76 | 3,56 | 19,05 | 50,80 | 0,15 | | | ● | ● |
| **CB314080020006RM** | -3 | 4,76 | 3,56 | 20,32 | 50,80 | 0,15 | | | ● | ● |
| **CB316025020006RM** | -3 | 4,76 | 4,06 | 6,35 | 50,80 | 0,15 | | | ● | ● |
| **CB316040020006RM** | -3 | 4,76 | 4,06 | 10,16 | 50,80 | 0,15 | | | ● | ● |
| **CB316050020006RM** | -3 | 4,76 | 4,06 | 12,70 | 50,80 | 0,15 | | | ● | ● |
| **CB316060020006RM** | -3 | 4,76 | 4,06 | 15,24 | 50,80 | 0,15 | | | ● | ● |
| **CB316075020006RM** | -3 | 4,76 | 4,06 | 19,05 | 50,80 | 0,15 | | | ● | ● |
| **CB316090020006RM** | -3 | 4,76 | 4,06 | 22,86 | 50,80 | 0,15 | | | ● | ● |
| **CB3160100020006RM** | -3 | 4,76 | 4,06 | 25,40 | 50,80 | 0,15 | | | ● | ● |

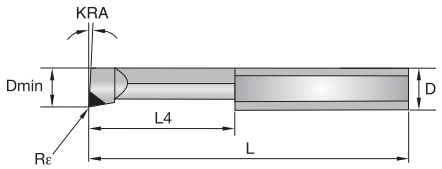



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CB-M • Diámetro de mango de 6,35 mm–7,94 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB418035025006RM** | -3 | 6,35 | 4,57 | 8,89 | 63,50 | 0,15 | | | ● | ● |
| **CB418050025006RM** | -3 | 6,35 | 4,57 | 12,70 | 63,50 | 0,15 | | | ● | ● |
| **CB418060025006RM** | -3 | 6,35 | 4,57 | 15,24 | 63,50 | 0,15 | | | ● | ● |
| **CB418075025006RM** | -3 | 6,35 | 4,57 | 19,05 | 63,50 | 0,15 | | | ● | ● |
| **CB418090025006RM** | -3 | 6,35 | 4,57 | 22,86 | 63,50 | 0,15 | | | ● | ● |
| **CB4180100025006RM** | -3 | 6,35 | 4,57 | 25,40 | 63,50 | 0,15 | | | ● | ● |
| **CB4180110025006RM** | -3 | 6,35 | 4,57 | 27,94 | 63,50 | 0,15 | | | ● | ● |
| **CB420040025006RM** | -3 | 6,35 | 5,08 | 10,16 | 63,50 | 0,15 | | | ● | ● |
| **CB420050025006RM** | -3 | 6,35 | 5,08 | 12,70 | 63,50 | 0,15 | | | ● | ● |
| **CB420060025006RM** | -3 | 6,35 | 5,08 | 15,24 | 63,50 | 0,15 | | | ● | ● |
| **CB420070025006RM** | -3 | 6,35 | 5,08 | 17,78 | 63,50 | 0,15 | | | ● | ● |
| **CB420080025006RM** | -3 | 6,35 | 5,08 | 20,32 | 63,50 | 0,15 | | | ● | ● |
| **CB420090025006RM** | -3 | 6,35 | 5,08 | 22,86 | 63,50 | 0,15 | | | ● | ● |
| **CB4200100025006RM** | -3 | 6,35 | 5,08 | 25,40 | 63,50 | 0,15 | | | ● | ● |
| **CB4200110025006RM** | -3 | 6,35 | 5,08 | 27,94 | 63,50 | 0,15 | | | ● | ● |
| **CB4200120025006RM** | -3 | 6,35 | 5,08 | 30,48 | 63,50 | 0,15 | | | ● | ● |
| **CB4200130025006RM** | -3 | 6,35 | 5,08 | 33,02 | 63,50 | 0,15 | | | ● | ● |
| **CB523040025006RM** | -3 | 7,94 | 5,84 | 10,16 | 63,50 | 0,15 | | | ● | ● |
| **CB523050025006RM** | -3 | 7,94 | 5,84 | 12,70 | 63,50 | 0,15 | | | ● | ● |
| **CB523060025006RM** | -3 | 7,94 | 5,84 | 15,24 | 63,50 | 0,15 | | | ● | ● |
| **CB523070025006RM** | -3 | 7,94 | 5,84 | 17,78 | 63,50 | 0,15 | | | ● | ● |
| **CB523080025006RM** | -3 | 7,94 | 5,84 | 20,32 | 63,50 | 0,15 | | | ● | ● |
| **CB523090025006RM** | -3 | 7,94 | 5,84 | 22,86 | 63,50 | 0,15 | | | ● | ● |
| **CB5230100025006RM** | -3 | 7,94 | 5,84 | 25,40 | 63,50 | 0,15 | | | ● | ● |
| **CB5230115025006RM** | -3 | 7,94 | 5,84 | 29,21 | 63,50 | 0,15 | | | ● | ● |
| **CB5230120025006RM** | -3 | 7,94 | 5,84 | 30,48 | 63,50 | 0,15 | | | ● | ● |
| **CB5230125025006RM** | -3 | 7,94 | 5,84 | 31,75 | 63,50 | 0,15 | | | ● | ● |
| **CB5230140025006RM** | -3 | 7,94 | 5,84 | 35,56 | 63,50 | 0,15 | | | ● | ● |
| **CB5230150025006RM** | -3 | 7,94 | 5,84 | 38,10 | 63,50 | 0,15 | | | ● | ● |
| **CB5230160025006RM** | -3 | 7,94 | 5,84 | 40,64 | 63,50 | 0,15 | | | ● | ● |
| **CB529050025006RM** | -3 | 7,94 | 7,37 | 12,70 | 63,50 | 0,15 | | | ● | ● |
| **CB529060025006RM** | -3 | 7,94 | 7,37 | 15,24 | 63,50 | 0,15 | | | ● | ● |
| **CB529075025006RM** | -3 | 7,94 | 7,37 | 19,05 | 63,50 | 0,15 | | | ● | ● |
| **CB529090025006RM** | -3 | 7,94 | 7,37 | 22,86 | 63,50 | 0,15 | | | ● | ● |
| **CB5290100025006RM** | -3 | 7,94 | 7,37 | 25,40 | 63,50 | 0,15 | | | ● | ● |
| **CB5290110025006RM** | -3 | 7,94 | 7,37 | 27,94 | 63,50 | 0,15 | | | ● | ● |
| **CB5290125025006RM** | -3 | 7,94 | 7,37 | 31,75 | 63,50 | 0,15 | | | ● | ● |
| **CB5290135025006RM** | -3 | 7,94 | 7,37 | 34,29 | 63,50 | 0,15 | | | ● | ● |
| **CB5290150025006RM** | -3 | 7,94 | 7,37 | 38,10 | 63,50 | 0,15 | | | ● | ● |
| **CB5290160025006RM** | -3 | 7,94 | 7,37 | 40,64 | 63,50 | 0,15 | | | ● | ● |
| **CB5290175025006RM** | -3 | 7,94 | 7,37 | 44,45 | 63,50 | 0,15 | | | ● | ● |

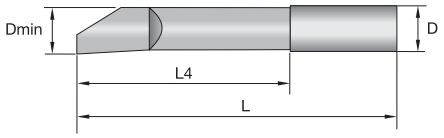



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CB-M • Diámetro de mango de 9,53 mm–12,70 mm

| Número de catálogo ISO | KRA | D | D min | L4 | L | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **CB6320500250006RM** | -3 | 9,53 | 8,13 | 12,70 | 63,50 | 0,15 | | | ● | ● |
| **CB6320600250006RM** | -3 | 9,53 | 8,13 | 15,24 | 63,50 | 0,15 | | | ● | ● |
| **CB6320750250006RM** | -3 | 9,53 | 8,13 | 19,05 | 63,50 | 0,15 | | | ● | ● |
| **CB6320900250006RM** | -3 | 9,53 | 8,13 | 22,86 | 63,50 | 0,15 | | | ● | ● |
| **CB6321000250006RM** | -3 | 9,53 | 8,13 | 25,40 | 63,50 | 0,15 | | | ● | ● |
| **CB6321100250006RM** | -3 | 9,53 | 8,13 | 27,94 | 63,50 | 0,15 | | | ● | ● |
| **CB6321250250006RM** | -3 | 9,53 | 8,13 | 31,75 | 63,50 | 0,15 | | | ● | ● |
| **CB6321500250006RM** | -3 | 9,53 | 8,13 | 38,10 | 63,50 | 0,15 | | | ● | ● |
| **CB6321600250006RM** | -3 | 9,53 | 8,13 | 40,64 | 63,50 | 0,15 | | | ● | ● |
| **CB6321800250006RM** | -3 | 9,53 | 8,13 | 45,72 | 63,50 | 0,15 | | | ● | ● |
| **CB6322000400006RM** | -3 | 9,53 | 8,13 | 50,80 | 101,60 | 0,15 | | | ● | ● |
| **CB6322500400006RM** | -3 | 9,53 | 8,13 | 63,50 | 101,60 | 0,15 | | | ● | ● |
| **CB6323000400006RM** | -3 | 9,53 | 8,13 | 76,20 | 101,60 | 0,15 | | | ● | ● |
| **CB6360500250006RM** | -3 | 9,53 | 9,14 | 12,70 | 63,50 | 0,15 | | | ● | ● |
| **CB6360600250006RM** | -3 | 9,53 | 9,14 | 15,24 | 63,50 | 0,15 | | | ● | ● |
| **CB6360750250006RM** | -3 | 9,53 | 9,14 | 19,05 | 63,50 | 0,15 | | | ● | ● |
| **CB6360900250006RM** | -3 | 9,53 | 9,14 | 22,86 | 63,50 | 0,15 | | | ● | ● |
| **CB6361000250006RM** | -3 | 9,53 | 9,14 | 25,40 | 63,50 | 0,15 | | | ● | ● |
| **CB6361150250006RM** | -3 | 9,53 | 9,14 | 29,21 | 63,50 | 0,15 | | | ● | ● |
| **CB6361250250006RM** | -3 | 9,53 | 9,14 | 31,75 | 63,50 | 0,15 | | | ● | ● |
| **CB6361500250006RM** | -3 | 9,53 | 9,14 | 38,10 | 63,50 | 0,15 | | | ● | ● |
| **CB6361600250006RM** | -3 | 9,53 | 9,14 | 40,64 | 63,50 | 0,15 | | | ● | ● |
| **CB6361800250006RM** | -3 | 9,53 | 9,14 | 45,72 | 63,50 | 0,15 | | | ● | ● |
| **CB6362000400006RM** | -3 | 9,53 | 9,14 | 50,80 | 101,60 | 0,15 | | | ● | ● |
| **CB6362500400006RM** | -3 | 9,53 | 9,14 | 63,50 | 101,60 | 0,15 | | | ● | ● |
| **CB6363000400006RM** | -3 | 9,53 | 9,14 | 76,20 | 101,60 | 0,15 | | | ● | ● |
| **CB8490750300006RM** | -3 | 12,70 | 12,45 | 19,05 | 76,20 | 0,15 | | | ● | ● |
| **CB8491000300006RM** | -3 | 12,70 | 12,45 | 25,40 | 76,20 | 0,15 | | | ● | ● |
| **CB8491250300006RM** | -3 | 12,70 | 12,45 | 31,75 | 76,20 | 0,15 | | | ● | ● |
| **CB8491500300006RM** | -3 | 12,70 | 12,45 | 38,10 | 76,20 | 0,15 | | | ● | ● |
| **CB8492000400006RM** | -3 | 12,70 | 12,45 | 50,80 | 101,60 | 0,15 | | | ● | ● |
| **CB8492500400006RM** | -3 | 12,70 | 12,45 | 63,50 | 101,60 | 0,15 | | | ● | ● |
| **CB8492600400006RM** | -3 | 12,70 | 12,45 | 66,04 | 101,60 | 0,15 | | | ● | ● |
| **CB8492750400006RM** | -3 | 12,70 | 12,45 | 69,85 | 101,60 | 0,15 | | | ● | ● |
| **CB8493000600006RM** | -3 | 12,70 | 12,45 | 76,20 | 152,40 | 0,15 | | | ● | ● |
| **CB8493500600006RM** | -3 | 12,70 | 12,45 | 88,90 | 152,40 | 0,15 | | | ● | ● |
| **CB8494000600006RM** | -3 | 12,70 | 12,45 | 101,60 | 152,40 | 0,15 | | | ● | ● |
| **CB8494500600006RM** | -3 | 12,70 | 12,45 | 114,30 | 152,40 | 0,15 | | | ● | ● |




● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CHB

| Número de catálogo ISO | D | D min | L4 | L | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|
| **CHB20200621500R** | 3,18 | 0,51 | 1,59 | 38,10 | ● | ● | | |
| **CHB20250621500R** | 3,18 | 0,64 | 1,59 | 38,10 | ● | ● | | |
| **CHB20251251500R** | 3,18 | 0,64 | 3,18 | 38,10 | ● | ● | | |
| **CHB20301251500R** | 3,18 | 0,76 | 3,18 | 38,10 | ● | ● | | |
| **CHB20301871500R** | 3,18 | 0,76 | 4,76 | 38,10 | ● | ● | | |
| **CHB20351251500R** | 3,18 | 0,89 | 3,18 | 38,10 | ● | ● | | |
| **CHB20351871500R** | 3,18 | 0,89 | 4,76 | 38,10 | ● | ● | | |
| **CHB20401871500R** | 3,18 | 1,02 | 4,76 | 38,10 | ● | ● | | |
| **CHB20402501500R** | 3,18 | 1,02 | 6,35 | 38,10 | ● | ● | | |
| **CHB20503121500R** | 3,18 | 1,27 | 7,94 | 38,10 | ● | ● | | |
| **CHB20603751500R** | 3,18 | 1,52 | 9,53 | 38,10 | ● | ● | | |
| **CHB20704371500R** | 3,18 | 1,78 | 11,10 | 38,10 | ● | ● | | |
| **CHB20805001500R** | 3,18 | 2,03 | 12,70 | 38,10 | ● | ● | | |
| **CHB20905001500R** | 3,18 | 2,29 | 12,70 | 38,10 | ● | ● | | |
| **CHB21005621500R** | 3,18 | 2,54 | 14,29 | 38,10 | ● | ● | | |
| **CHB21206251500R** | 3,18 | 3,05 | 15,88 | 38,10 | ● | ● | | |
| **CHB2120100015000R** | 3,18 | 3,05 | 25,40 | 38,10 | ● | ● | | |
| **CHB31357502000R** | 4,76 | 3,43 | 19,05 | 50,80 | ● | ● | | |
| **CHB3135100020000R** | 4,76 | 3,43 | 25,40 | 50,80 | ● | ● | | |
| **CHB3150100020000R** | 4,76 | 3,81 | 25,40 | 50,80 | ● | ● | | |
| **CHB3150125020000R** | 4,76 | 3,81 | 31,75 | 50,80 | ● | ● | | |
| **CHB3180100020000R** | 4,76 | 4,57 | 25,40 | 50,80 | ● | ● | | |
| **CHB3180125020000R** | 4,76 | 4,57 | 31,75 | 50,80 | ● | ● | | |
| **CHB3180150020000R** | 4,76 | 4,57 | 38,10 | 50,80 | ● | ● | | |
| **CHB4210100025000R** | 6,35 | 5,33 | 25,40 | 63,50 | ● | ● | | |
| **CHB4210125025000R** | 6,35 | 5,33 | 31,75 | 63,50 | ● | ● | | |
| **CHB4210150025000R** | 6,35 | 5,33 | 38,10 | 63,50 | ● | ● | | |
| **CHB4240100025000R** | 6,35 | 6,10 | 25,40 | 63,50 | ● | ● | | |
| **CHB4240150025000R** | 6,35 | 6,10 | 38,10 | 63,50 | ● | ● | | |
| **CHB4240175025000R** | 6,35 | 6,10 | 44,45 | 63,50 | ● | ● | | |
| **CHB5300100025000R** | 7,94 | 7,62 | 25,40 | 63,50 | ● | ● | | |
| **CHB5300150025000R** | 7,94 | 7,62 | 38,10 | 63,50 | ● | ● | | |
| **CHB5300175025000R** | 7,94 | 7,62 | 44,45 | 63,50 | ● | ● | | |
| **CHB6360100025000R** | 9,53 | 9,14 | 25,40 | 63,50 | ● | ● | | |
| **CHB6360150025000R** | 9,53 | 9,14 | 38,10 | 63,50 | ● | ● | | |
| **CHB6360175025000R** | 9,53 | 9,14 | 44,45 | 63,50 | ● | ● | | |
| **CHB6360200040000R** | 9,53 | 9,14 | 50,80 | 101,60 | ● | ● | | |
| **CHB6360225040000R** | 9,53 | 9,14 | 57,15 | 101,60 | ● | ● | | |
| **CHB6360250040000R** | 9,53 | 9,14 | 63,50 | 101,60 | ● | ● | | |
| **CHB8480150030000R** | 12,70 | 12,19 | 38,10 | 76,20 | ● | ● | | |
| **CHB8480200030000R** | 12,70 | 12,19 | 50,80 | 76,20 | ● | ● | | |
| **CHB8480250040000R** | 12,70 | 12,19 | 63,50 | 101,60 | ● | ● | | |
| **CHB8480300040000R** | 12,70 | 12,19 | 76,20 | 101,60 | ● | ● | | |
| **CHB8480350060000R** | 12,70 | 12,19 | 88,90 | 152,40 | ● | ● | | |
| **CHB8480400060000R** | 12,70 | 12,19 | 101,60 | 152,40 | ● | ● | | |
| **CHB8480450060000R** | 12,70 | 12,19 | 114,30 | 152,40 | ● | ● | | |

## Las soluciones de mandrinado más completas a nivel mundial

## Cómo elegir la plaquita de ranurado correcta

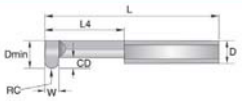
1 Seleccione la herramienta con mayor D min (mandrinado mínimo) para la aplicación.

2 Seleccione la herramienta con menor L4 (profundidad de corte).

3 Seleccione la CD (profundidad de corte) y el W (ancho de ranurado) correctos.

**Solid Carbide Bars**
Carbide Full Radius Inserts

WIDIA CIRCLE




● first choice
○ alternate choice

■ CFR • Shank Diameter 6,35mm–7,95mm

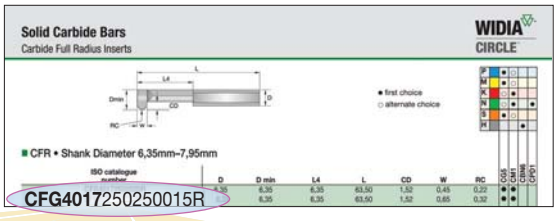
| ISO catalogue number | D | 1 D min | 2 L4 | L | 3 CD | W | RC | C05 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CFR40172502500R | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| CFR40252502500R | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |
| CFR40302502500R | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,78 | 0,39 | ● | ● | | |
| CFR40173752500R | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| CFR40253752500R | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |
| CFR40303752500R | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,78 | 0,39 | ● | ● | | |
| CFR40175002500R | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| CFR40255002500R | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |

4 Seleccione la calidad apropiada con las descripciones de calidades de la página C74.

5 Seleccione las condiciones de corte con la tabla de velocidades y avances de la página C75.

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




### C
Material

| | | |
|---|---|---|
| **C** | = | Metal duro |

### FG
Estilo de ranura

| | | |
|---|---|---|
| **FG** | = | Ranurado frontal |
| **FR** | = | Radio completo |
| **OR** | = | Junta tórica |
| **RR** | = | Anillo de retención |
| **UG** | = | Destalonado |
| **UPG** | = | Destalonado/perfil |

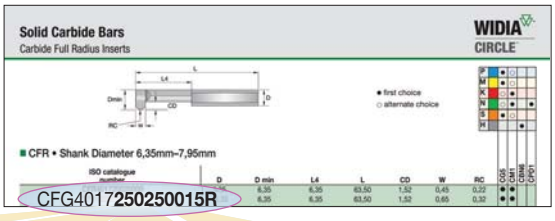
### 4
Diámetro del mango
*aparece como "D"*

| | | |
|---|---|---|
| 4 | = | 6,35 mm |
| 5 | = | 7,94 mm |
| 6 | = | 9,53 mm |
| 8 | = | 12,70 mm |
| 10 | = | 15,88 mm |
| 12 | = | 19,05 mm |

### 017
Ancho de la ranura
*aparece como "W"*

| | | |
|---|---|---|
| 017 | = | 0,43 mm/0,45 mm |
| 020 | = | 0,51 mm |
| 025 | = | 0,64 mm/0,65 mm |
| 030 | = | 0,76 mm/0,78 mm |
| 033 | = | 0,84 mm/0,85 mm |
| 038 | = | 0,97 mm/0,98 mm |
| 040 | = | 1,02 mm |
| 047 | = | 1,19 mm |
| 050 | = | 1,27 mm |
| 056 | = | 1,42 mm |
| 062 | = | 1,58 mm |
| 063 | = | 1,60 mm |
| 070 | = | 1,78 mm |
| 088 | = | 2,24 mm |
| 093 | = | 2,36 mm |
| 094 | = | 2,39 mm |
| 097 | = | 2,46 mm |
| 125 | = | 3,18 mm |
| 126 | = | 3,20 mm |
| 142 | = | 3,61 mm |
| 145 | = | 3,68 mm |
| 157 | = | 3,99 mm |
| 175 | = | 4,45 mm |
| 187 | = | 4,75 mm |
| 188 | = | 4,78 mm |
| 209 | = | 5,31 mm |
| 242 | = | 6,15 mm |
| 250 | = | 6,35 mm |

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## 250

Profundidad del mandrinado
*aparece como "CD" o "L4"*

| | | |
|---|---|---|
| 050 | = | 1,27 mm |
| 075 | = | 1,91 mm |
| 100 | = | 2,54 mm |
| 150 | = | 3,81 mm |
| 250 | = | 6,35 mm |
| 375 | = | 9,53 mm |
| 500 | = | 12,70 mm |
| 563 | = | 14,30 mm |
| 625 | = | 15,88 mm |
| 750 | = | 19,05 mm |
| 813 | = | 20,65 mm |
| 938 | = | 23,83 mm |
| 1000 | = | 25,40 mm |
| 1250 | = | 31,75 mm |
| 1500 | = | 38,10 mm |

## 2500

Longitud total
*aparece como "L"*

| | | |
|---|---|---|
| 2500 | = | 63,50 mm |
| 3000 | = | 76,20 mm |
| 4000 | = | 101,60 mm |

## 15

Radio de la herramienta
*aparece como "Rε/RC"*

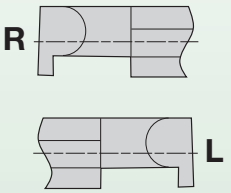
| | | |
|---|---|---|
| 15 | = | 0,38 mm |
| 40 | = | 1,02 mm |

## R

Dirección de la plaquita

**R** = a derechas

**L** = a izquierdas



# WIN WITH WIDIA™

WIDIA

## Plaquitas de las series **Victory™ TN5100 y TN7100**

Nuestras nuevas calidades de torneado de la serie Victory TN de WIDIA le ofrecen una mejora importante y cuantificable en la productividad, sin importar lo complicado que sea el corte.

**TN5100**

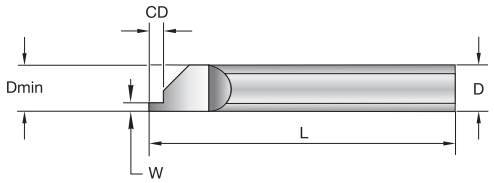
- Reduzca drásticamente los ciclos de tiempo con una velocidad y una capacidad de avance mayores hasta en un 50%.
- Obtenga una vida prolongada de la herramienta con una mejora del 50% en resistencia al desgaste.
- Diseñadas específicamente para el acabado y desbaste de fundición.

**TN7100**

- Un recubrimiento multicapas único que ofrece un rendimiento a alta velocidad sin igual.
- Ideal para el acabado y el desbaste pesado de todos los aceros.

Para obtener más información sobre nuestras innovaciones, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

WIDIA VICTORY
Win with WIDIA™

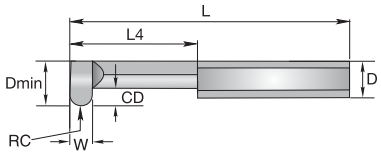



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ CFG

| Número de catálogo ISO | D | D min | L | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|
| CFG40200502500R | 6,35 | 6,60 | 63,50 | 1,27 | 0,51 | ● | ● | | |
| CFG40300502500R | 6,35 | 6,60 | 63,50 | 1,27 | 0,76 | ● | ● | | |
| CFG40400502500R | 6,35 | 6,60 | 63,50 | 1,27 | 1,02 | ● | ● | | |
| CFG40500502500R | 6,35 | 6,60 | 63,50 | 1,27 | 1,27 | ● | ● | | |
| CFG50300502500R | 7,94 | 8,13 | 63,50 | 1,27 | 0,76 | ● | ● | | |
| CFG50400502500R | 7,94 | 8,13 | 63,50 | 1,27 | 1,02 | ● | ● | | |
| CFG50500502500R | 7,94 | 8,13 | 63,50 | 1,27 | 1,27 | ● | ● | | |
| CFG50620752500R | 7,94 | 8,13 | 63,50 | 1,91 | 1,58 | ● | ● | | |
| CFG60300502500R | 9,53 | 9,78 | 63,50 | 1,27 | 0,76 | ● | ● | | |
| CFG60620752500R | 9,53 | 9,78 | 63,50 | 1,91 | 1,58 | ● | ● | | |
| CFG60931002500R | 9,53 | 9,78 | 63,50 | 2,54 | 2,36 | ● | ● | | |
| CFG61251002500R | 9,53 | 9,78 | 63,50 | 2,54 | 3,18 | ● | ● | | |
| CFG80620753000R | 12,70 | 12,95 | 76,20 | 1,91 | 1,58 | ● | ● | | |
| CFG80931003000R | 12,70 | 12,95 | 76,20 | 2,54 | 2,36 | ● | ● | | |
| CFG81251003000R | 12,70 | 12,95 | 76,20 | 2,54 | 3,18 | ● | ● | | |
| CFG81561003000R | 12,70 | 12,95 | 76,20 | 2,54 | 3,96 | ● | ● | | |
| CFG100620753500R | 15,88 | 16,13 | 88,90 | 1,91 | 1,58 | ● | ● | | |
| CFG100931003500R | 15,88 | 16,13 | 88,90 | 2,54 | 2,36 | ● | ● | | |
| CFG101251003500R | 15,88 | 16,13 | 88,90 | 2,54 | 3,18 | ● | ● | | |
| CFG101561003500R | 15,88 | 16,13 | 88,90 | 2,54 | 3,96 | ● | ● | | |
| CFG101871503500R | 15,88 | 16,13 | 88,90 | 3,81 | 4,75 | ● | ● | | |
| CFG120620754000R | 19,05 | 19,30 | 101,60 | 1,91 | 1,58 | ● | ● | | |
| CFG120931004000R | 19,05 | 19,30 | 101,60 | 2,54 | 2,36 | ● | ● | | |
| CFG121251004000R | 19,05 | 19,30 | 101,60 | 2,54 | 3,18 | ● | ● | | |
| CFG121561004000R | 19,05 | 19,30 | 101,60 | 2,54 | 3,96 | ● | ● | | |
| CFG121871504000R | 19,05 | 19,30 | 101,60 | 3,81 | 4,75 | ● | ● | | |
| CFG122502504000R | 19,05 | 19,30 | 101,60 | 6,35 | 6,35 | ● | ● | | |



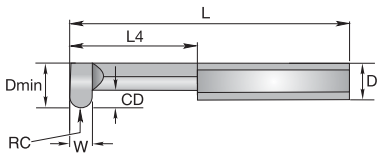

● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |



## ■ CFR • Diámetro de mango de 6,35 mm–7,95 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | W | RC | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CFR40172502500R** | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| **CFR40252502500R** | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |
| **CFR40302502500R** | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,78 | 0,39 | ● | ● | | |
| **CFR40173752500R** | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| **CFR40253752500R** | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |
| **CFR40303752500R** | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,78 | 0,39 | ● | ● | | |
| **CFR40175002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| **CFR40255002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |
| **CFR40305002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,78 | 0,39 | ● | ● | | |
| **CFR40176252500R** | 6,35 | 6,35 | 15,88 | 63,50 | 1,52 | 0,45 | 0,22 | ● | ● | | |
| **CFR40256252500R** | 6,35 | 6,35 | 15,88 | 63,50 | 1,52 | 0,65 | 0,32 | ● | ● | | |
| **CFR40306252500R** | 6,35 | 6,35 | 15,88 | 63,50 | 1,52 | 0,78 | 0,39 | ● | ● | | |
| **CFR50332502500R** | 7,94 | 7,93 | 6,35 | 63,50 | 2,79 | 0,85 | 0,43 | ● | ● | | |
| **CFR50382502500R** | 7,94 | 7,93 | 6,35 | 63,50 | 2,79 | 0,98 | 0,49 | ● | ● | | |
| **CFR50333752500R** | 7,94 | 7,93 | 9,53 | 63,50 | 2,79 | 0,85 | 0,43 | ● | ● | | |
| **CFR50335002500R** | 7,94 | 7,93 | 12,70 | 63,50 | 2,79 | 0,85 | 0,43 | ● | ● | | |
| **CFR50385002500R** | 7,94 | 7,93 | 12,70 | 63,50 | 2,79 | 0,98 | 0,49 | ● | ● | | |
| **CFR50383752500R** | 7,94 | 7,93 | 9,53 | 63,50 | 2,79 | 0,98 | 0,49 | ● | ● | | |
| **CFR50337502500R** | 7,94 | 7,93 | 19,05 | 63,50 | 2,79 | 0,85 | 0,43 | ● | ● | | |
| **CFR50387502500R** | 7,94 | 7,93 | 19,05 | 63,50 | 2,79 | 0,98 | 0,49 | ● | ● | | |

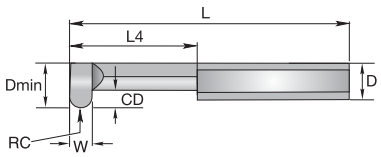



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CFR • Diámetro de mango de 9,53 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | W | RC | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CFR60402502500R** | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,02 | 0,51 | ● | ● | | |
| **CFR60472502500R** | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,19 | 0,60 | ● | ● | | |
| **CFR60562502500R** | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,42 | 0,71 | ● | ● | | |
| **CFR60632502500R** | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,60 | 0,80 | ● | ● | | |
| **CFR60702502500R** | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,78 | 0,89 | ● | ● | | |
| **CFR60882502500R** | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 2,24 | 1,12 | ● | ● | | |
| **CFR60403752500R** | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,02 | 0,51 | ● | ● | | |
| **CFR60473752500R** | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,19 | 0,60 | ● | ● | | |
| **CFR60563752500R** | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,42 | 0,71 | ● | ● | | |
| **CFR60633752500R** | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,60 | 0,80 | ● | ● | | |
| **CFR60703752500R** | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,78 | 0,89 | ● | ● | | |
| **CFR60883752500R** | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 2,24 | 1,12 | ● | ● | | |
| **CFR60405002500R** | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,02 | 0,51 | ● | ● | | |
| **CFR60475002500R** | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,19 | 0,60 | ● | ● | | |
| **CFR60565002500R** | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,42 | 0,71 | ● | ● | | |
| **CFR60635002500R** | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,60 | 0,80 | ● | ● | | |
| **CFR60705002500R** | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,78 | 0,89 | ● | ● | | |
| **CFR60885002500R** | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 2,24 | 1,12 | ● | ● | | |
| **CFR60407502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,02 | 0,51 | ● | ● | | |
| **CFR60477502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,19 | 0,60 | ● | ● | | |
| **CFR60567502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,42 | 0,71 | ● | ● | | |
| **CFR60637502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,60 | 0,80 | ● | ● | | |
| **CFR60707502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,78 | 0,89 | ● | ● | | |
| **CFR60887502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 2,24 | 1,12 | ● | ● | | |
| **CFR604010002500R** | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,02 | 0,51 | ● | ● | | |
| **CFR604710002500R** | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,19 | 0,60 | ● | ● | | |
| **CFR605610002500R** | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,42 | 0,71 | ● | ● | | |
| **CFR606310002500R** | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,60 | 0,80 | ● | ● | | |
| **CFR607010002500R** | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,78 | 0,89 | ● | ● | | |
| **CFR608810002500R** | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 2,24 | 1,12 | ● | ● | | |
| **CFR604012502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,02 | 0,51 | ● | ● | | |
| **CFR604712502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,19 | 0,60 | ● | ● | | |
| **CFR605612502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,42 | 0,71 | ● | ● | | |
| **CFR606312502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,60 | 0,80 | ● | ● | | |
| **CFR607012502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,78 | 0,89 | ● | ● | | |
| **CFR608812502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 2,24 | 1,12 | ● | ● | | |



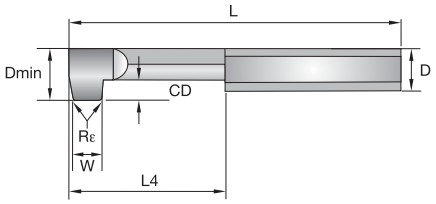

● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |



## ■ CFR • Diámetro de mango de 12,70 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | W | RC | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CFR80945003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 2,39 | 1,19 | ● | ● | | |
| **CFR81265003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 3,20 | 1,60 | ● | ● | | |
| **CFR81575003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 3,99 | 1,99 | ● | ● | | |
| **CFR81885003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 4,78 | 2,39 | ● | ● | | |
| **CFR82505003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 6,35 | 3,18 | ● | ● | | |
| **CFR80947503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 2,39 | 1,19 | ● | ● | | |
| **CFR81267503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 3,20 | 1,60 | ● | ● | | |
| **CFR81577503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 3,99 | 1,99 | ● | ● | | |
| **CFR81887503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 4,78 | 2,39 | ● | ● | | |
| **CFR82507503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 6,35 | 3,18 | ● | ● | | |
| **CFR809410003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 2,39 | 1,19 | ● | ● | | |
| **CFR812610003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 3,20 | 1,60 | ● | ● | | |
| **CFR815710003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 3,99 | 1,99 | ● | ● | | |
| **CFR818810003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 4,78 | 2,39 | ● | ● | | |
| **CFR825010003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 6,35 | 3,18 | ● | ● | | |
| **CFR809412503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 2,39 | 1,19 | ● | ● | | |
| **CFR812612503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 3,20 | 1,60 | ● | ● | | |
| **CFR815712503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 3,99 | 1,99 | ● | ● | | |
| **CFR818812503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 4,78 | 2,39 | ● | ● | | |
| **CFR825012503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 6,35 | 3,18 | ● | ● | | |
| **CFR809415003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 2,39 | 1,19 | ● | ● | | |
| **CFR812615003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 3,20 | 1,60 | ● | ● | | |
| **CFR815715003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 3,99 | 1,99 | ● | ● | | |
| **CFR818815003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 4,78 | 2,39 | ● | ● | | |
| **CFR825015003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 6,35 | 3,18 | ● | ● | | |

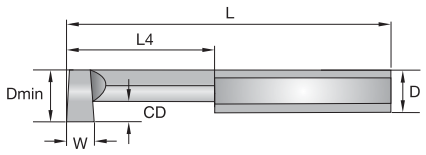



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ COR

| Número de catálogo ISO | D | D min | L4 | L | CD | W | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COR4097500250015R** | 6,35 | 6,35 | 12,70 | 63,50 | 2,79 | 2,46 | 0,38 | ● | ● | | |
| **COR4142563250040R** | 6,35 | 6,35 | 14,30 | 63,50 | 2,79 | 3,61 | 1,02 | ● | ● | | |
| **COR4145625250040R** | 6,35 | 6,35 | 15,88 | 63,50 | 2,79 | 3,68 | 1,02 | ● | ● | | |
| **COR6175750250015R** | 9,53 | 9,53 | 19,05 | 63,50 | 3,18 | 4,45 | 0,38 | ● | ● | | |
| **COR6209813250040R** | 9,53 | 9,53 | 20,65 | 63,50 | 3,18 | 5,31 | 1,02 | ● | ● | | |
| **COR6242938250040R** | 9,53 | 9,53 | 23,83 | 63,50 | 3,18 | 6,15 | 1,02 | ● | ● | | |

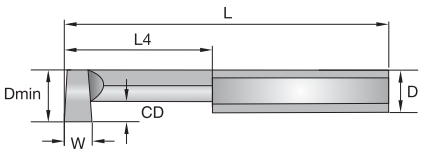



● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | | ● | ○ | | | |
| M | | ● | ○ | | | |
| K | | ○ | ● | | | |
| N | | ○ | ● | | | ● |
| S | | ● | ○ | | | |
| H | | | | ● | | |

## ■ CRR • Diámetro de mango de 6,35 mm–7,94 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CRR40172502500R** | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,43 | ● | ● | | |
| **CRR40252502500R** | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,64 | ● | ● | | |
| **CRR40302502500R** | 6,35 | 6,35 | 6,35 | 63,50 | 1,52 | 0,76 | ● | ● | | |
| **CRR40173752500R** | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,43 | ● | ● | | |
| **CRR40253752500R** | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,64 | ● | ● | | |
| **CRR40303752500R** | 6,35 | 6,35 | 9,53 | 63,50 | 1,52 | 0,76 | ● | ● | | |
| **CRR40175002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,43 | ● | ● | | |
| **CRR40255002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,64 | ● | ● | | |
| **CRR40305002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 0,76 | ● | ● | | |
| **CRR40176252500R** | 6,35 | 6,35 | 15,88 | 63,50 | 1,52 | 0,43 | ● | ● | | |
| **CRR40256252500R** | 6,35 | 6,35 | 15,88 | 63,50 | 1,52 | 0,64 | ● | ● | | |
| **CRR40306252500R** | 6,35 | 6,35 | 15,88 | 63,50 | 1,52 | 0,76 | ● | ● | | |
| **CRR50332502500R** | 7,94 | 7,94 | 6,35 | 63,50 | 2,79 | 0,84 | ● | ● | | |
| **CRR50382502500R** | 7,94 | 7,94 | 6,35 | 63,50 | 2,79 | 0,97 | ● | ● | | |
| **CRR50333752500R** | 7,94 | 7,94 | 9,53 | 63,50 | 2,79 | 0,84 | ● | ● | | |
| **CRR50383752500R** | 7,94 | 7,94 | 9,53 | 63,50 | 2,79 | 0,97 | ● | ● | | |
| **CRR50335002500R** | 7,94 | 7,94 | 12,70 | 63,50 | 2,79 | 0,84 | ● | ● | | |
| **CRR50385002500R** | 7,94 | 7,94 | 12,70 | 63,50 | 2,79 | 0,97 | ● | ● | | |
| **CRR50337502500R** | 7,94 | 7,94 | 19,05 | 63,50 | 2,79 | 0,84 | ● | ● | | |
| **CRR50387502500R** | 7,94 | 7,94 | 19,05 | 63,50 | 2,79 | 0,97 | ● | ● | | |

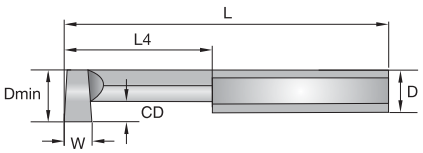



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CRR • Diámetro de mango de 9,53 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| CRR60402502500R | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,02 | ● | ● | | |
| CRR60472502500R | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,19 | ● | ● | | |
| CRR60562502500R | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,42 | ● | ● | | |
| CRR60632502500R | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,60 | ● | ● | | |
| CRR60702502500R | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 1,78 | ● | ● | | |
| CRR60882502500R | 9,53 | 9,53 | 6,35 | 63,50 | 2,79 | 2,24 | ● | ● | | |
| CRR60403752500R | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,02 | ● | ● | | |
| CRR60473752500R | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,19 | ● | ● | | |
| CRR60563752500R | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,42 | ● | ● | | |
| CRR60633752500R | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,60 | ● | ● | | |
| CRR60703752500R | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 1,78 | ● | ● | | |
| CRR60883752500R | 9,53 | 9,53 | 9,53 | 63,50 | 2,79 | 2,24 | ● | ● | | |
| CRR60405002500R | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,02 | ● | ● | | |
| CRR60475002500R | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,19 | ● | ● | | |
| CRR60565002500R | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,42 | ● | ● | | |
| CRR60635002500R | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,60 | ● | ● | | |
| CRR60705002500R | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 1,78 | ● | ● | | |
| CRR60885002500R | 9,53 | 9,53 | 12,70 | 63,50 | 2,79 | 2,24 | ● | ● | | |
| CRR60407502500R | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,02 | ● | ● | | |
| CRR60477502500R | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,19 | ● | ● | | |
| CRR60567502500R | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,42 | ● | ● | | |
| CRR60637502500R | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,60 | ● | ● | | |
| CRR60707502500R | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 1,78 | ● | ● | | |
| CRR60887502500R | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 2,24 | ● | ● | | |
| CRR604010002500R | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,02 | ● | ● | | |
| CRR604710002500R | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,19 | ● | ● | | |
| CRR605610002500R | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,42 | ● | ● | | |
| CRR606310002500R | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,60 | ● | ● | | |
| CRR607010002500R | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 1,78 | ● | ● | | |
| CRR608810002500R | 9,53 | 9,53 | 25,40 | 63,50 | 2,79 | 2,24 | ● | ● | | |
| CRR604012502500R | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,02 | ● | ● | | |
| CRR604712502500R | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,19 | ● | ● | | |
| CRR605612502500R | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,42 | ● | ● | | |
| CRR606312502500R | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,60 | ● | ● | | |
| CRR607012502500R | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 1,78 | ● | ● | | |
| CRR608812502500R | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 2,24 | ● | ● | | |



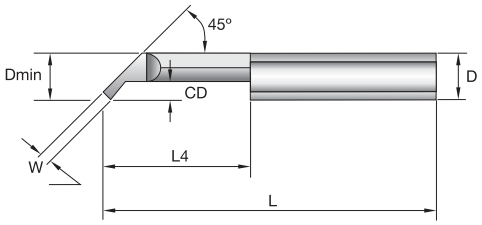

● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | ● | ○ | | | | |
| M | ● | ○ | | | | |
| K | ○ | ● | | | | |
| N | ○ | ● | | | | ● |
| S | ● | ○ | | | | |
| H | | | | ● | | |



## ■ CRR • Diámetro de mango de 12,70 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CRR80945003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 2,39 | ● | ● | | |
| **CRR81265003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 3,20 | ● | ● | | |
| **CRR81575003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 3,99 | ● | ● | | |
| **CRR81885003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 4,78 | ● | ● | | |
| **CRR82505003000R** | 12,70 | 12,70 | 12,70 | 76,20 | 4,06 | 6,35 | ● | ● | | |
| **CRR80947503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 2,39 | ● | ● | | |
| **CRR81267503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 3,20 | ● | ● | | |
| **CRR81577503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 3,99 | ● | ● | | |
| **CRR81887503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 4,78 | ● | ● | | |
| **CRR82507503000R** | 12,70 | 12,70 | 19,05 | 76,20 | 4,06 | 6,35 | ● | ● | | |
| **CRR809410003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 2,39 | ● | ● | | |
| **CRR812610003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 3,20 | ● | ● | | |
| **CRR815710003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 3,99 | ● | ● | | |
| **CRR818810003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 4,78 | ● | ● | | |
| **CRR825010003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 4,06 | 6,35 | ● | ● | | |
| **CRR809412503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 2,39 | ● | ● | | |
| **CRR812612503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 3,20 | ● | ● | | |
| **CRR815712503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 3,99 | ● | ● | | |
| **CRR818812503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 4,78 | ● | ● | | |
| **CRR825012503000R** | 12,70 | 12,70 | 31,75 | 76,20 | 4,06 | 6,35 | ● | ● | | |
| **CRR809415003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 2,39 | ● | ● | | |
| **CRR812615003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 3,20 | ● | ● | | |
| **CRR815715003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 3,99 | ● | ● | | |
| **CRR818815003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 4,78 | ● | ● | | |
| **CRR825015003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 4,06 | 6,35 | ● | ● | | |

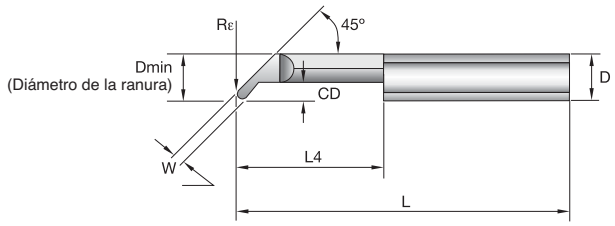



● primera elección
○ elección alternativa

| | | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|
| P | | ● | ○ | | |
| M | | ● | ○ | | |
| K | | ○ | ● | | |
| N | | ○ | ● | | ● |
| S | | ● | ○ | | |
| H | | | | ● | |

## ■ CUG

| Número de catálogo ISO | D | D min | L4 | L | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CUG40205002500R** | 6,35 | 6,60 | 12,70 | 63,50 | 1,02 | 0,51 | ● | ● | | |
| **CUG40305002500R** | 6,35 | 6,60 | 12,70 | 63,50 | 1,27 | 0,76 | ● | ● | | |
| **CUG402010002500R** | 6,35 | 6,60 | 25,40 | 63,50 | 1,02 | 0,51 | ● | ● | | |
| **CUG403010002500R** | 6,35 | 6,60 | 25,40 | 63,50 | 1,27 | 0,76 | ● | ● | | |
| **CUG50505002500R** | 7,94 | 8,26 | 12,70 | 63,50 | 2,54 | 1,27 | ● | ● | | |
| **CUG505010002500R** | 7,94 | 8,26 | 25,40 | 63,50 | 2,54 | 1,27 | ● | ● | | |
| **CUG506210002500R** | 7,94 | 8,26 | 25,40 | 63,50 | 2,54 | 1,58 | ● | ● | | |
| **CUG506212502500R** | 7,94 | 8,26 | 31,75 | 63,50 | 2,54 | 1,58 | ● | ● | | |
| **CUG606210002500R** | 9,53 | 9,78 | 25,40 | 63,50 | 2,54 | 1,58 | ● | ● | | |
| **CUG609310002500R** | 9,53 | 9,78 | 25,40 | 63,50 | 2,54 | 2,36 | ● | ● | | |
| **CUG612510002500R** | 9,53 | 9,78 | 25,40 | 63,50 | 2,54 | 3,18 | ● | ● | | |
| **CUG606212502500R** | 9,53 | 9,78 | 31,75 | 63,50 | 2,54 | 1,58 | ● | ● | | |
| **CUG609312502500R** | 9,53 | 9,78 | 31,75 | 63,50 | 2,54 | 2,36 | ● | ● | | |
| **CUG612512502500R** | 9,53 | 9,78 | 31,75 | 63,50 | 2,54 | 3,18 | ● | ● | | |
| **CUG806210003000R** | 12,70 | 12,95 | 25,40 | 76,20 | 3,81 | 1,58 | ● | ● | | |
| **CUG809310003000R** | 12,70 | 12,95 | 25,40 | 76,20 | 3,81 | 2,36 | ● | ● | | |
| **CUG812510003000R** | 12,70 | 12,95 | 25,40 | 76,20 | 3,81 | 3,18 | ● | ● | | |
| **CUG806215003000R** | 12,70 | 12,95 | 38,10 | 76,20 | 3,81 | 1,58 | ● | ● | | |
| **CUG809315003000R** | 12,70 | 12,95 | 38,10 | 76,20 | 3,81 | 2,36 | ● | ● | | |
| **CUG812515003000R** | 12,70 | 12,95 | 38,10 | 76,20 | 3,81 | 3,18 | ● | ● | | |




● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CUPG

| Número de catálogo ISO | D | D min | L4 | L | CD | W | Rε | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CUPG40205002500R** | 6,35 | 6,60 | 12,70 | 63,50 | 1,02 | 0,51 | 0,25 | ● | ● | | |
| **CUPG40305002500R** | 6,35 | 6,60 | 12,70 | 63,50 | 1,27 | 0,76 | 0,38 | ● | ● | | |
| **CUPG402010002500R** | 6,35 | 6,60 | 25,40 | 63,50 | 1,02 | 0,51 | 0,25 | ● | ● | | |
| **CUPG403010002500R** | 6,35 | 6,60 | 25,40 | 63,50 | 1,27 | 0,76 | 0,38 | ● | ● | | |
| **CUPG50505002500R** | 7,94 | 8,26 | 12,70 | 63,50 | 2,54 | 1,27 | 0,64 | ● | ● | | |
| **CUPG505010002500R** | 7,94 | 8,26 | 25,40 | 63,50 | 2,54 | 1,27 | 0,64 | ● | ● | | |
| **CUPG506210002500R** | 7,94 | 8,26 | 25,40 | 63,50 | 2,54 | 1,58 | 0,79 | ● | ● | | |
| **CUPG506212502500R** | 7,94 | 8,26 | 31,75 | 63,50 | 2,54 | 1,58 | 0,79 | ● | ● | | |
| **CUPG606210002500R** | 9,53 | 9,78 | 25,40 | 63,50 | 2,54 | 1,58 | 0,79 | ● | ● | | |
| **CUPG609310002500R** | 9,53 | 9,78 | 25,40 | 63,50 | 2,54 | 2,36 | 1,18 | ● | ● | | |
| **CUPG612510002500R** | 9,53 | 9,78 | 25,40 | 63,50 | 2,54 | 3,18 | 1,59 | ● | ● | | |
| **CUPG606212502500R** | 9,53 | 9,78 | 31,75 | 63,50 | 2,54 | 1,58 | 0,79 | ● | ● | | |
| **CUPG609312502500R** | 9,53 | 9,78 | 31,75 | 63,50 | 2,54 | 2,36 | 1,18 | ● | ● | | |
| **CUPG612512502500R** | 9,53 | 9,78 | 31,75 | 63,50 | 2,54 | 3,18 | 1,59 | ● | ● | | |
| **CUPG806210003000R** | 12,70 | 12,95 | 25,40 | 76,20 | 3,81 | 1,58 | 0,79 | ● | ● | | |
| **CUPG809310003000R** | 12,70 | 12,95 | 25,40 | 76,20 | 3,81 | 2,36 | 1,18 | ● | ● | | |
| **CUPG812510003000R** | 12,70 | 12,95 | 25,40 | 76,20 | 3,81 | 3,18 | 1,59 | ● | ● | | |
| **CUPG806215003000R** | 12,70 | 12,95 | 38,10 | 76,20 | 3,81 | 1,58 | 0,79 | ● | ● | | |
| **CUPG809315003000R** | 12,70 | 12,95 | 38,10 | 76,20 | 3,81 | 2,36 | 1,18 | ● | ● | | |
| **CUPG812515003000R** | 12,70 | 12,95 | 38,10 | 76,20 | 3,81 | 3,18 | 1,59 | ● | ● | | |

# WIN WITH WIDIA™

## Serie WIDIA-CIRCLE™ de herramientas para orificios pequeños

La línea WIDIA™ de herramientas de mandrinado de orificios pequeños es una opción excelente y económica para una amplia gama de aplicaciones. Nuestras barras de metal duro integral proporcionan una versatilidad de mecanizado y resistencia a la ruptura. Las plaquitas intercambiables están disponibles tanto en mangos de acero como de metal duro.

### Serie A/B

- Un sistema de bloqueo exclusivo que permite cambios de plaquita rápidos y precisos.

### Quadralock™

- Ranuras en V y pernos de límite para una mayor indexabilidad.

### Barras de micromandrinado

- Acción de corte libre, mejores acabados superficiales y mayor evacuación de virutas.

### Barras de metal duro integral

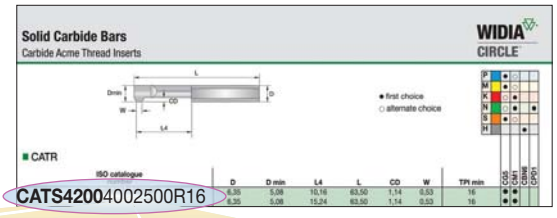
- Las herramientas y portaherramientas precisos y de cambio rápido son ideales para las aplicaciones de mecanizado de piezas pequeñas.

Para obtener más información sobre nuestras innovaciones, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

WIDIA™
Win with WIDIA™

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




### C
Material

**C** = Metal duro

### ATS
Estilo de la rosca

| | | |
|---|---|---|
| **ATS** | = | Rosca Acme Longitud extracorta |
| **ATR** | = | Rosca Acme Longitud regular |
| **IT** | = | Punto único de 60° Rosca |
| **TR** | = | Desahogo de rosca |

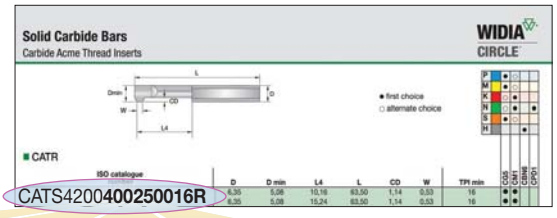
### 4
Diámetro del mango
*aparece como "D"*

| | | |
|---|---|---|
| 2 | = | 3,18 mm |
| 3 | = | 4,76 mm |
| 4 | = | 6,35 mm |
| 5 | = | 7,94 mm |
| 6 | = | 9,53 mm |
| 8 | = | 12,70 mm |

### 200
Mandrinado mínimo
*aparece como "D min"*

| | | |
|---|---|---|
| 040 | = | 1,02 mm |
| 050 | = | 1,27 mm |
| 060 | = | 1,52 mm |
| 080 | = | 2,03 mm |
| 100 | = | 2,54 mm |
| 120 | = | 3,05 mm |
| 125 | = | 3,18 mm |
| 140 | = | 3,56 mm |
| 160 | = | 4,06 mm |
| 180 | = | 4,57 mm |
| 187 | = | 4,75 mm |
| 200 | = | 5,08 mm |
| 230 | = | 5,84 mm |
| 235 | = | 5,97 mm |
| 250 | = | 6,35 mm |
| 290 | = | 7,37 mm |
| 312 | = | 7,93 mm |
| 320 | = | 8,13 mm |
| 360 | = | 9,14 mm |
| 375 | = | 9,53 mm |
| 490 | = | 12,45 mm |
| 500 | = | 12,70 mm |

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## 400

Profundidad del mandrinado

*aparece como "L4"*

| | | |
|---|---|---|
| 075 | = | 1,91 mm |
| 100 | = | 2,54 mm |
| 150 | = | 3,81 mm |
| 200 | = | 5,08 mm |
| 250 | = | 6,35 mm |
| 300 | = | 7,62 mm |
| 350 | = | 8,89 mm |
| 375 | = | 9,53 mm |
| 400 | = | 10,16 mm |
| 500 | = | 12,70 mm |
| 600 | = | 15,24 mm |
| 750 | = | 19,05 mm |
| 1000 | = | 25,40 mm |
| 1250 | = | 31,75 mm |
| 1500 | = | 38,10 mm |
| 1750 | = | 44,45 mm |
| 1800 | = | 45,72 mm |
| 2000 | = | 50,80 mm |

## 2500

Longitud total

*aparece como "L"*

| | | |
|---|---|---|
| 1500 | = | 38,10 mm |
| 2000 | = | 50,80 mm |
| 2500 | = | 63,50 mm |
| 3000 | = | 76,20 mm |

## 16

Roscas

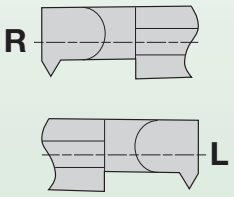
*aparecen como "TP" (paso) o "TPI" (roscados por pulgada)*

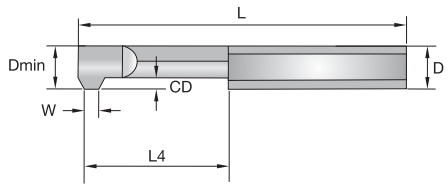
## R

Dirección de la plaquita

**R** = a derechas

**L** = a izquierdas



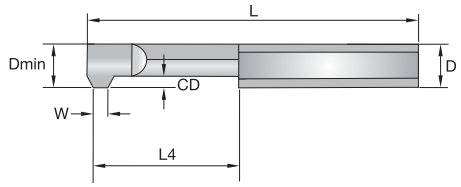



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CATR

| Número de catálogo ISO | D | D min | L4 | L | CD | W | TPI min | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CATR4200400250016R** | 6,35 | 5,08 | 10,16 | 63,50 | 1,14 | 0,53 | 16 | ● | ● | | |
| **CATR4200600250016R** | 6,35 | 5,08 | 15,24 | 63,50 | 1,14 | 0,53 | 16 | ● | ● | | |
| **CATR4200750250016R** | 6,35 | 5,08 | 19,05 | 63,50 | 1,14 | 0,53 | 16 | ● | ● | | |
| **CATR42001000250016R** | 6,35 | 5,08 | 25,40 | 63,50 | 1,14 | 0,53 | 16 | ● | ● | | |
| **CATR5235500250014R** | 7,94 | 5,97 | 12,70 | 63,50 | 1,78 | 0,61 | 14 | ● | ● | | |
| **CATR5235750250014R** | 7,94 | 5,97 | 19,05 | 63,50 | 1,78 | 0,61 | 14 | ● | ● | | |
| **CATR52351000250014R** | 7,94 | 5,97 | 25,40 | 63,50 | 1,78 | 0,61 | 14 | ● | ● | | |
| **CATR52351250250014R** | 7,94 | 5,97 | 31,75 | 63,50 | 1,78 | 0,61 | 14 | ● | ● | | |
| **CATR52351750250014R** | 7,94 | 5,97 | 44,45 | 63,50 | 1,78 | 0,61 | 14 | ● | ● | | |
| **CATR6360500250012R** | 9,53 | 9,14 | 12,70 | 63,50 | 2,16 | 0,71 | 12 | ● | ● | | |
| **CATR6360750250012R** | 9,53 | 9,14 | 19,05 | 63,50 | 2,16 | 0,71 | 12 | ● | ● | | |
| **CATR63601000250012R** | 9,53 | 9,14 | 25,40 | 63,50 | 2,16 | 0,71 | 12 | ● | ● | | |
| **CATR63601250250012R** | 9,53 | 9,14 | 31,75 | 63,50 | 2,16 | 0,71 | 12 | ● | ● | | |
| **CATR63601800250012R** | 9,53 | 9,14 | 45,72 | 63,50 | 2,16 | 0,71 | 12 | ● | ● | | |
| **CATR8490750300010R** | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 0,81 | 10 | ● | ● | | |
| **CATR849075030008R** | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,04 | 8 | ● | ● | | |
| **CATR849075030006R** | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,45 | 6 | ● | ● | | |
| **CATR849075030005R** | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,75 | 5 | ● | ● | | |
| **CATR84901500300010R** | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 0,81 | 10 | ● | ● | | |
| **CATR8490150030008R** | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,04 | 8 | ● | ● | | |
| **CATR8490150030006R** | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,45 | 6 | ● | ● | | |
| **CATR8490150030005R** | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,75 | 5 | ● | ● | | |
| **CATR84902000300010R** | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 0,81 | 10 | ● | ● | | |
| **CATR8490200030008R** | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,04 | 8 | ● | ● | | |
| **CATR8490200030006R** | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,45 | 6 | ● | ● | | |
| **CATR8490200030005R** | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,75 | 5 | ● | ● | | |

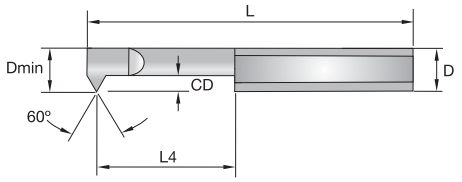



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## CATS

| Número de catálogo ISO | D | D min | L4 | L | CD | W | TPI min | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CATS4200400250016R | 6,35 | 5,08 | 10,16 | 63,50 | 1,14 | 0,61 | 16 | ● | ● | | |
| CATS4200600250016R | 6,35 | 5,08 | 15,24 | 63,50 | 1,14 | 0,61 | 16 | ● | ● | | |
| CATS4200750250016R | 6,35 | 5,08 | 19,05 | 63,50 | 1,14 | 0,61 | 16 | ● | ● | | |
| CATS42001000250016R | 6,35 | 5,08 | 25,40 | 63,50 | 1,14 | 0,61 | 16 | ● | ● | | |
| CATS5235500250014R | 7,94 | 5,97 | 12,70 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS5235750250014R | 7,94 | 5,97 | 19,05 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS52351000250014R | 7,94 | 5,97 | 25,40 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS52351250250014R | 7,94 | 5,97 | 31,75 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS52351750250014R | 7,94 | 5,97 | 44,45 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS52907502500014R | 7,94 | 7,37 | 19,05 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS52901000250014R | 7,94 | 7,37 | 25,40 | 63,50 | 1,78 | 0,71 | 14 | ● | ● | | |
| CATS63605002500012R | 9,53 | 9,14 | 12,70 | 63,50 | 2,16 | 0,84 | 12 | ● | ● | | |
| CATS63607502500012R | 9,53 | 9,14 | 19,05 | 63,50 | 2,16 | 0,84 | 12 | ● | ● | | |
| CATS63601000250012R | 9,53 | 9,14 | 25,40 | 63,50 | 2,16 | 0,84 | 12 | ● | ● | | |
| CATS63601250250012R | 9,53 | 9,14 | 31,75 | 63,50 | 2,16 | 0,84 | 12 | ● | ● | | |
| CATS63601800250012R | 9,53 | 9,14 | 45,72 | 63,50 | 2,16 | 0,84 | 12 | ● | ● | | |
| CATS84907503000010R | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 0,94 | 10 | ● | ● | | |
| CATS8490750300009R | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,07 | 9 | ● | ● | | |
| CATS8490750300008R | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,22 | 8 | ● | ● | | |
| CATS8490750300007R | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,40 | 7 | ● | ● | | |
| CATS8490750300006R | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 1,65 | 6 | ● | ● | | |
| CATS8490750300005R | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 2,01 | 5 | ● | ● | | |
| CATS84901500300010R | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 0,94 | 10 | ● | ● | | |
| CATS84901500300009R | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,07 | 9 | ● | ● | | |
| CATS84901500300008R | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,22 | 8 | ● | ● | | |
| CATS84901500300007R | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,40 | 7 | ● | ● | | |
| CATS84901500300006R | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 1,65 | 6 | ● | ● | | |
| CATS84901500300005R | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 2,01 | 5 | ● | ● | | |
| CATS84902000300010R | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 0,94 | 10 | ● | ● | | |
| CATS84902000300009R | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,07 | 9 | ● | ● | | |
| CATS84902000300008R | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,22 | 8 | ● | ● | | |
| CATS84902000300007R | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,40 | 7 | ● | ● | | |
| CATS84902000300006R | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 1,65 | 6 | ● | ● | | |
| CATS84902000300005R | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 2,01 | 5 | ● | ● | | |

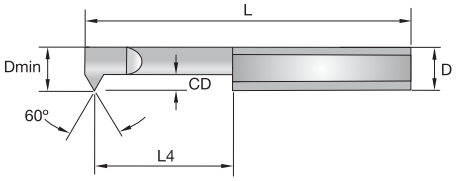



● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | ● | ○ | | | | |
| M | ● | ○ | | | | |
| K | ○ | ● | | | | |
| N | ○ | ● | | | | ● |
| S | ● | ○ | | | | |
| H | | | | ● | | |

## ■ CIT • Diámetro de mango de 6,35 mm–7,94 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | TP max | TP min | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | |
| **CIT41803502500R** | 6,35 | 4,57 | 8,89 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT41805002500R** | 6,35 | 4,57 | 12,70 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT41807502500R** | 6,35 | 4,57 | 19,05 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT418010002500R** | 6,35 | 4,57 | 25,40 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT42004002500R** | 6,35 | 5,08 | 10,16 | 63,50 | 1,14 | 0,6 | 1,6 | ● | | | |
| **CIT42006002500R** | 6,35 | 5,08 | 15,24 | 63,50 | 1,14 | 0,6 | 1,6 | ● | ● | | |
| **CIT42007502500R** | 6,35 | 5,08 | 19,05 | 63,50 | 1,14 | 0,6 | 1,6 | ● | ● | | |
| **CIT420010002500R** | 6,35 | 5,08 | 25,40 | 63,50 | 1,14 | 0,6 | 1,6 | ● | ● | | |
| **CIT52304002500R** | 7,94 | 5,84 | 10,16 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT52306002500R** | 7,94 | 5,84 | 15,24 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT52307502500R** | 7,94 | 5,84 | 19,05 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT523010002500R** | 7,94 | 5,84 | 25,40 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT523015002500R** | 7,94 | 5,84 | 38,10 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT52905002500R** | 7,94 | 7,37 | 12,70 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT52907502500R** | 7,94 | 7,37 | 19,05 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT529010002500R** | 7,94 | 7,37 | 25,40 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT529012502500R** | 7,94 | 7,37 | 31,75 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT529017502500R** | 7,94 | 7,37 | 44,45 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | | |
| **CIT41803502500L** | 6,35 | 4,57 | 8,89 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT41805002500L** | 6,35 | 4,57 | 12,70 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT41807502500L** | 6,35 | 4,57 | 19,05 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT418010002500L** | 6,35 | 4,57 | 25,40 | 63,50 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT42004002500L** | 6,35 | 5,08 | 10,16 | 63,50 | 1,14 | 0,6 | 1,6 | ● | | | |
| **CIT42006002500L** | 6,35 | 5,08 | 15,24 | 63,50 | 1,14 | 0,6 | 1,6 | ● | ● | | |
| **CIT42007502500L** | 6,35 | 5,08 | 19,05 | 63,50 | 1,14 | 0,6 | 1,6 | ● | ● | | |
| **CIT420010002500L** | 6,35 | 5,08 | 25,40 | 63,50 | 1,14 | 0,6 | 1,6 | ● | ● | | |
| **CIT52304002500L** | 7,94 | 5,84 | 10,16 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT52306002500L** | 7,94 | 5,84 | 15,24 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT52307502500L** | 7,94 | 5,84 | 19,05 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT523010002500L** | 7,94 | 5,84 | 25,40 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT523015002500L** | 7,94 | 5,84 | 38,10 | 63,50 | 1,40 | 0,6 | 1,8 | ● | ● | | |
| **CIT52905002500L** | 7,94 | 7,37 | 12,70 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT52907502500L** | 7,94 | 7,37 | 19,05 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT529010002500L** | 7,94 | 7,37 | 25,40 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT529012502500L** | 7,94 | 7,37 | 31,75 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |
| **CIT529017502500L** | 7,94 | 7,37 | 44,45 | 63,50 | 1,78 | 0,6 | 2,1 | ● | ● | | |




● primera elección
○ elección alternativa

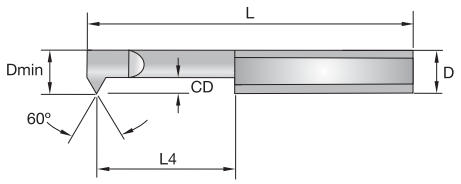
| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | ● | | |

## ■ CIT • Diámetro de mango de 3,18 mm–4,76 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | TP max | TP min | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | |
| **CIT20400751500R** | 3,18 | 1,02 | 1,91 | 38,10 | 0,38 | 0,3 | 0,6 | ● | ● | | |
| **CIT20401001500R** | 3,18 | 1,02 | 2,54 | 38,10 | 0,38 | 0,3 | 0,6 | ● | ● | | |
| **CIT20401501500R** | 3,18 | 1,02 | 3,81 | 38,10 | 0,38 | 0,3 | 0,6 | ● | ● | | |
| **CIT20501001500R** | 3,18 | 1,27 | 2,54 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20501501500R** | 3,18 | 1,27 | 3,81 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20502001500R** | 3,18 | 1,27 | 5,08 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20602001500R** | 3,18 | 1,52 | 5,08 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20602501500R** | 3,18 | 1,52 | 6,35 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20603001500R** | 3,18 | 1,52 | 7,62 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20802501500R** | 3,18 | 2,03 | 6,35 | 38,10 | 0,51 | 0,3 | 0,8 | ● | ● | | |
| **CIT20803501500R** | 3,18 | 2,03 | 8,89 | 38,10 | 0,51 | 0,3 | 0,8 | ● | ● | | |
| **CIT20805001500R** | 3,18 | 2,03 | 12,70 | 38,10 | 0,51 | 0,3 | 0,8 | ● | ● | | |
| **CIT21002501500R** | 3,18 | 2,54 | 6,35 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT21003501500R** | 3,18 | 2,54 | 8,89 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT21005001500R** | 3,18 | 2,54 | 12,70 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT21006001500R** | 3,18 | 2,54 | 15,24 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT31202502000R** | 4,76 | 3,05 | 6,35 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31204002000R** | 4,76 | 3,05 | 10,16 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31205002000R** | 4,76 | 3,05 | 12,70 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31206002000R** | 4,76 | 3,05 | 15,24 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31207502000R** | 4,76 | 3,05 | 19,05 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31402502000R** | 4,76 | 3,56 | 6,35 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31404002000R** | 4,76 | 3,56 | 10,16 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31405002000R** | 4,76 | 3,56 | 12,70 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31407502000R** | 4,76 | 3,56 | 19,05 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31602502000R** | 4,76 | 4,06 | 6,35 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT31604002000R** | 4,76 | 4,06 | 10,16 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT31605002000R** | 4,76 | 4,06 | 12,70 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT31607502000R** | 4,76 | 4,06 | 19,05 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT316010002000R** | 4,76 | 4,06 | 25,40 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |

*(continuación)*

*(continuación)*

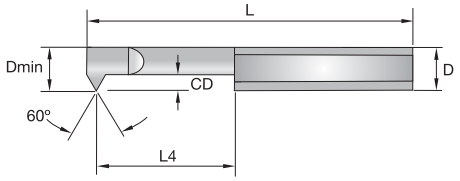



● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | ● | ○ | | | | |
| M | ● | ○ | | | | |
| K | ○ | ● | | | | |
| N | ○ | ● | | | | ● |
| S | ● | ○ | | | | |
| H | | | | ● | | |

## ■ CIT • Diámetro de mango de 3,18 mm–4,76 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | TP max | TP min | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | | |
| **CIT20400751500L** | 3,18 | 1,02 | 1,91 | 38,10 | 0,38 | 0,3 | 0,6 | ● | ● | | |
| **CIT20401001500L** | 3,18 | 1,02 | 2,54 | 38,10 | 0,38 | 0,3 | 0,6 | ● | ● | | |
| **CIT20401501500L** | 3,18 | 1,02 | 3,81 | 38,10 | 0,38 | 0,3 | 0,6 | ● | ● | | |
| **CIT20501001500L** | 3,18 | 1,27 | 2,54 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20501501500L** | 3,18 | 1,27 | 3,81 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20502001500L** | 3,18 | 1,27 | 5,08 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20602001500L** | 3,18 | 1,52 | 5,08 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20602501500L** | 3,18 | 1,52 | 6,35 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20603001500L** | 3,18 | 1,52 | 7,62 | 38,10 | 0,51 | 0,3 | 0,6 | ● | ● | | |
| **CIT20802501500L** | 3,18 | 2,03 | 6,35 | 38,10 | 0,51 | 0,3 | 0,8 | ● | ● | | |
| **CIT20803501500L** | 3,18 | 2,03 | 8,89 | 38,10 | 0,51 | 0,3 | 0,8 | ● | ● | | |
| **CIT20805001500L** | 3,18 | 2,03 | 12,70 | 38,10 | 0,51 | 0,3 | 0,8 | ● | ● | | |
| **CIT21002501500L** | 3,18 | 2,54 | 6,35 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT21003501500L** | 3,18 | 2,54 | 8,89 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT21005001500L** | 3,18 | 2,54 | 12,70 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT21006001500L** | 3,18 | 2,54 | 15,24 | 38,10 | 0,64 | 0,4 | 0,8 | ● | ● | | |
| **CIT31202502000L** | 4,76 | 3,05 | 6,35 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31204002000L** | 4,76 | 3,05 | 10,16 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31205002000L** | 4,76 | 3,05 | 12,70 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31206002000L** | 4,76 | 3,05 | 15,24 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31207502000L** | 4,76 | 3,05 | 19,05 | 50,80 | 0,76 | 0,5 | 1,1 | ● | ● | | |
| **CIT31402502000L** | 4,76 | 3,56 | 6,35 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31404002000L** | 4,76 | 3,56 | 10,16 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31405002000L** | 4,76 | 3,56 | 12,70 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31407502000L** | 4,76 | 3,56 | 19,05 | 50,80 | 0,89 | 0,5 | 1,3 | ● | ● | | |
| **CIT31602502000L** | 4,76 | 4,06 | 6,35 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT31604002000L** | 4,76 | 4,06 | 10,16 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT31605002000L** | 4,76 | 4,06 | 12,70 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT31607502000L** | 4,76 | 4,06 | 19,05 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |
| **CIT316010002000L** | 4,76 | 4,06 | 25,40 | 50,80 | 1,02 | 0,5 | 1,4 | ● | ● | | |

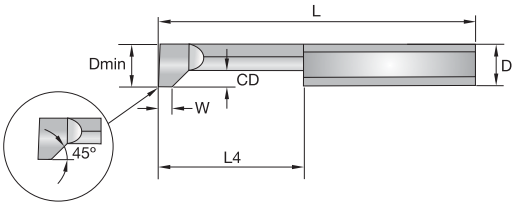



● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ○ | | | |
| M | ● | ○ | | | |
| K | ○ | ● | | | |
| N | ○ | ● | | | ● |
| S | ● | ○ | | | |
| H | | | | ● | |

## ■ CIT • Diámetro de mango de 9,53 mm–12,70 mm

| Número de catálogo ISO | D | D min | L4 | L | CD | TP max | TP min | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | | |
| **CIT63205002500R** | 9,53 | 8,13 | 12,70 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT63207502500R** | 9,53 | 8,13 | 19,05 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT632010002500R** | 9,53 | 8,13 | 25,40 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT632012502500R** | 9,53 | 8,13 | 31,75 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT632018002500R** | 9,53 | 8,13 | 45,72 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT63605002500R** | 9,53 | 9,14 | 12,70 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT63607502500R** | 9,53 | 9,14 | 19,05 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT636010002500R** | 9,53 | 9,14 | 25,40 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT636012502500R** | 9,53 | 9,14 | 31,75 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT636018002500R** | 9,53 | 9,14 | 45,72 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT84907503000R** | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 0,8 | 3,2 | ● | ● | | |
| **CIT849015003000R** | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 0,8 | 3,2 | ● | ● | | |
| **CIT849020003000R** | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 0,8 | 3,2 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | | |
| **CIT63205002500L** | 9,53 | 8,13 | 12,70 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT63207502500L** | 9,53 | 8,13 | 19,05 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT632010002500L** | 9,53 | 8,13 | 25,40 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT632012502500L** | 9,53 | 8,13 | 31,75 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT632018002500L** | 9,53 | 8,13 | 45,72 | 63,50 | 1,91 | 0,8 | 2,5 | ● | ● | | |
| **CIT63605002500L** | 9,53 | 9,14 | 12,70 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT63607502500L** | 9,53 | 9,14 | 19,05 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT636010002500L** | 9,53 | 9,14 | 25,40 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT636012502500L** | 9,53 | 9,14 | 31,75 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT636018002500L** | 9,53 | 9,14 | 45,72 | 63,50 | 2,16 | 0,8 | 2,5 | ● | ● | | |
| **CIT84907503000L** | 12,70 | 12,45 | 19,05 | 76,20 | 3,05 | 0,8 | 3,2 | ● | ● | | |
| **CIT849015003000L** | 12,70 | 12,45 | 38,10 | 76,20 | 3,05 | 0,8 | 3,2 | ● | ● | | |
| **CIT849020003000L** | 12,70 | 12,45 | 50,80 | 76,20 | 3,05 | 0,8 | 3,2 | ● | ● | | |



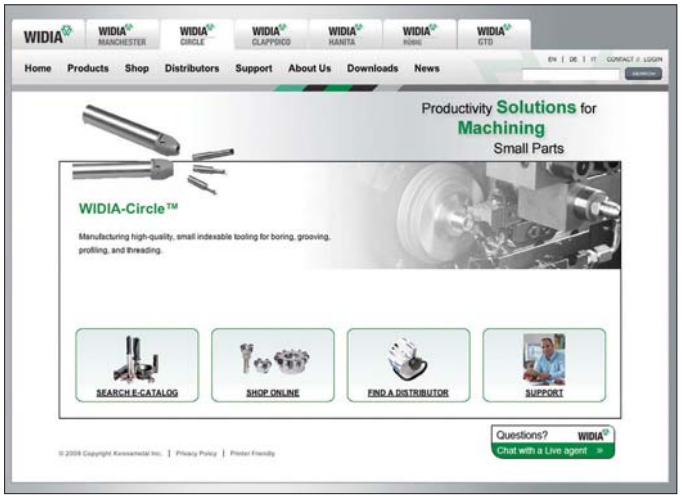

● primera elección
○ elección alternativa

| | | | | | | |
|---|---|---|---|---|---|---|
| P | ● | ○ | | | | |
| M | ● | ○ | | | | |
| K | ○ | ● | | | | |
| N | ○ | ● | | | | ● |
| S | ● | ○ | | | | |
| H | | | | ● | | |

## ■ CTR

| Número de catálogo ISO | D | D min | L4 | L | CD | W | CG5 | CM1 | CBN6 | CPD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CTR21253751500R** | 3,18 | 3,18 | 9,53 | 38,10 | 1,27 | 1,58 | ● | ● | | |
| **CTR31873752000R** | 4,76 | 4,75 | 9,53 | 50,80 | 1,27 | 1,98 | ● | ● | | |
| **CTR31877502000R** | 4,76 | 4,75 | 19,05 | 50,80 | 1,27 | 1,98 | ● | ● | | |
| **CTR42505002500R** | 6,35 | 6,35 | 12,70 | 63,50 | 1,52 | 2,39 | ● | ● | | |
| **CTR425010002500R** | 6,35 | 6,35 | 25,40 | 63,50 | 1,52 | 2,39 | ● | ● | | |
| **CTR53127502500R** | 7,94 | 7,93 | 19,05 | 63,50 | 2,16 | 2,39 | ● | ● | | |
| **CTR531212502500R** | 7,94 | 7,93 | 31,75 | 63,50 | 2,16 | 2,39 | ● | ● | | |
| **CTR63757502500R** | 9,53 | 9,53 | 19,05 | 63,50 | 2,79 | 3,18 | ● | ● | | |
| **CTR637512502500R** | 9,53 | 9,53 | 31,75 | 63,50 | 2,79 | 3,18 | ● | ● | | |
| **CTR850010003000R** | 12,70 | 12,70 | 25,40 | 76,20 | 3,43 | 3,96 | ● | ● | | |
| **CTR850015003000R** | 12,70 | 12,70 | 38,10 | 76,20 | 3,43 | 3,96 | ● | ● | | |

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

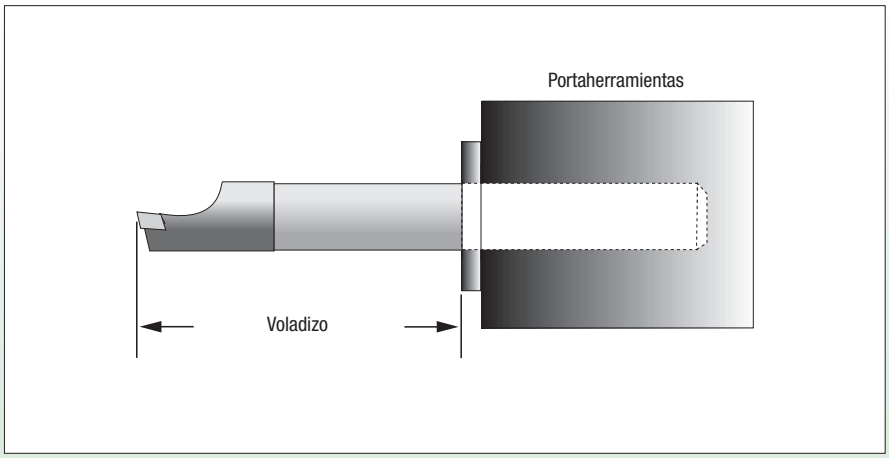
## *Productos WIDIA*

Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.

## Recomendaciones de configuración para el voladizo de la barra

Las herramientas de corte WIDIA-CIRCLE™ son las mejores herramientas de mandrinado, ranurado, perfilado y roscado que existen. Durante más de 50 años, WIDIA-CIRCLE se ha convertido en líder del sector solucionando problemas de mecanizado de orificios pequeños en importantes fábricas de todo el mundo.

Un problema común que sufre toda herramienta de corte es extender la herramienta hasta más allá de su punto de fijación. Este voladizo excesivo puede provocar vibraciones, acabados de mala calidad o una insuficiente vida de herramienta.




Recomendamos un voladizo con proporción de 4:1 (4 veces el diámetro de la barra) durante el uso de barras de mango de acero y de hasta 10:1 (10 veces el diámetro de la barra) durante el uso de barras de mango de metal duro. Múltiples factores afectan a las proporciones de los voladizos:

- El tipo de material o materiales que se mecanizan.
- La profundidad del corte o cortes.
- Avance(s).

Las condiciones recomendadas pueden resultar insatisfactorias debido a las vibraciones. Las vibraciones pueden deberse a instalaciones poco rígidas, los armónicos de la máquina o las condiciones de mecanizado. En la mayoría de casos, se pueden reducir las vibraciones cambiando las RPM de la máquina.

| diámetro del mango | mango de acero (proporción 4:1) | mango de metal duro (proporción 10:1) |
|---|---|---|
| 4,00 mm | 16,00 mm | 40,00 mm |
| 5,00 mm | 20,00 mm | 50,00 mm |
| 6,00 mm | 24,00 mm | 60,00 mm |
| 8,00 mm | 32,00 mm | 80,00 mm |
| 10,00 mm | 40,00 mm | 100,00 mm |
| 12,00 mm | 48,00 mm | 120,00 mm |
| 16,00 mm | 64,00 mm | 160,00 mm |
| 20,00 mm | 80,00 mm | 200,00 mm |
| 25,00 mm | 100,00 mm | 250,00 mm |
| 32,00 mm | 128,00 mm | 320,00 mm |

## Información y recomendaciones de configuración

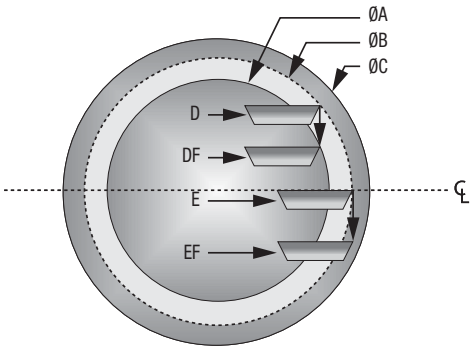
**Herramienta "D"**
**(por encima de la línea central)**

La configuración ØB está desviada a la posición "DF", aliviando el ataque al desviarlo a un orificio más pequeño, ØA. La herramienta "D" no puede "atacar" debido a que el corte (carga) se vuelve más ligero a medida que se desvía.

**Herramienta "E"**
**(en la línea central o por debajo)**

La configuración ØB "ataca" y se desvía hacia la posición "EF" y el orificio ØC. Cuanto mayor es el ataque, mayor es la desviación.

**Punta de la plaquita**
Esto permite al usuario final mantener unas tolerancias más estrechas, producir un mejor acabado y evitar las vibraciones.

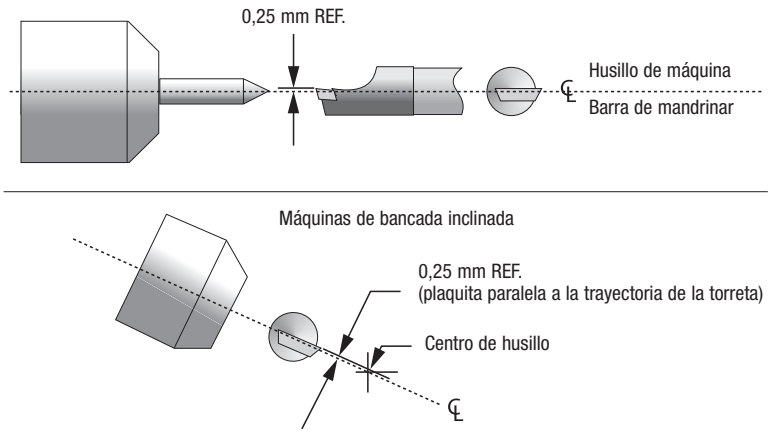



Las geometrías integradas de las barras de mandrinado de precisión WIDIA-CIRCLE™ se basan en el concepto de que el mango de la barra de mandrinar siempre estará colocado en la línea central del husillo de la máquina. El punto de corte deberá ser ligeramente elevado (en dirección opuesta a la rotación) salvo al estar frente a la línea central o al cortar dentro de los diámetros exteriores.

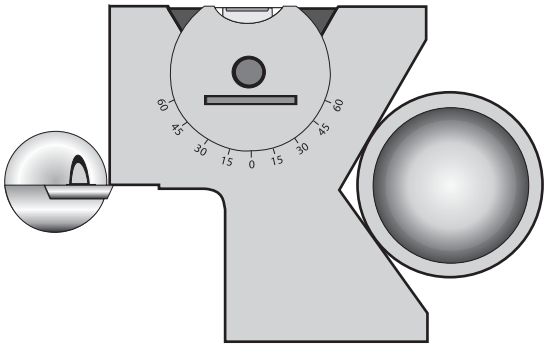
Utilice el nivel de configuración de precisión de WIDIA-CIRCLE o:

1. Utilice el calibre de altura central y coloque la plaquita tal y como se muestra en la ilustración.
2. Si el punto central es inevitable, marque el centro de la barra con una escuadra o punzón de centrado. Coloque la plaquita tal y como se muestra en la ilustración.
3. Ponga un filo recto en la plaquita para ayudar a colocar la plaquita paralelamente al recorrido o a la línea central.

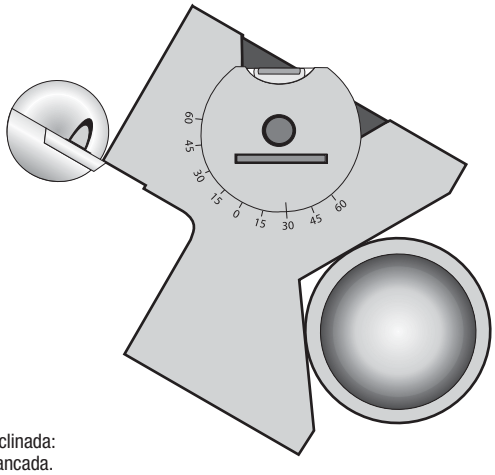
*NOTA: en algunos casos, para reducir las vibraciones o el cono, puede ser necesario girar la plaquita menos de 0,25 mm, pero más de 0,05 mm, por encima del centro.*



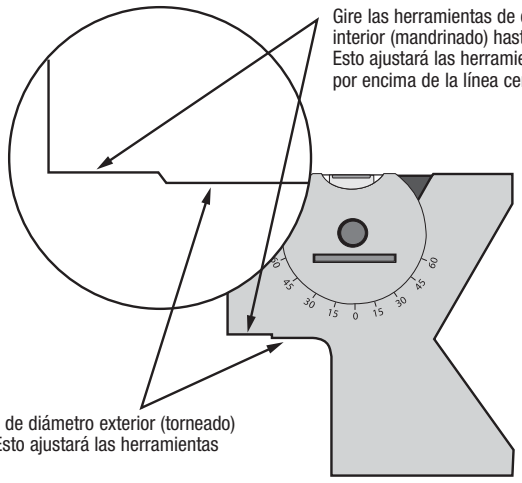
Nivel de configuración de precisión Uni-Level



Para la mayoría de las máquinas:
Ajuste la rueda en la marca de 0°.



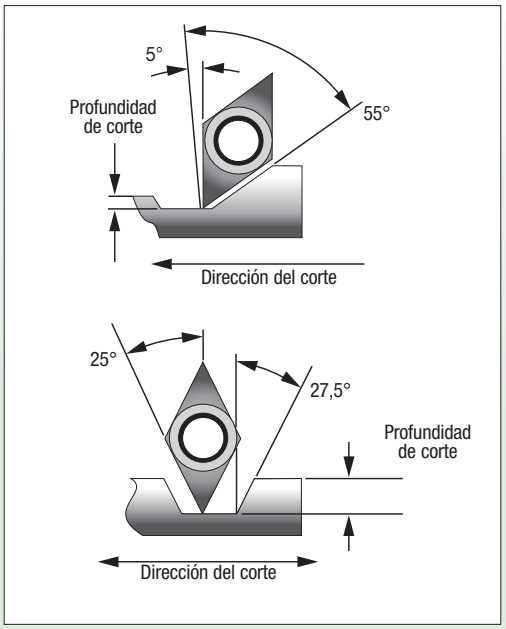
Para máquinas de bancada inclinada:
Ajuste el dial al grado de la bancada.



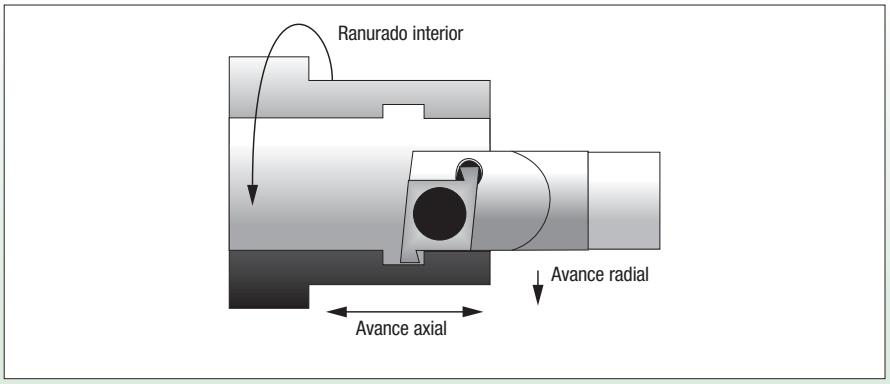
Gire las herramientas de diámetro interior (mandrinado) hasta esta posición. Esto ajustará las herramientas a 0,25 mm por encima de la línea central.

Gire las herramientas de diámetro exterior (torneado) hasta esta posición. Esto ajustará las herramientas en la línea central.

## Información y recomendaciones de configuración para mandrinado y perfilado



## Información y recomendaciones de configuración para ranurado



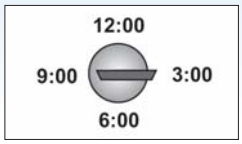

Plaquitas de ranurado tipo CDG intercambiables

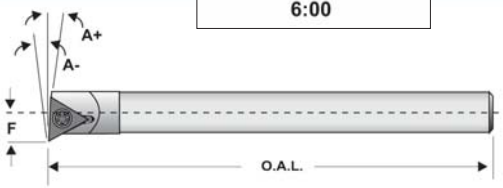
| condiciones de voladizo seguro: | acero (proporción 4:1) | metal duro (proporción 10:1) |
|---|---|---|
| superficies: | consulte las páginas C34 y C35 | |
| avances radiales: | Serie C = 0,008–0,025 mm<br>Serie Q = 0,008–0,051 mm | |
| avances axiales: | Serie C = 0,013–0,051 mm<br>Serie Q = 0,013–0,127 mm | |

Durante más de 50 años, WIDIA-CIRCLE™ ha ofrecido las barras de mandrinar de orificios pequeños más fiables y de mayor calidad que existen.

Aunque nuestra amplia línea de productos abarca la mayoría de aplicaciones de mecanizado, comprendemos que sea necesaria una herramienta de solución a medida.

Ubicaciones partes planas




## Barras de mandrinar de tipo mango recto
Acero o metal duro

**Fecha** / /

### Dimensiones especificadas por el cliente

| | | |
|---|---|---|
| | = **O.A.L. (Longitud total)** | Desde el triple del diámetro de la barra hasta la longitud señalada en el catálogo. |
| | = **"F" Dimensión** | 0,254 mm más que la dimensión básica señalada en el catálogo, sólo para barras con plaquitas triangulares. |
| | = **"A" Dimensión** | Entre +10° y -10° sólo barras con plaquitas triangulares. |
| | = **Ubicación parte plana o planas** | 1 parte plana: sin cargo (consulte la ilustración anterior). |

**Instrucciones especiales**
(haga las anotaciones o bocetos que considere necesarios necesarios en la casilla de la derecha)

**Estándar de catálogo más próximo**

**Cliente**

**Distribuidor**

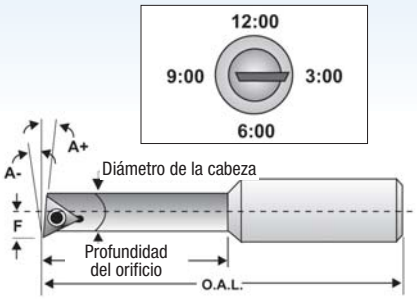
**Requisitos de envío**

☐ Por tierra ☐ Aéreo 1 día ☐ Aéreo 2 días ☐ Aéreo 3 días

*Aviso a distribuidores: utilicen esta hoja de trabajo para recopilar información para el cliente.*

Utilice esta hoja de trabajo para modificar cualquiera de nuestros productos y satisfacer sus propias especificaciones. Si sus requisitos especiales no entran en ninguna de estas categorías, póngase en contacto con nosotros directamente.

Ubicación parte plana o planas




## Barras de mandrinar de tipo mango reducido

Acero o metal duro

**Fecha** / /

**Dimensiones especificadas por el cliente**

| | | |
|---|---|---|
| | = **Profundidad del mandrinado** | Acero con diámetro entre 19,05 mm y 6 veces mayor; metal duro entre 19,05 mm y 10 veces mayor. |
| | = **O.A.L. (Longitud total)** | Acero; más pequeño que la longitud total señalada en el catálogo, metal duro, profundidad de mandrinado y longitud de manguito estándar. |
| | = **"F" Dimensión** | 0,254 mm más o menos que la dimensión básica señalada en el catálogo, sólo para barras con plaquitas triangulares. |
| | = **"A" Dimensión** | Entre +10 y -10 sólo barras con plaquitas triangulares. |
| | = **Ubicación parte plana o planas** | 1 parte plana: sin cargo (consulte la ilustración anterior). |

**Instrucciones especiales**
(haga las anotaciones o bocetos que considere necesarios necesarios en la casilla de la derecha)

**Estándar de catálogo más próximo**

**Cliente**

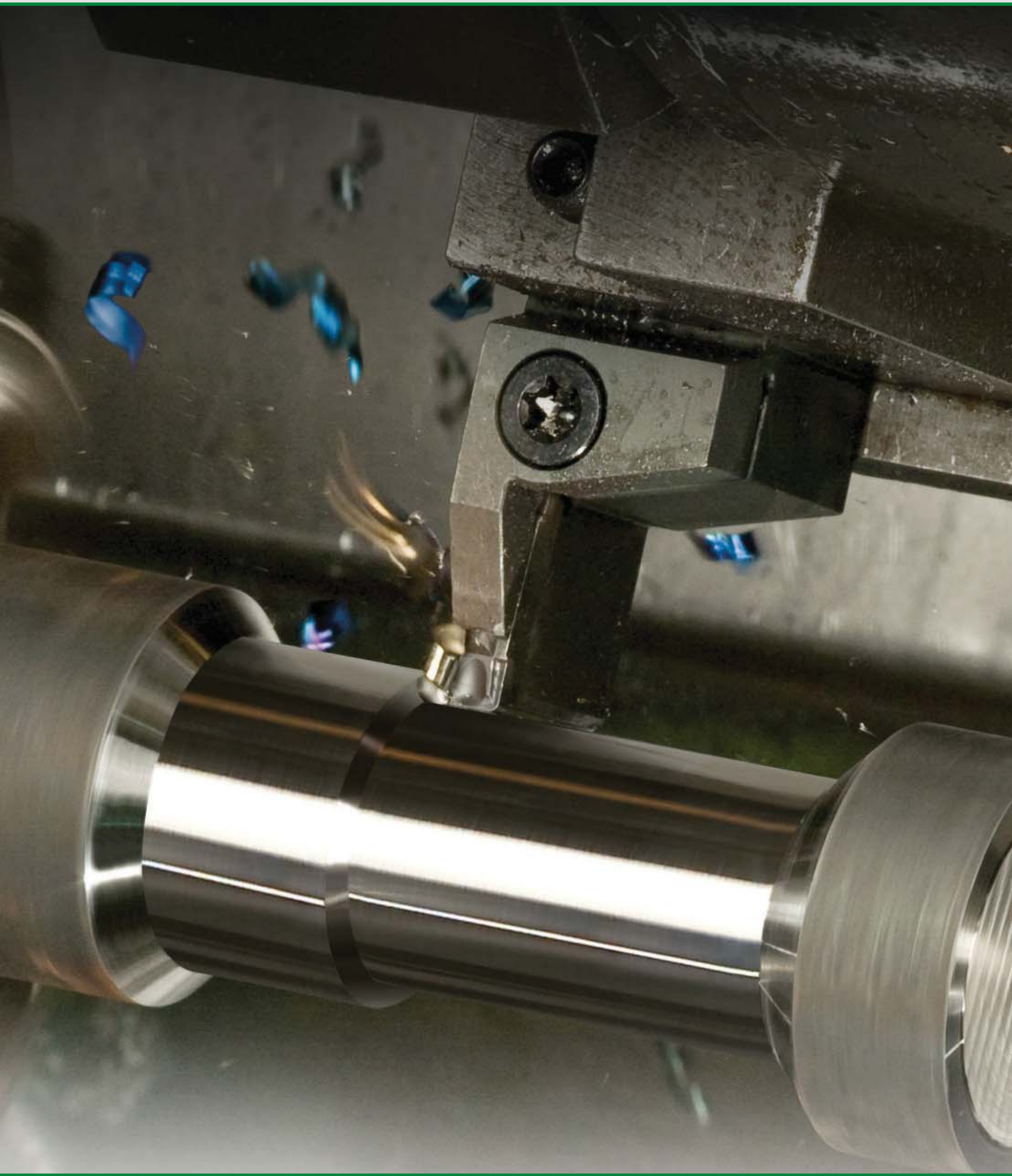
**Distribuidor**

**Requisitos de envío**

☐ Por tierra ☐ Aéreo 1 día ☐ Aéreo 2 días ☐ Aéreo 3 días

*Aviso a distribuidores: utilicen esta hoja de trabajo para recopilar información para el cliente.*

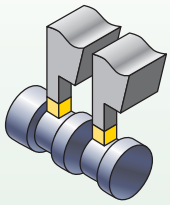
WIDIA
MANCHESTER

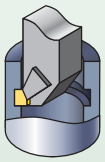


# Ranurado, tronzado y torneado

**Guía de aplicaciones de ranurado** . . . . . **D2–D3**
**WMT™ Ranurado, tronzado y torneado** . . . . . **D4–D29**
**TopGroove™** . . . . . **D30–D69**
**ProGroove™** . . . . . **D70–D83**
**Separator™** . . . . . **D84–D101**
**Ranger™ Ranurado frontal** . . . . . **D102–D109**
**S-LOC™ Ranurado** . . . . . **D110–D115**

## Ranurado





### WMT™

- Anchos de corte de plaquita: 2,0 mm–8,0 mm.
- Geometría para ranurado profundo.
- Profundidades de corte de diámetro exterior: 16,5 mm–25,4 mm.
- Disponibilidad de portaherramientas con cartucho/mango integral con amarre por tornillo.
- Diámetro mínimo de barras de mandrinar para diámetro interior: 57,15 mm.

**Páginas:**
**D4–D29**

### TopGroove™

- Anchos de corte de plaquita: 0,5 mm–6,35 mm.
- Profundidades de corte de plaquita: 0,64 mm–12,7 mm.
- Portaherramientas de mango integral disponibles.
- Diámetro de mandrinado mínimo de barras de mandrinar para diámetro interior: 11,2 mm.

**Páginas:**
**D30–D69**

### ProGroove™

- Las plaquitas permiten una ejecución sinterizada de precisión, con buenas tolerancias y repetibilidad.
- Portaherramientas de mango integral con fijación por tornillo disponibles.
- Ranurado y torneado de diámetro exterior.
- Profundidades de corte de plaquita: 10,0 mm–40,0 mm.

**Páginas:**
**D70–D82**

### S-LOC™

- Anchos de corte de plaquita: 1,04 mm–3,81 mm.
- Profundidad de corte máxima: 2,4 mm.
- Plaquitas para mandrinado o roscado disponibles.
- Portaherramientas de mango integral con fijación por tornillo para aplicaciones de diámetro interior.
- Diámetro de mandrinado mínimo de barras de mandrinar para diámetro interior: 14,2 mm.

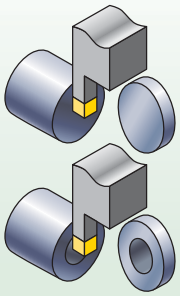
**Páginas:**
**D110–D115**

### LG

- Anchos de corte de plaquita: 8,0 mm–16,0 mm.
- Profundidades de corte de diámetro exterior: 20,0 mm–32,0 mm.
- Herramientas con mango integral de fijación de cuña de apriete disponibles.

**Página:**
**D74**

## Tronzado



### WMT

- Plaquitas de doble extremo económicas para rigidez y precisión dimensional.
- Anchos de tronzado: 1,5 mm–4,0 mm; profundidad máxima: 22,2 mm.
- Posibilidades a derechas y a izquierdas: Ángulos de ataque de 5° y 12°.
- Disponibilidad de portaherramientas de cartucho/mango integral con amarre por tornillo.

**Páginas:**
**D4–D29**

### ProGroove

- Plaquitas de filo único para la máxima profundidad.
- Anchos de tronzado: 2,0 mm–8,0 mm.
- Estilos a derechas y a izquierdas con ángulos de ataque de 6º.
- Portaherramientas de mango integral con fijación por tornillo/hojas de autofijación disponibles.

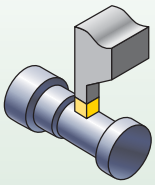
**Páginas:**
**D70–D82**

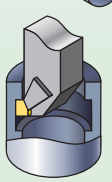
### Separator™

- Anchos de tronzado: 2,0 mm–4,0 mm.
- Hojas de autofijación mecánica positiva.
- Portaherramientas de estilos a derechas y a izquierdas disponibles.
- Plaquitas de filo único para la máxima profundidad.

**Páginas:**
**D84–D101**

## Vaciar y tornear





### WMT

**Retirada de existencias pesadas en aplicaciones de torneado**

- Plaquitas de doble extremo, anchos de corte: 2,0 mm–8,0 mm.
- Disponibilidad de portaherramientas de cartucho/mango integral con amarre por tornillo.
- Profundidades de corte de diámetro exterior: 16,5 mm–25,4 mm.
- Diámetro de mandrinado mínimo de barras de mandrinar para diámetro interior: 57,15 mm.

**Páginas:**
**D4–D29**

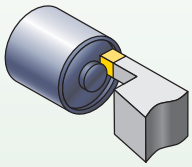
### ProGroove

**Para plaquitas de corte ligero**

- Anchos de corte: 2,0 mm–8,0 mm.
- Plaquitas de filo único para la máxima profundidad.
- Portaherramientas de mango integral con fijación por tornillo disponibles.
- Profundidades de corte de diámetro exterior: 10,0 mm–40,0 mm.

**Páginas:**
**D70–D82**

## Ranurado frontal



### WMT

- Diámetro mínimo de la ranura frontal: 38,0 mm–205,0 mm.
- Anchos de corte: 3,0 mm–6,35 mm.
- Profundidades de corte: 13,0 mm–25,4 mm.

Páginas: D4–D29

### Ranger™

- Diámetro D.E. mínimo de la ranura frontal: 57,0 mm–400,0 mm.
- Anchos de corte: 3,18 mm–6,35 mm.
- Profundidades de corte: 19,0 mm–25,4 mm.
- Portaherramientas de cartucho ajustable y fijación por tornillo con distintos anchos y rotaciones de husillo.
- Portaherramientas de mango redondo y mango ángulo derecho cuadrado disponibles.

Páginas: D102–D109

### S-LOC

- Diámetro mínimo de la ranura frontal: 12,7 mm o superior.
- Anchos de corte: 1,04 mm–3,81 mm.
- Profundidad de corte máxima: 2,4 mm.
- Portaherramientas integral con fijación por tornillo.

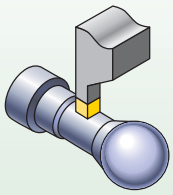
Páginas: D110–D115

### TopGroove

- Rango de diámetros mínimos de la ranura frontal de plaquitas estándar: 54,0 mm–330,0 mm.
- Rango de plaquitas de ranurado de cara NFD/NF: 24,0 mm–57,0 mm.
- Rango de anchos de corte para plaquitas estándar: 0,8 mm–9,5 mm.
- Rango de anchos de corte para plaquitas de ranurado de cara NFD/NF: 2,0 mm–6,35 mm.
- Rango de profundidades de corte para plaquitas estándar: 1,27 mm–12,7 mm.
- Rango de profundidades de corte para plaquitas de ranurado de cara NFD/NF: 3,8 mm–6,35 mm.
- Rango de profundidades de corte para NF: 0,8 mm–9,5 mm.
- Rango de profundidades de corte para NFD: 6,35 mm–12,7 mm.

Páginas: D30–D69

## Perfilado



### WMT

**Para retirada de existencias pesadas**

- Anchos de corte de plaquita de radio completo: 3,0 mm–8,0 mm.
- Disponibilidad de portaherramientas de cartucho/mango integral con amarre por tornillo.
- Profundidades de corte de diámetro exterior: 16,5 mm–25,4 mm.

Páginas: D4–D29

### TopGroove

**Evacuación de material pesado/moderado en profundidades con perfil de poca profundidad**

- Anchos de corte de plaquita de radio completo: 1,57 mm–6,35 mm.
- Profundidades de corte de plaquita: 2,39 mm–6,35 mm.
- Portaherramientas de mango integral y cabezas Erickson™ disponibles.

Páginas: D30–D69

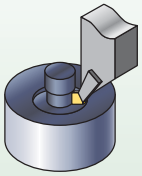
### ProGroove

**Para corte ligero**

- Anchos de corte de plaquita de radio completo: 3,0 mm–6,0 mm.
- Disponibilidad de portaherramientas de cartucho/mango integral con amarre por tornillo.
- Profundidades de corte de diámetro exterior: 10,0 mm–32,0 mm.

Páginas: D70–D82

## Destalonado



### TopGroove

- Anchos de plaquita de destalonado: 2,4 mm–4,0 mm.
- Plaquita de doble extremo económicas.

Páginas: D30–D69

# **Sistema** WMT™

*Un solo sistema para ranurado, tronzado, torneado y perfilado*

La línea WIDIA™ de portaherramientas WMT es la opción económica y fiable para todas las aplicaciones de ranurado, tronzado, torneado y perfilado. Puede estar seguro de que el sistema WMT asegura un posicionamiento preciso de la plaquita y proporciona sólo el mecanizado más preciso con tiempos de ciclo excepcionalmente rápidos y un rendimiento superior.

## Versátil y bien construido

- El sistema WMT permite una importante retirada de existencias en aplicaciones de torneado.
- Geometría excelente para sus aplicaciones de ranurado profundo más exigentes.
- Diseñada específicamente para aumentar las velocidades y los avances.
- Asegura unos acabados superficiales más finos y una larga y fiable vida de la herramienta.

## Portaherramientas WMT

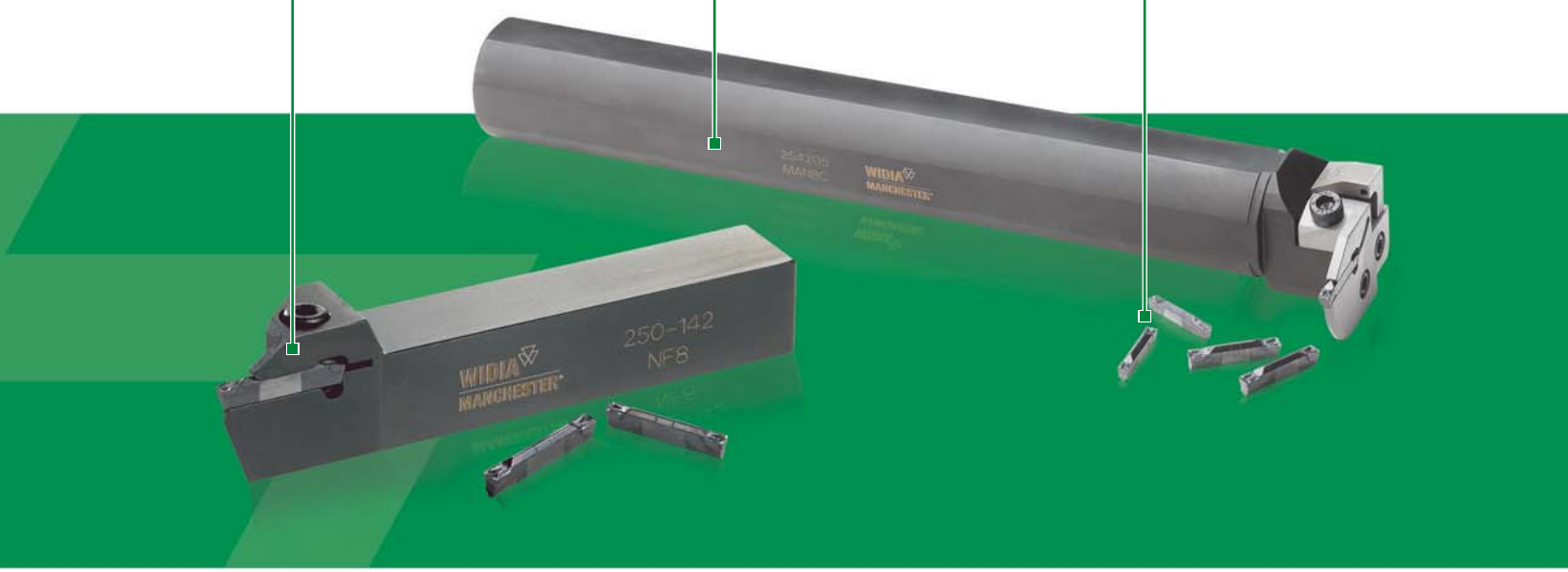
- Capacidades de rigidez y sujeción del sistema excelentes.
- Garantiza unos tiempos de ciclo rápidos y posiciones limitadas de la torreta.
- Posicionamiento exacto de la plaquita para un mecanizado preciso.
- La forma en doble V implica un indexado de plaquitas más fácil para el operario y un óptimo posicionamiento de la plaquita.

WIDIA MANCHESTER

Área de fijación extralarga para una estabilidad de torneado y ranurado insuperables.

Versatilidad excepcional en una herramienta para todas las aplicaciones de diámetro exterior e interior.

Ranurado intercambiable y plaquitas de tronzar diseñadas para un control de virutas excelente.



## WMT SLS

- Adaptable y fácil de usar, reduce el tiempo de instalación y tiempos muertos entre un trabajo y otro.
- Un cartucho reemplazable que facilita y acelera el cambio de aplicaciones.
- Una variedad de anchos de plaquita disponibles para cumplir sus necesidades específicas.
- Sistema de amarre dentado ("Serrated Locking System" o SLS) integral y modular que acepta plaquitas SX, SX Ultra y PT/PC.

## Las soluciones de torneado más avanzadas del sector

Para una calidad, un valor y un rendimiento incomparables, no busque más: todo eso lo encontrará en la completa línea WIDIA™ de soluciones para ranurado y tronzado, fiables y con diseño exclusivo. Las únicas herramientas que necesitará de la marca en la que siempre puede confiar.

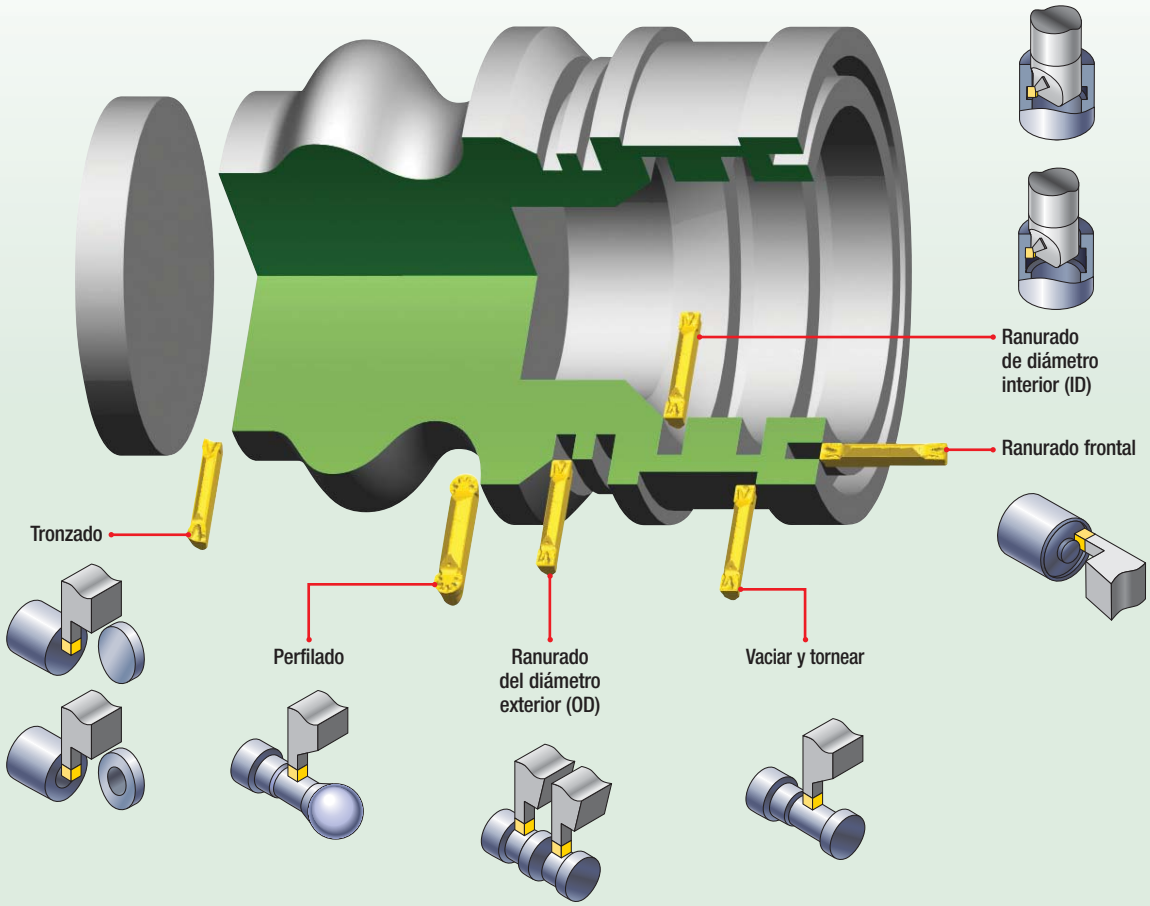
El sistema WMT, con su área de fijación extralarga y un posicionamiento preciso de las plaquitas, asegura un mecanizado excepcionalmente rápido y preciso, una herramienta de todo-en-uno, para sus aplicaciones de ranurado, tronzado, torneado y perfilado más exigentes.

Es perfecto para toda operación de uso general, incluyendo tanto el ranurado profundo como de poca profundidad.

Utilice esta cómoda guía de fácil uso para identificar y seleccionar las armas de ranurado y tronzado adecuadas para sus necesidades específicas.

**1 Elija la aplicación que se va a llevar cabo:**

Profundidad, ancho y perfil de la ranura.




**2 Identifique el material que se va a mecanizar:**

Cada herramienta tiene una marca de una letra que indica los materiales que se pueden mecanizar.

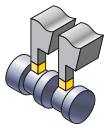
| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

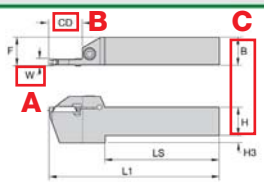
**3 Seleccione un portaherramientas en función de la aplicación:**

- **A** Elija el ancho "W" apropiado necesario para la aplicación.
- **B** Elija la dimensión de profundidad de corte "CD" más corta para una mayor rigidez de la herramienta.
- **C** Seleccione las dimensiones de mango de portaherramientas "H" y "B" más grandes para la máxima rigidez.

**WMT™ Grooving, Cut-Off, and Turning**
Integral Toolholders

WIDIA MANCHESTER



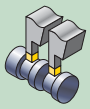
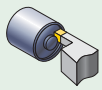



Right Hand Tool

■ OD Grooving

| | | A | B | | C | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| order number | catalogue number | W | CD | F | H | B | H3 | L1 | LS | clamp screw |
| | Right hand | | | | | | | | | |
| 3650516 | 250409 | 1,50 | 17 | 25 | 25 | 25 | – | 150 | 116 | 606249 |
| 3650456 | 250205 | 2,00 | 17 | 16 | 16 | 16 | 6 | 125 | 101 | 606249 |
| 3650458 | 250207 | 2,00 | 17 | 20 | 20 | 20 | – | 125 | 92 | 606249 |
| 3650506 | 250295 | 2,00 | 17 | 25 | 25 | 25 | – | 150 | 116 | 606249 |
| 3650460 | 250217 | 3,00 | 11 | 16 | 16 | 16 | – | 125 | 92 | 619205 |
| 3650462 | 250219 | 3,00 | 22 | 16 | 16 | 16 | 5 | 125 | 83 | 619205 |
| 3650468 | 250227 | 3,00 | 11 | 20 | 20 | 20 | – | 125 | 92 | 619205 |
| 3650470 | 250229 | 3,00 | 22 | 20 | 20 | 20 | 5 | 125 | 83 | 619205 |
| 3650479 | 250241 | 3,00 | 11 | 25 | 25 | 25 | – | 150 | 117 | 619205 |
| 3650481 | 250243 | 3,00 | 22 | 25 | 25 | 25 | – | 150 | 109 | 619205 |
| 3650464 | 250221 | 4,00 | 22 | 16 | 16 | 16 | 5 | 125 | 83 | 619205 |
| 3653751 | 250231 | 4,00 | 20 | – | 20 | – | – | 125 | 83 | 619205 |
| 3650483 | 250245 | 4,00 | 22 | 25 | 25 | 25 | – | 150 | 109 | 619205 |
| 3650502 | 250281 | 4,00 | 11 | 16 | 16 | 16 | – | 125 | 92 | 619205 |
| 3650504 | 250283 | 4,00 | 11 | 20 | 20 | 20 | – | 125 | 92 | 619205 |
| 3653752 | 250285 | 4,00 | 11 | 25 | 25 | 25 | – | 150 | 117 | 619205 |
| 3650466 | 250223 | 5,00 | 14 | 16 | 16 | 15 | – | 125 | 88 | 619168 |
| 3650473 | 250233 | 5,00 | 14 | 20 | 20 | 19 | – | 125 | 88 | 619168 |
| 3650475 | 250235 | 5,00 | 15 | 20 | 20 | 19 | 5 | 140 | 93 | 619168 |
| 3650485 | 250247 | 5,00 | 14 | 25 | 25 | 24 | – | 150 | 113 | 619168 |
| 3650487 | 250249 | 5,00 | 25 | 25 | 25 | 24 | – | 150 | 104 | 619168 |
| 3650477 | 250237 | 6,00 | 14 | 20 | 20 | 19 | – | 140 | 103 | 619168 |
| 3650489 | 250251 | 6,00 | 14 | 25 | 25 | 24 | – | 150 | 114 | 619168 |
| 3650491 | 250253 | 6,00 | 25 | 25 | 25 | 24 | – | 150 | 104 | 619168 |
| 3650494 | 250255 | 8,00 | 14 | 25 | 25 | 24 | – | 150 | 113 | 619168 |
| 3650496 | 250257 | 8,00 | 25 | 25 | 25 | 24 | – | 150 | 104 | 619168 |
| 3650498 | 250275 | 8,00 | 14 | 32 | 32 | 31 | – | 150 | 113 | 619168 |
| 3650500 | 250277 | 8,00 | 25 | 32 | 32 | 31 | – | 150 | 104 | 619168 |

(continued)

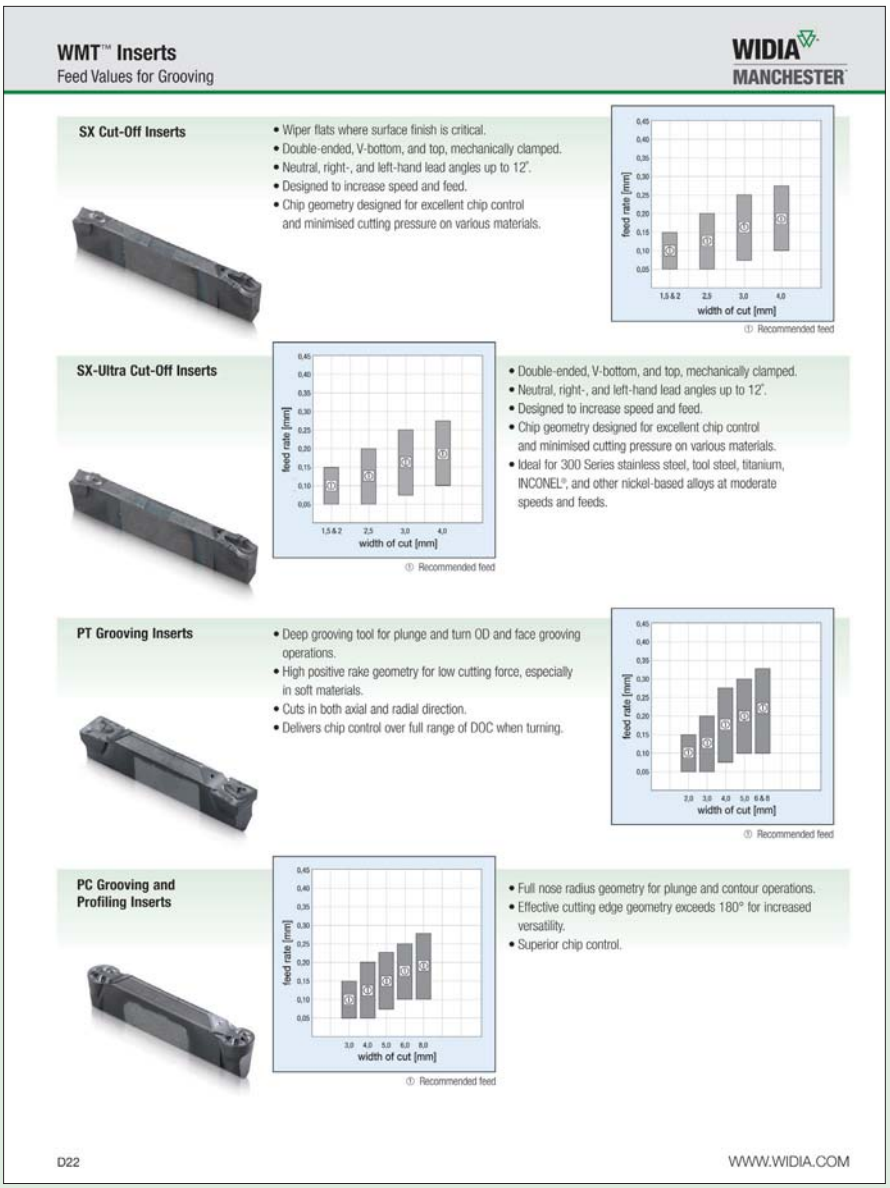
| | aplicación | portaherramientas convencionales | hojas modulares |
|---|---|---|---|
|  | Ranurado y tronzado de diámetro exterior | páginas D10–D12 | páginas D16–D17 |
|  | Ranurado frontal | páginas D13–D14 | páginas D18–D19 |
| | Ranurado de diámetro interior | — | páginas D20–D21 |
| | Vaciar y tornear | páginas D10–D12 | páginas D16–D17 |

**4 Seleccione el tipo de rompevirutas para la aplicación:**

| | |
|---|---|
| **SX-ULTRA** | (1ª elección) Tronzado |
| **SX** | Tronzado con plaquitas wiper |
| **PT** | Ranurado y torneado |
| **PC** | Perfilado y torneado |

*NOTA: la tabla muestra los avances iniciales recomendados.*

*Consulte la página D22.*



**WMT™ Inserts**
Feed Values for Grooving

WIDIA MANCHESTER

**SX Cut-Off Inserts**

- Wiper flats where surface finish is critical.
- Double-ended, V-bottom, and top, mechanically clamped.
- Neutral, right-, and left-hand lead angles up to 12°.
- Designed to increase speed and feed.
- Chip geometry designed for excellent chip control and minimised cutting pressure on various materials.



① Recommended feed

**SX-Ultra Cut-Off Inserts**

- Double-ended, V-bottom, and top, mechanically clamped.
- Neutral, right-, and left-hand lead angles up to 12°.
- Designed to increase speed and feed.
- Chip geometry designed for excellent chip control and minimised cutting pressure on various materials.
- Ideal for 300 Series stainless steel, tool steel, titanium, INCONEL®, and other nickel-based alloys at moderate speeds and feeds.



① Recommended feed

**PT Grooving Inserts**

- Deep grooving tool for plunge and turn OD and face grooving operations.
- High positive rake geometry for low cutting force, especially in soft materials.
- Cuts in both axial and radial direction.
- Delivers chip control over full range of DOC when turning.



① Recommended feed

**PC Grooving and Profiling Inserts**

- Full nose radius geometry for plunge and contour operations.
- Effective cutting edge geometry exceeds 180° for increased versatility.
- Superior chip control.



① Recommended feed

D22

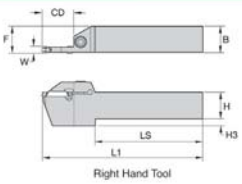
WWW.WIDIA.COM

**A** Elija el ancho de plaquita "W" apropiado para su aplicación específica.

**B** Seleccione el valor necesario "RR" del radio de esquina.

**WMT™ Grooving, Cut-Off, and Turning**
Integral Toolholders

WIDIA MANCHESTER




Right Hand Tool

■ OD Cut-Off and Grooving

| order number | catalogue number | H | W (A) | CD (B) | F | B | H3 | L1 | LS | clamp screw |
|---|---|---|---|---|---|---|---|---|---|---|
| | Right hand | | | | | | | | | |
| 3650456 | 250205 | 16,0 | 2,00 | 16,5 | 16,0 | 15,5 | 6 | 125 | 101 | 606249 |
| 3650460 | 250217 | 16,0 | 3,00 | 11,0 | 16,0 | 15,6 | – | 125 | 92 | 619205 |
| 3650462 | 250219 | 16,0 | 3,00 | 22,0 | 16,0 | 15,6 | 5 | 125 | 83 | 619205 |
| 3650464 | 250221 | 16,0 | 4,00 | 22,0 | 16,0 | 15,5 | 5 | 125 | 83 | 619205 |
| 3650502 | 250281 | 16,0 | 4,00 | 11,0 | 16,0 | 15,5 | – | 125 | 92 | 619205 |
| 3650466 | 250223 | 16,0 | 5,00 | 14,0 | 16,0 | 15,2 | – | 125 | 88 | 619168 |
| 3650458 | 250207 | 20,0 | 2,00 | 16,5 | 20,0 | 19,5 | – | 125 | 92 | 606249 |

**5 Seleccione la calidad:**

| condición de corte | | Calidades recomendadas: acero | acero inoxidable | fundición | metales no férreos | aleaciones de alta temperatura | materiales endurecidos |
|---|---|---|---|---|---|---|---|
| corte suave, superficie pretorneada | | TN6016 | TN6026 | TN6016 | TN6016 | TN6026 | TN6026 |
| profundidad de corte, fundido o forja variables | | TN6016 | TN6026 | TN6016 | TN6016 | TN6026 | TN6026 |
| corte ligeramente interrumpido | | TN6031 | TN6026 | TN6031 | TN6031 | TN6026 | TN6026 |
| corte muy interrumpido | | TN6031 | TN6026 | TN6031 | TN6031 | TN6026 | TN6026 |

*Consulte en la página D23 las calidades y descripciones de calidades.*

**6 Determine los datos de corte:**

A Identifique la velocidad inicial (vc), en función del grupo de materiales y la calidad.

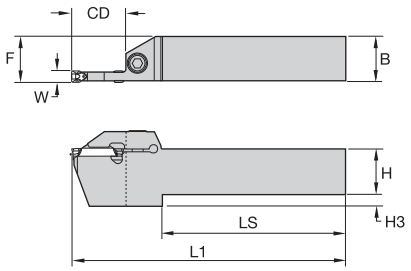
B La primera opción en la velocidad inicial está en **negrita**.

*Consulte la página D24 para datos de corte.*

**WMT™ Grooving, Cut-Off, and Turning**
Recommended Cutting Speed Starting Conditions

WIDIA MANCHESTER

| ANSI ISO 513 | VDI 3323 | Cutting Speed • vc m/min | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Material Group | | min | Start | max | min | Start | max | min | Start | max |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| P | 1 | 170 | **200** | 230 | 140 | **170** | 195 | 130 | **150** | 175 |
| | 2 | 170 | **200** | 230 | 140 | **170** | 195 | 130 | **150** | 175 |
| | 3 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 4 | 150 | **185** | 215 | 130 | **155** | 180 | 115 | **140** | 165 |
| | 5 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 6 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 7 | 165 | **195** | 225 | 140 | **165** | 190 | 125 | **150** | 175 |
| | 8 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 9 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 10 | 145 | **175** | 205 | 125 | **150** | 175 | 110 | **135** | 155 |
| | 11 | 120 | **150** | 185 | 105 | **130** | 155 | 95 | **115** | 140 |
| | 12 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 13.1 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 13.2 | 120 | **150** | 185 | 105 | **130** | 155 | 95 | **115** | 140 |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| M | 14.1 | 105 | **135** | 170 | 90 | **115** | 140 | 80 | **105** | 130 |
| | 14.2 | 85 | **115** | 145 | 75 | **100** | 125 | 65 | **90** | 110 |
| | 14.3 | 70 | **100** | 130 | 60 | **85** | 110 | 50 | **75** | 100 |
| | 14.4 | 55 | **85** | 115 | 45 | **70** | 95 | 40 | **65** | 85 |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| K | 15 | 185 | **215** | 245 | 155 | **180** | 205 | 140 | **165** | 185 |
| | 16 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 17 | 150 | **185** | 215 | 130 | **155** | 180 | 115 | **140** | 165 |
| | 18 | 145 | **175** | 205 | 125 | **150** | 175 | 110 | **135** | 155 |
| | 19 | 200 | **230** | 260 | 170 | **195** | 220 | 150 | **175** | 200 |
| | 20 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| N | 21 | 305 | **335** | 365 | 260 | **285** | 310 | | | |
| | 22 | 245 | **275** | 305 | 205 | **235** | 260 | | | |
| | 23 | 305 | **335** | 365 | 260 | **285** | 310 | | | |
| | 24 | 245 | **275** | 305 | 205 | **235** | 260 | | | |
| | 25 | 215 | **245** | 275 | 180 | **205** | 235 | | | |
| | 26 | 150 | **185** | 215 | 130 | **155** | 180 | | | |
| | 27 | 150 | **185** | 215 | 130 | **155** | 180 | | | |
| | 28 | 150 | **185** | 215 | 130 | **155** | 180 | | | |
| | 29 | 135 | **170** | 200 | 115 | **140** | 170 | | | |
| | 30 | 135 | **170** | 200 | 115 | **140** | 170 | | | |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| S | 31 | 50 | **80** | 115 | 45 | **70** | 95 | 35 | **60** | 80 |
| | 32 | 35 | **65** | 100 | 30 | **55** | 85 | 25 | **50** | 70 |
| | 33 | 40 | **70** | 100 | 30 | **60** | 85 | 30 | **50** | 70 |
| | 34 | 30 | **60** | 90 | 25 | **50** | 80 | 20 | **45** | 65 |
| | 35 | 35 | **65** | 95 | 30 | **55** | 80 | 25 | **45** | 70 |
| | 36 | 65 | **100** | 130 | 55 | **85** | 110 | 50 | **70** | 90 |
| | 37 | 40 | **70** | 100 | 30 | **60** | 85 | 30 | **50** | 70 |




Herramienta a derechas

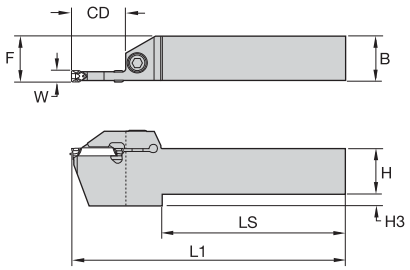


## Tronzado y ranurado de diámetro exterior

| Número de pedido | Número de catálogo | H | W | CD | F | B | H3 | L1 | LS | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|
| | A derechas | | | | | | | | | |
| 3650456 | 250205 | 16,0 | 2,00 | 16,5 | 16,0 | 15,5 | 6 | 125 | 101 | 606249 |
| 3650460 | 250217 | 16,0 | 3,00 | 11,0 | 16,0 | 15,6 | — | 125 | 92 | 619205 |
| 3650462 | 250219 | 16,0 | 3,00 | 22,0 | 16,0 | 15,6 | 5 | 125 | 83 | 619205 |
| 3650464 | 250221 | 16,0 | 4,00 | 22,0 | 16,0 | 15,5 | 5 | 125 | 83 | 619205 |
| 3650502 | 250281 | 16,0 | 4,00 | 11,0 | 16,0 | 15,5 | — | 125 | 92 | 619205 |
| 3650466 | 250223 | 16,0 | 5,00 | 14,0 | 16,0 | 15,2 | — | 125 | 88 | 619168 |
| 3650458 | 250207 | 20,0 | 2,00 | 16,5 | 20,0 | 19,5 | — | 125 | 92 | 606249 |
| 3650468 | 250227 | 20,0 | 3,00 | 11,0 | 20,0 | 19,5 | — | 125 | 92 | 619205 |
| 3650470 | 250229 | 20,0 | 3,00 | 22,0 | 20,0 | 19,5 | 5 | 125 | 83 | 619205 |
| 3653751 | 250231 | 20,0 | 4,00 | 20,0 | — | — | — | 125 | 83 | 619205 |
| 3650504 | 250283 | 20,0 | 4,00 | 11,0 | 20,0 | 19,5 | — | 125 | 92 | 619205 |
| 3650473 | 250233 | 20,0 | 5,00 | 14,0 | 20,0 | 19,2 | — | 125 | 88 | 619168 |
| 3650475 | 250235 | 20,0 | 5,00 | 15,0 | 20,0 | 19,2 | 5 | 140 | 93 | 619168 |
| 3650477 | 250237 | 20,0 | 6,00 | 14,0 | 20,0 | 19,2 | — | 140 | 103 | 619168 |
| 3650516 | 250409 | 25,0 | 1,50 | 16,5 | 25,0 | 24,5 | — | 150 | 116 | 606249 |
| 3650506 | 250295 | 25,0 | 2,00 | 16,5 | 25,0 | 24,5 | — | 150 | 116 | 606249 |
| 3650479 | 250241 | 25,0 | 3,00 | 11,0 | 25,0 | 24,5 | — | 150 | 117 | 619205 |
| 3650481 | 250243 | 25,0 | 3,00 | 22,0 | 25,0 | 24,5 | — | 150 | 109 | 619205 |
| 3650483 | 250245 | 25,0 | 4,00 | 22,0 | 25,0 | 24,5 | — | 150 | 109 | 619205 |
| 3653752 | 250285 | 25,0 | 4,00 | 11,0 | 25,0 | 24,7 | — | 150 | 117 | 619205 |
| 3650485 | 250247 | 25,0 | 5,00 | 14,0 | 25,0 | 24,1 | — | 150 | 113 | 619168 |
| 3650487 | 250249 | 25,0 | 5,00 | 25,0 | 25,0 | 24,1 | — | 150 | 104 | 619168 |
| 3650489 | 250251 | 25,0 | 6,00 | 14,0 | 25,0 | 24,1 | — | 150 | 114 | 619168 |
| 3650491 | 250253 | 25,0 | 6,00 | 25,0 | 25,0 | 24,1 | — | 150 | 104 | 619168 |
| 3650494 | 250255 | 25,0 | 8,00 | 14,0 | 25,0 | 23,9 | — | 150 | 113 | 619168 |
| 3650496 | 250257 | 25,0 | 8,00 | 25,0 | 25,0 | 23,9 | — | 150 | 104 | 619168 |
| 3650498 | 250275 | 32,0 | 8,00 | 14,0 | 32,0 | 30,9 | — | 150 | 113 | 619168 |
| 3650500 | 250277 | 32,0 | 8,00 | 25,0 | 32,0 | 30,9 | — | 150 | 104 | 619168 |

*(continuación)*

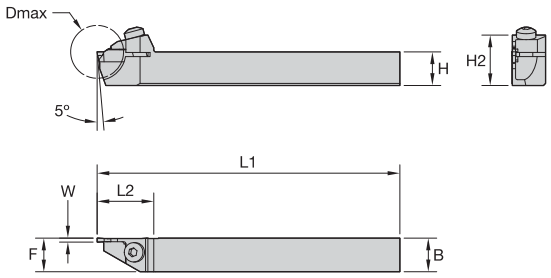
*(continuación)*




Herramienta a derechas

## Tronzado y ranurado de diámetro exterior

| Número de pedido | Número de catálogo | H | W | CD | F | B | H3 | L1 | LS | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | | | | |
| **3650457** | **250206** | 16,0 | 2,00 | 16,5 | 16,0 | 15,5 | 6 | 125 | 101 | **606249** |
| **3650461** | **250218** | 16,0 | 3,00 | 11,0 | 16,0 | 15,5 | — | 125 | 92 | **619205** |
| **3650463** | **250220** | 16,0 | 3,00 | 22,0 | 16,0 | 15,5 | 5 | 125 | 83 | **619205** |
| **3650465** | **250222** | 16,0 | 4,00 | 22,0 | 16,0 | 15,5 | 5 | 125 | 83 | **619205** |
| **3650503** | **250282** | 16,0 | 4,00 | 11,0 | 16,0 | 15,5 | — | 125 | 92 | **619205** |
| **3650467** | **250224** | 16,0 | 5,00 | 14,0 | 16,0 | 15,2 | — | 125 | 88 | **619168** |
| **3650459** | **250208** | 20,0 | 2,00 | 16,5 | 20,0 | 19,5 | — | 125 | 92 | **606249** |
| **3650469** | **250228** | 20,0 | 3,00 | 11,0 | 20,0 | 19,5 | — | 125 | 92 | **619205** |
| **3650471** | **250230** | 20,0 | 3,00 | 22,0 | 20,0 | 19,5 | 5 | 125 | 83 | **619205** |
| **3650472** | **250232** | 20,0 | 4,00 | 22,0 | 20,0 | 19,7 | 5 | 125 | 83 | **619205** |
| **3650505** | **250284** | 20,0 | 4,00 | 11,0 | 20,0 | 19,5 | — | 125 | 92 | **619205** |
| **3650474** | **250234** | 20,0 | 5,00 | 14,0 | 20,0 | 19,2 | — | 125 | 88 | **619168** |
| **3650476** | **250236** | 20,0 | 5,00 | 15,0 | 20,0 | 19,2 | 5 | 140 | 93 | **619168** |
| **3650478** | **250238** | 20,0 | 6,00 | 14,0 | 20,0 | 19,3 | — | 140 | 103 | **619168** |
| **3650507** | **250296** | 25,0 | 2,00 | 16,5 | 25,0 | 24,5 | — | 150 | 116 | **606249** |
| **3653332** | **250410** | 25,0 | 2,00 | 16,5 | 25,3 | 24,5 | — | 150 | 116 | **606249** |
| **3650480** | **250242** | 25,0 | 3,00 | 11,0 | 25,0 | 24,5 | — | 150 | 116 | **619205** |
| **3650482** | **250244** | 25,0 | 3,00 | 22,0 | 25,0 | 24,5 | — | 150 | 109 | **619205** |
| **3650484** | **250246** | 25,0 | 4,00 | 22,0 | 25,0 | 24,5 | — | 150 | 109 | **619205** |
| **3653763** | **250286** | 25,0 | 4,00 | 11,0 | 25,0 | 24,7 | — | 150 | 117 | **619205** |
| **3650486** | **250248** | 25,0 | 5,00 | 14,0 | 25,0 | 24,1 | — | 150 | 113 | **619168** |
| **3650488** | **250250** | 25,0 | 5,00 | 25,0 | 25,0 | 24,1 | — | 150 | 104 | **619168** |
| **3650490** | **250252** | 25,0 | 6,00 | 14,0 | 25,0 | 24,1 | — | 150 | 114 | **619168** |
| **3650493** | **250254** | 25,0 | 6,00 | 25,0 | 25,0 | 24,1 | — | 150 | 104 | **619168** |
| **3650495** | **250256** | 25,0 | 8,00 | 14,0 | 25,0 | 23,9 | — | 150 | 113 | **619168** |
| **3650497** | **250258** | 25,0 | 8,00 | 25,0 | 25,0 | 23,9 | — | 150 | 104 | **619168** |
| **3650499** | **250276** | 32,0 | 8,00 | 14,0 | 32,0 | 30,9 | — | 150 | 113 | **619168** |
| **3650501** | **250278** | 32,0 | 8,00 | 25,0 | 32,0 | 30,9 | — | 150 | 104 | **619168** |

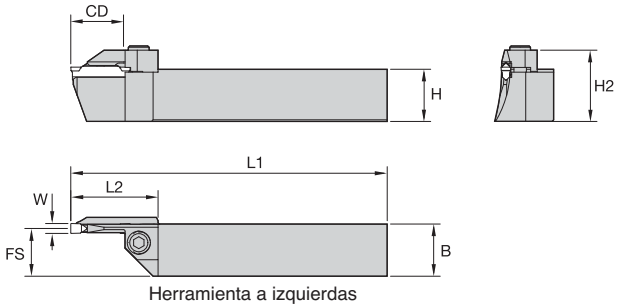


Herramienta a izquierdas

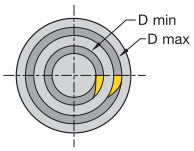
## Ranurado y tronzado suizo

| Número de pedido | Número de catálogo | W | D max | B | H | H2 | F | L1 | L2 | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **3650508** | **250401** | 1,50 | 20 | 10,0 | 10,0 | 16 | 10,0 | 100 | 21 | **606249** |
| **3650510** | **250403** | 1,50 | 20 | 12,0 | 12,0 | 18 | 12,0 | 100 | 21 | **606249** |
| **3650512** | **250405** | 1,50 | 26 | 15,9 | 16,0 | 24 | 16,0 | 125 | 24 | **606266** |
| **3650514** | **250407** | 1,50 | 26 | 19,9 | 20,0 | 28 | 20,0 | 125 | 24 | **606266** |
| **3653413** | **250411** | 2,00 | 20 | 10,0 | 10,0 | 16 | 10,0 | 100 | 21 | **606249** |
| **3653415** | **250413** | 2,00 | 20 | 12,0 | 12,0 | 18 | 12,0 | 100 | 21 | **606249** |
| **3653417** | **250415** | 2,00 | 26 | 15,8 | 16,0 | 24 | 16,0 | 125 | 24 | **606266** |
| **3653419** | **250417** | 2,00 | 26 | 19,8 | 20,0 | 28 | 20,0 | 125 | 24 | **606266** |
| | **A izquierdas** | | | | | | | | | |
| **3650509** | **250402** | 1,50 | 20 | 10,0 | 10,0 | 16 | 10,0 | 100 | 21 | **606249** |
| **3650511** | **250404** | 1,50 | 20 | 12,0 | 12,0 | 18 | 12,0 | 100 | 21 | **606249** |
| **3650513** | **250406** | 1,50 | 26 | 15,9 | 16,0 | 24 | 16,0 | 125 | 24 | **606266** |
| **3650515** | **250408** | 1,50 | 26 | 19,9 | 20,0 | 28 | 20,0 | 125 | 24 | **606266** |
| **3653414** | **250412** | 2,00 | 20 | 10,0 | 10,0 | 16 | 10,0 | 100 | 21 | **606249** |
| **3653416** | **250414** | 2,00 | 20 | 12,0 | 12,0 | 18 | 12,0 | 100 | 21 | **606249** |
| **3653418** | **250416** | 2,00 | 26 | 15,8 | 16,0 | 24 | 16,0 | 125 | 24 | **606266** |
| **3653420** | **250418** | 2,00 | 26 | 19,8 | 20,0 | 28 | 20,0 | 125 | 24 | **606266** |

*NOTA: filo exterior de plaquita en línea con el filo del portaherramientas para portaherramientas con mango de 10,0 mm y 12,0 mm.*



Herramienta a izquierdas

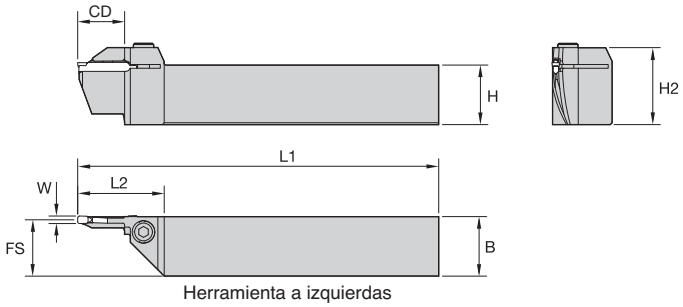



| Tipo lama | Forma de la pieza | A izquierdas | A derechas |
|---|---|---|---|
| Curva de entrada | | | |
| Curva de salida | | | |

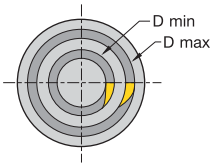
## Curva de salida

| Número de pedido | Número de catálogo | W | CD | D max | D min | FS | H2 | H | B | L1 | L2 | amarre | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3653421** | **251217** | 3,00 | 13,0 | 52 | 38 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653425** | **251221** | 3,00 | 16,0 | 100 | 70 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653423** | **251219** | 3,00 | 16,0 | 70 | 52 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653427** | **251223** | 3,00 | 19,0 | 205 | 100 | 23,5 | 32 | 25,0 | 24,8 | 150 | 37 | – | **619205** |
| **3653764** | **251265** | 4,00 | 12,5 | 52 | 32 | 23,0 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653768** | **251269** | 4,00 | 15,5 | 100 | 70 | 23,0 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653766** | **251267** | 4,00 | 15,5 | 70 | 52 | 23,0 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653770** | **251271** | 4,00 | 18,5 | 205 | 100 | 23,0 | 32 | 24,8 | 24,8 | 150 | 37 | – | **619205** |
| **3653429** | **251233** | 5,00 | 16,0 | 52 | 38 | 22,5 | 34 | 25,0 | 24,6 | 150 | 38 | **446102** | **619168** |
| **3653433** | **251237** | 5,00 | 19,0 | 100 | 70 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| **3653431** | **251235** | 5,00 | 19,0 | 70 | 52 | 22,5 | 34 | 24,8 | 24,8 | 150 | 38 | **446102** | **619168** |
| **3653435** | **251239** | 5,00 | 25,0 | 205 | 100 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| **3653437** | **251249** | 6,00 | 16,0 | 52 | 38 | 22,0 | 35 | 24,8 | 24,8 | 150 | 38 | **446102** | **619168** |
| **3653441** | **251253** | 6,00 | 19,0 | 100 | 70 | 22,0 | 36 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| **3653439** | **251251** | 6,00 | 19,0 | 70 | 52 | 22,0 | 34 | 24,8 | 24,8 | 150 | 38 | **446102** | **619168** |
| **3653443** | **251255** | 6,00 | 25,0 | 205 | 100 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| | **A izquierdas** | | | | | | | | | | | | |
| **3653422** | **251218** | 3,00 | 13,0 | 52 | 38 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653424** | **251220** | 3,00 | 16,0 | 70 | 52 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653426** | **251222** | 3,00 | 16,0 | 100 | 70 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653428** | **251224** | 3,00 | 19,0 | 205 | 100 | 23,5 | 32 | 24,8 | 24,8 | 150 | 37 | – | **619205** |
| **3653765** | **251266** | 4,00 | 12,5 | 52 | 32 | 23,0 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653769** | **251270** | 4,00 | 15,5 | 100 | 70 | 23,0 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653767** | **251268** | 4,00 | 15,5 | 70 | 52 | 23,0 | 32 | 24,8 | 24,8 | 150 | 34 | – | **619205** |
| **3653771** | **251272** | 4,00 | 18,5 | 205 | 100 | 23,0 | 32 | 24,8 | 24,8 | 150 | 37 | – | **619205** |
| **3653430** | **251234** | 5,00 | 16,0 | 52 | 38 | 22,5 | 34 | 24,8 | 24,8 | 150 | 38 | **446101** | **619168** |
| **3653432** | **251236** | 5,00 | 19,0 | 70 | 52 | 22,5 | 34 | 24,8 | 24,8 | 150 | 38 | **446101** | **619168** |
| **3653434** | **251238** | 5,00 | 19,0 | 100 | 70 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |
| **3653436** | **251240** | 5,00 | 25,0 | 205 | 100 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |
| **3653438** | **251250** | 6,00 | 16,0 | 52 | 38 | 22,0 | 35 | 24,8 | 24,8 | 150 | 38 | **446101** | **619168** |
| **3653440** | **251252** | 6,00 | 19,0 | 70 | 52 | 22,0 | 34 | 24,8 | 24,8 | 150 | 38 | **446101** | **619168** |
| **3653442** | **251254** | 6,00 | 19,0 | 100 | 70 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |
| **3653444** | **251256** | 6,00 | 25,0 | 205 | 100 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |

*NOTA: el filo de corte de la plaquita para el sistema de ranurado frontal de WMT se coloca a +0,75 mm por encima del centro.*
*El sistema de ranurado frontal de WMT no está diseñado para cortar diámetros de menos de 12,6 mm.*
*Los portaherramientas que aceptan plaquitas con ancho de 3,0 mm poseen un amarre integral.*
*Los portaherramientas que aceptan plaquitas con ancho de 5,0 mm y 6,0 mm cuentan con un amarre desmontable.*




Herramienta a izquierdas




| Tipo lama | Forma de la pieza | | A izquierdas | A derechas |
|---|---|---|---|---|
| Curva de entrada | | | | |
| Curva de salida | | | | |

## Curva de entrada

| Número de pedido | Número de catálogo | W | CD | D max | D min | FS | H2 | H | B | L1 | L2 | amarre | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3634282** | **252209M** | 3,00 | 15,9 | 100 | 70 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | **–** | **MS326** |
| **3634284** | **252211M** | 3,00 | 19,1 | 205 | 100 | 23,5 | 32 | 24,8 | 24,8 | 150 | 37 | **–** | **MS326** |
| **3634286** | **252217M** | 5,00 | 19,1 | 100 | 70 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| **3634288** | **252219M** | 5,00 | 25,4 | 205 | 100 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| **3634290** | **252225M** | 6,00 | 19,1 | 100 | 70 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| **3634292** | **252227M** | 6,00 | 25,4 | 205 | 100 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446104** | **619168** |
| | **A izquierdas** | | | | | | | | | | | | |
| **3634283** | **252210M** | 3,00 | 15,9 | 100 | 70 | 23,5 | 32 | 24,8 | 24,8 | 150 | 34 | **–** | **MS326** |
| **3634285** | **252212M** | 3,00 | 19,1 | 205 | 100 | 23,5 | 32 | 24,8 | 24,8 | 150 | 37 | **–** | **MS326** |
| **3634287** | **252218M** | 5,00 | 19,1 | 100 | 70 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |
| **3634289** | **252220M** | 5,00 | 25,4 | 205 | 100 | 22,5 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |
| **3634291** | **252226M** | 6,00 | 19,1 | 100 | 70 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |
| **3634293** | **252228M** | 6,00 | 25,4 | 205 | 100 | 22,0 | 34 | 24,8 | 24,8 | 150 | 42 | **446103** | **619168** |

*NOTA: el filo de corte de la plaquita para el sistema de ranurado frontal de WMT se coloca a +0,75 mm por encima del centro.*
*El sistema de ranurado frontal de WMT no está diseñado para cortar diámetros de menos de 12,6 mm.*
*Los portaherramientas que aceptan plaquitas con ancho de 3,0 mm poseen un amarre integral.*
*Los portaherramientas que aceptan plaquitas con ancho de 5,0 mm y 6,0 mm cuentan con un amarre desmontable.*

# WIN WITH WIDIA™

WIDIA™

## Sistema **WMT**™

La línea WIDIA™ WMT es la opción económica y fiable para todas las aplicaciones de ranurado, tronzado, torneado y perfilado. Puede estar seguro de que el sistema WMT asegura un posicionamiento preciso de la plaquita y proporciona sólo el mecanizado más preciso con tiempos de ciclo excepcionalmente rápidos y un rendimiento superior.

### Portaherramientas WMT

- Garantiza unos tiempos de ciclo rápidos y posiciones limitadas de la torreta.
- Posicionamiento exacto de la plaquita para un mecanizado preciso.

### WMT SLS

- Una variedad de anchos de plaquita disponibles para cumplir sus necesidades específicas.
- Sistema de amarre dentado (“Serrated Locking System” o SLS) integral y modular que acepta plaquitas SX, SX Ultra y PT/PC.

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

WIDIA™
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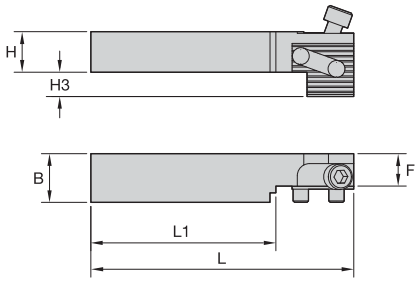


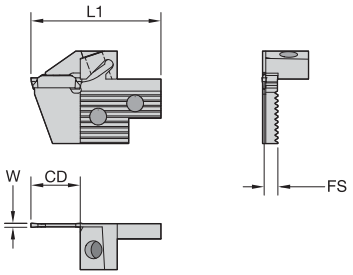
Herramienta a izquierdas

Conjunto a derechas



## Ranurado, tronzado y ranurado frontal

| Número de pedido | Número de catálogo | H | B | L | L1 | F | H3 | tornillo de cartucho | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | |
| **3653445** | **253201** | 16,0 | 20,0 | 101 | 70,4 | 14,8 | 9 | **606255** | **619168** |
| **3653447** | **253203** | 20,0 | 20,0 | 101 | 70,4 | 14,8 | 5 | **606255** | **619168** |
| **3653451** | **253207** | 25,0 | 25,0 | 126 | 95,4 | 19,8 | — | **619419** | **619168** |
| **3653449** | **253205** | 32,0 | 32,0 | 126 | 95,4 | 26,8 | — | **619419** | **619168** |
| | **A izquierdas** | | | | | | | | |
| **3653446** | **253202** | 16,0 | 20,0 | 101 | 70,4 | 14,8 | 9 | **606255** | **619168** |
| **3653448** | **253204** | 20,0 | 20,0 | 101 | 70,4 | 14,8 | 5 | **606255** | **619168** |
| **3653452** | **253208** | 25,0 | 25,0 | 126 | 95,4 | 19,8 | — | **619419** | **619168** |
| **3653450** | **253206** | 32,0 | 32,0 | 126 | 95,4 | 26,8 | — | **619419** | **619168** |



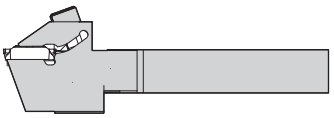

Herramienta a izquierdas

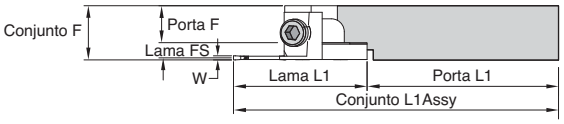
Conjunto a derechas

## Ranurado y tronzado

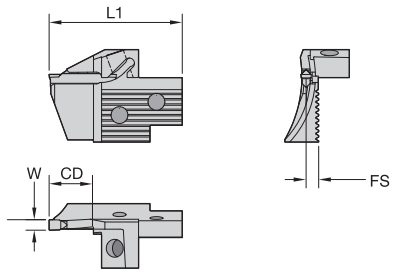
| Número de pedido | Número de catálogo | W | CD | L1 | FS |
|---|---|---|---|---|---|
| | **A derechas** | | | | |
| **3653461** | **348101** | 1,50 | 16,5 | 49,1 | 5,2 |
| **3653463** | **348103** | 2,00 | 16,5 | 49,1 | 5,0 |
| **3653465** | **348105** | 2,38 | 19,1 | 52,1 | 4,7 |
| **3653467** | **348107** | 3,00 | 22,2 | 54,6 | 4,4 |
| **3653469** | **348109** | 4,00 | 22,2 | 54,6 | 4,8 |
| **3653703** | **348111** | 4,76 | 25,4 | 57,1 | 4,3 |
| **3653705** | **348113** | 6,36 | 25,4 | 57,2 | 4,0 |
| | **A izquierdas** | | | | |
| **3653462** | **348102** | 1,50 | 16,5 | 49,1 | 5,2 |
| **3653464** | **348104** | 2,00 | 16,5 | 49,1 | 5,0 |
| **3653466** | **348106** | 2,38 | 19,1 | 52,1 | 4,7 |
| **3653468** | **348108** | 3,00 | 22,2 | 54,6 | 4,4 |
| **3653470** | **348110** | 4,00 | 22,2 | 54,6 | 4,8 |
| **3653704** | **348112** | 4,76 | 25,4 | 57,1 | 4,3 |
| **3653706** | **348114** | 6,36 | 25,4 | 57,2 | 4,0 |

*NOTA: los anchos de 4,0 mm, 5,0 mm y 6,0 mm no están recomendados para los portaherramientas con mango de 16,0 mm.*
*El ancho de 6,0 mm no está recomendado para los portaherramientas con mango de 20,0 mm.*

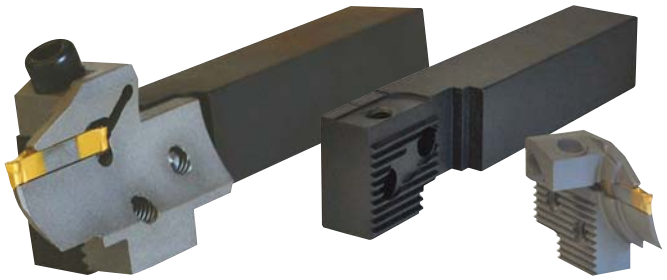





Conjunto L1 = L1 (porta) + L1 (lama)
Conjunto F = F (porta) + FS (lama) + W/2 - 0,787 mm




Herramienta a izquierdas



Conjunto a derechas



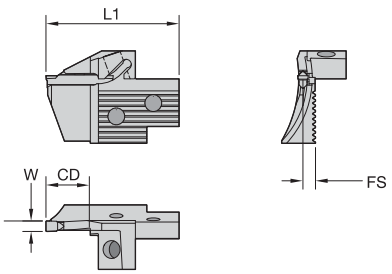
## Ranurado frontal • Curva de salida

| Número de pedido | Número de catálogo | W | D min | D max | CD | FS | L1 |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3653707** | **349101** | 3,0 | 38 | 51 | 12,7 | 4,4 | 50,3 |
| **3653708** | **349102** | 3,0 | 51 | 70 | 15,9 | 4,4 | 50,3 |
| **3653709** | **349103** | 3,0 | 70 | 102 | 15,9 | 4,4 | 50,3 |
| **3653710** | **349104** | 3,0 | 102 | 203 | 19,1 | 4,4 | 52,7 |
| **3653715** | **349109** | 4,0 | 38 | 51 | 12,7 | 4,8 | 50,3 |
| **3653716** | **349110** | 4,0 | 51 | 70 | 15,9 | 4,8 | 50,3 |
| **3653717** | **349111** | 4,0 | 70 | 102 | 15,9 | 4,8 | 50,3 |
| **3653718** | **349112** | 4,0 | 102 | 203 | 19,1 | 4,8 | 52,7 |
| **3653723** | **349117** | 5,0 | 38 | 51 | 15,9 | 4,3 | 52,7 |
| **3653724** | **349118** | 5,0 | 51 | 70 | 19,1 | 4,3 | 52,7 |
| **3653725** | **349119** | 5,0 | 70 | 102 | 19,1 | 4,3 | 56,6 |
| **3653726** | **349120** | 5,0 | 102 | 203 | 25,4 | 4,3 | 56,6 |
| **3653731** | **349125** | 6,0 | 30 | 51 | 15,9 | 5,6 | 52,7 |
| **3653732** | **349126** | 6,0 | 51 | 70 | 19,1 | 5,6 | 52,7 |
| **3653733** | **349127** | 6,0 | 70 | 102 | 19,1 | 5,6 | 56,6 |
| **3653734** | **349128** | 6,0 | 102 | 203 | 25,4 | 5,6 | 56,6 |

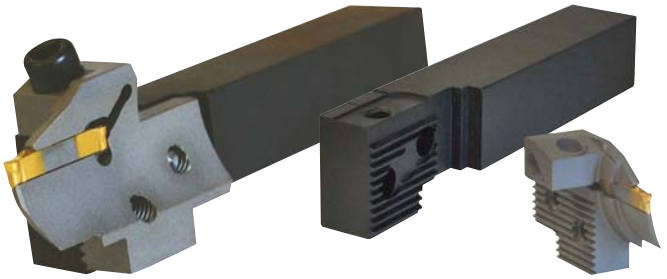
*NOTA: el ancho de 6,0 mm no está recomendado para los portaherramientas con mango de 20,0 mm. Consulte en la página D16 las herramientas con mango.*

*(continuación)*

*(continuación)*



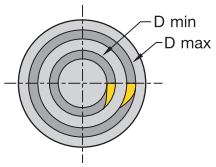

Herramienta a izquierdas



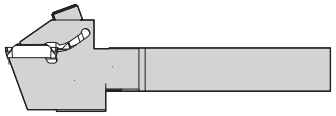
Conjunto a derechas

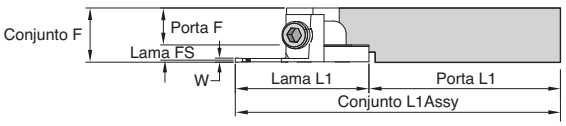
## Ranurado frontal • Curva de salida

| Número de pedido | Número de catálogo | W | D min | D max | CD | FS | L1 |
|---|---|---|---|---|---|---|---|
| | **A izquierdas** | | | | | | |
| **3653711** | **349105** | 3,0 | 38 | 51 | 12,7 | 4,4 | 50,3 |
| **3653712** | **349106** | 3,0 | 51 | 70 | 15,9 | 4,4 | 50,3 |
| **3653713** | **349107** | 3,0 | 70 | 102 | 15,9 | 4,4 | 50,3 |
| **3653714** | **349108** | 3,0 | 102 | 203 | 19,1 | 4,4 | 52,7 |
| **3653719** | **349113** | 4,0 | 38 | 51 | 12,7 | 4,8 | 50,3 |
| **3653720** | **349114** | 4,0 | 51 | 70 | 15,9 | 4,8 | 50,3 |
| **3653721** | **349115** | 4,0 | 70 | 102 | 15,9 | 4,8 | 50,3 |
| **3653722** | **349116** | 4,0 | 102 | 203 | 19,1 | 4,8 | 52,7 |
| **3653727** | **349121** | 5,0 | 38 | 51 | 15,9 | 4,3 | 52,7 |
| **3653728** | **349122** | 5,0 | 51 | 70 | 19,1 | 4,3 | 52,7 |
| **3653729** | **349123** | 5,0 | 70 | 102 | 19,1 | 4,3 | 56,6 |
| **3653730** | **349124** | 5,0 | 102 | 203 | 25,4 | 4,3 | 56,6 |
| **3653735** | **349129** | 6,0 | 30 | 51 | 15,9 | 5,6 | 52,7 |
| **3653736** | **349130** | 6,0 | 51 | 70 | 19,1 | 5,6 | 52,7 |
| **3653737** | **349131** | 6,0 | 70 | 102 | 19,1 | 5,6 | 56,6 |
| **3653738** | **349132** | 6,0 | 102 | 203 | 25,4 | 5,6 | 56,6 |

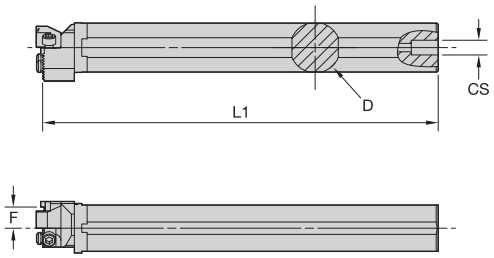



| Tipo lama | Forma de la pieza | A izquierdas | A derechas |
|---|---|---|---|
| Curva de entrada | | | |
| Curva de salida | | | |

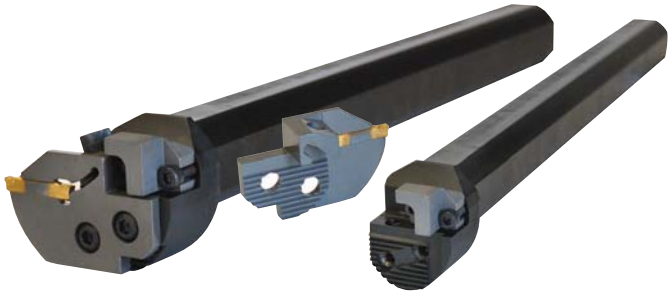





Conjunto L1 = L1 (porta) + L1 (lama)
Conjunto F = F (porta) + FS (lama) + W/2 - 0,787 mm




Herramienta a derechas



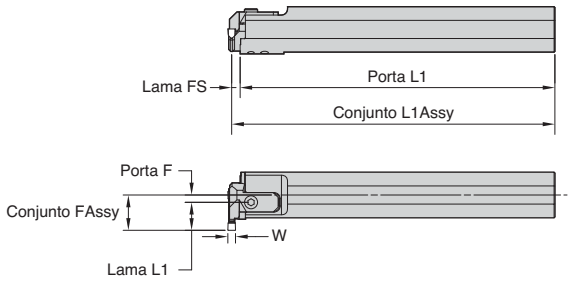
Conjunto a izquierdas



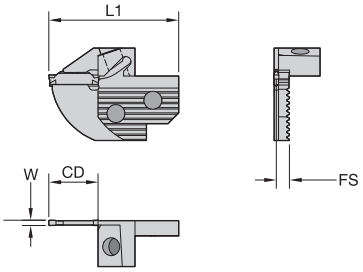
## Ranurado de diámetro interior

| Número de pedido | Número de catálogo | D | F | L1 | CS | tornillo de cartucho | manguito de refrigerante | tornillo de soporte de refrigerante | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | |
| **3653454** | **254202** | 25 | -16,0 | 194,0 | 1/4-18 NPT | **606256** | **614126** | **619151** | **619168** |
| **3653456** | **254204** | 32 | -16,0 | 244,0 | 1/4-18 NPT | **606256** | **614126** | **619151** | **619168** |
| **3653458** | **254206** | 40 | -16,0 | 294,0 | 1/4-18 NPT | **606256** | **614126** | **619151** | **619168** |
| **3653459** | **254207** | 50 | -13,0 | 298,9 | 1/4-18 NPT | **606256** | **614125** | **619151** | **619168** |
| **3653460** | **254208** | 50 | -13,0 | 298,9 | 1/4-18 NPT | **606256** | **614126** | **619151** | **619168** |
| | **A izquierdas** | | | | | | | | |
| **3653453** | **254201** | 25 | -16,0 | 194,0 | 1/4-18 NPT | **606256** | **614125** | **619151** | **619168** |
| **3653455** | **254203** | 32 | -16,0 | 244,0 | 1/4-18 NPT | **606256** | **614125** | **619151** | **619168** |
| **3653457** | **254205** | 40 | -16,0 | 294,0 | 1/4-18 NPT | **606256** | **614125** | **619151** | **619168** |

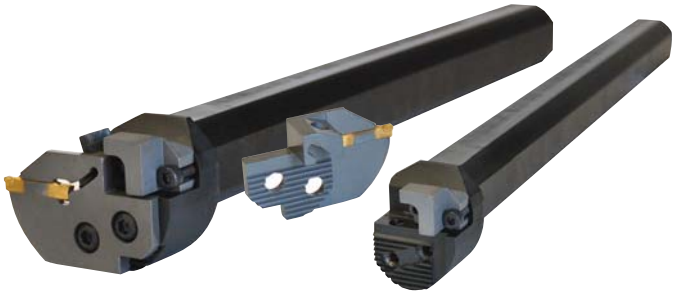
*NOTA: los portaherramientas a derechas emplean cartuchos a izquierdas.*




Conjunto L1 = L1 (porta) + FS (lama) + W/2 - 0,787 mm
Conjunto F = F (porta) + L1 (lama)



Herramienta a izquierdas


Conjunto a izquierdas

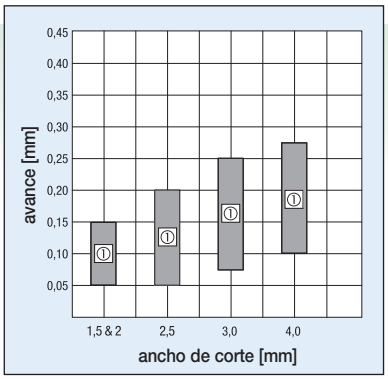
## Ranurado de diámetro interior

| Número de pedido | Número de catálogo | W | CD | FS | L1 |
|---|---|---|---|---|---|
| | **A derechas** | | | | |
| **3653739** | **350103** | 2,00 | 12,7 | 5,0 | 49,1 |
| **3653741** | **350105** | 2,50 | 15,9 | 4,7 | 52,1 |
| **3653743** | **350107** | 3,00 | 19,1 | 4,4 | 54,6 |
| **3653745** | **350109** | 4,00 | 19,1 | 4,8 | 54,6 |
| **3653747** | **350111** | 5,00 | 21,6 | 4,3 | 57,1 |
| **3653749** | **350113** | 6,00 | 21,6 | 4,0 | 57,2 |
| | **A izquierdas** | | | | |
| **3653740** | **350104** | 2,00 | 12,7 | 5,0 | 49,1 |
| **3653742** | **350106** | 2,50 | 15,9 | 4,7 | 52,1 |
| **3653744** | **350108** | 3,00 | 19,1 | 4,4 | 54,6 |
| **3653746** | **350110** | 4,00 | 19,1 | 4,8 | 54,6 |
| **3653748** | **350112** | 5,00 | 21,6 | 4,3 | 57,1 |
| **3653750** | **350114** | 6,00 | 21,6 | 4,0 | 57,2 |

*NOTA: los anchos de 5,0 mm y 6,0 mm no están recomendados para los portaherramientas con mango de 25,0 mm.*
*Los portaherramientas a derechas emplean cartuchos a izquierdas.*

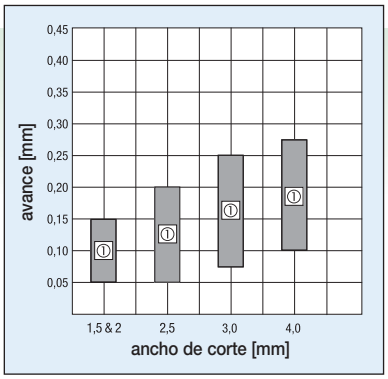
## Plaquitas de tronzar SX

- Planos “wiper” cuando el acabado superficial sea de gran importancia.
- Doble extremo con una parte superior e inferior en “V”, con sujeción mecánica.
- Ángulos de ataque neutral, a derechas e izquierdas de hasta 12˚.
- Diseñadas para aumentar la velocidad y el avance.
- La geometría para virutas está diseñada para un excelente control de virutas y una presión del corte minimizada sobre varios materiales.




① Avance recomendado

## Plaquitas de tronzar SX-Ultra

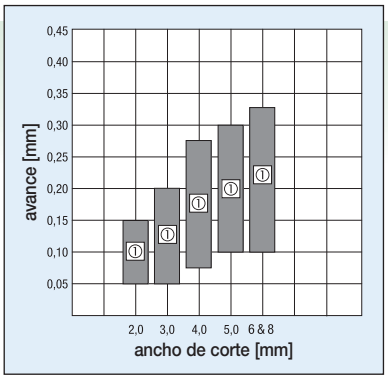



① Avance recomendado

- Doble extremo con una parte superior e inferior en “V”, con sujeción mecánica.
- Ángulos de ataque neutros, a derechas e izquierdas de hasta 12˚.
- Diseñadas para aumentar la velocidad y el avance.
- La geometría para virutas está diseñada para un excelente control de virutas y una presión del corte minimizada sobre varios materiales.
- Ideal para la serie 300 de acero inoxidable, acero para herramientas, titanio, INCONEL® y otras aleaciones con base de níquel a velocidades y avances moderados.

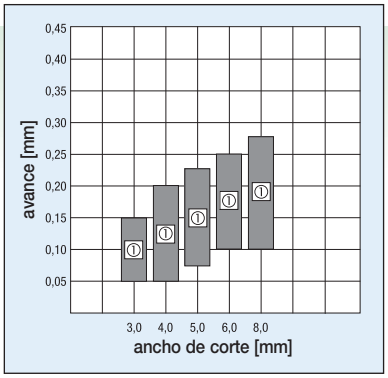
## Plaquitas para ranurado PT

- Herramienta de ranurado profundo y para operaciones de vaciado y torneado de diámetro exterior, así como también para ranurado frontal.
- Geometría de inclinación positiva para baja fuerza del corte, especialmente en materiales blandos.
- Corta en dirección axial y radial.
- Ofrece control de virutas en un rango completo de profundidad del corte durante el torneado.



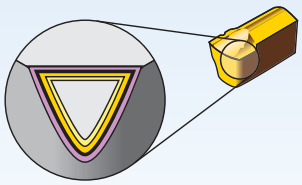

① Avance recomendado

## Plaquitas para ranurado PC y perfilado




① Avance recomendado

- Geometría de radio de nariz completo para operaciones de vaciado y contorneado.
- Geometría de filo del corte efectiva que excede los 180 grados para una mayor versatilidad.
- Superior control de virutas.



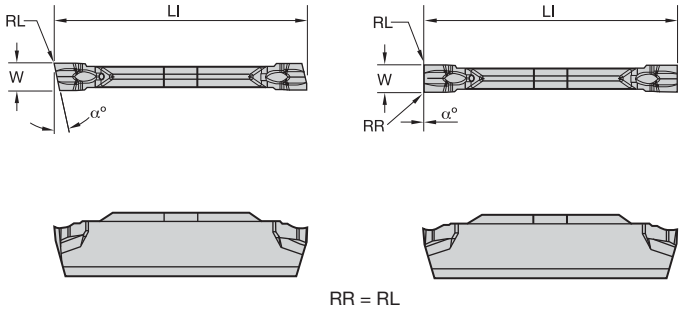
Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TN6016 | HC-P15 | Un recubrimiento PVD-TiAlN avanzado en un sustrato duro de metal duro y grano fino con mayor resistencia al calor. Recomendado para velocidades de corte medias y más altas en condiciones moderadas. | P | | | P | P | P | | | | |
| | | | M | | | M | M | M | | | | |
| | | | K | | | K | K | K | | | | |
| | | | N | | | N | N | N | | | | |
| | | | S | | | | S | S | | | | |
| | | | | | | | | | | | | |
| TN6026 | HC-M25 | Un recubrimiento de PVD-TiAlN avanzado en un sustrato de metal duro y de grano fino superior, excepcionales propiedades de temperatura con una resistencia excelente para evitar el recrecimiento de filos. Velocidades y avances medias y altas. Para aceros inoxidables y aleaciones a altas temperaturas. | | | | P | P | P | | | | |
| | | | | | | M | M | M | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | S | | | S | S | S | | | | |
| | | | H | | | | H | H | H | | | |
| TN6031 | HC-P30 | Un recubrimiento PVD-TiAlN avanzado en un sustrato duro de metal duro y grano fino resistente a los choques con mayor resistencia a la oxidación. Recomendada en velocidades de corte baja y media cuando sean necesarias buenas propiedades de dureza. | | | | | P | P | P | | |
| | | | | | | | M | M | M | | |
| | | | K | | | | K | K | K | | |
| | | | N | | | | N | N | N | | |
| | | | S | | | | S | S | S | | |
| | | | H | | | | H | H | H | | |

| ANSI ISO 513 | VDI 3323 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| P | 1 | 170 | **200** | 230 | 140 | **170** | 195 | 130 | **150** | 175 |
| | 2 | 170 | **200** | 230 | 140 | **170** | 195 | 130 | **150** | 175 |
| | 3 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 4 | 150 | **185** | 215 | 130 | **155** | 180 | 115 | **140** | 165 |
| | 5 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 6 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 7 | 165 | **195** | 225 | 140 | **165** | 190 | 125 | **150** | 175 |
| | 8 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 9 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 10 | 145 | **175** | 205 | 125 | **150** | 175 | 110 | **135** | 155 |
| | 11 | 120 | **150** | 185 | 105 | **130** | 155 | 95 | **115** | 140 |
| | 12 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 13.1 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 13.2 | 120 | **150** | 185 | 105 | **130** | 155 | 95 | **115** | 140 |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| M | 14.1 | 105 | **135** | 170 | 90 | **115** | 140 | 80 | **105** | 130 |
| | 14.2 | 85 | **115** | 145 | 75 | **100** | 125 | 65 | **90** | 110 |
| | 14.3 | 70 | **100** | 130 | 60 | **85** | 110 | 50 | **75** | 100 |
| | 14.4 | 55 | **85** | 115 | 45 | **70** | 95 | 40 | **65** | 85 |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| K | 15 | 185 | **215** | 245 | 155 | **180** | 205 | 140 | **165** | 185 |
| | 16 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | 17 | 150 | **185** | 215 | 130 | **155** | 180 | 115 | **140** | 165 |
| | 18 | 145 | **175** | 205 | 125 | **150** | 175 | 110 | **135** | 155 |
| | 19 | 200 | **230** | 260 | 170 | **195** | 220 | 150 | **175** | 200 |
| | 20 | 135 | **170** | 200 | 115 | **140** | 170 | 105 | **130** | 150 |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| N | 21 | 305 | **335** | 365 | 260 | **285** | 310 | | | |
| | 22 | 245 | **275** | 305 | 205 | **235** | 260 | | | |
| | 23 | 305 | **335** | 365 | 260 | **285** | 310 | | | |
| | 24 | 245 | **275** | 305 | 205 | **235** | 260 | | | |
| | 25 | 215 | **245** | 275 | 180 | **205** | 235 | | | |
| | 26 | 150 | **185** | 215 | 130 | **155** | 180 | | | |
| | 27 | 150 | **185** | 215 | 130 | **155** | 180 | | | |
| | 28 | 150 | **185** | 215 | 130 | **155** | 180 | | | |
| | 29 | 135 | **170** | 200 | 115 | **140** | 170 | | | |
| | 30 | 135 | **170** | 200 | 115 | **140** | 170 | | | |
| | | TN6016 (M93) | | | TN6031 (M43) | | | TN6026 (M433B) | | |
| S | 31 | 50 | **80** | 115 | 45 | **70** | 95 | 35 | **60** | 80 |
| | 32 | 35 | **65** | 100 | 30 | **55** | 85 | 25 | **50** | 70 |
| | 33 | 40 | **70** | 100 | 30 | **60** | 85 | 30 | **50** | 70 |
| | 34 | 30 | **60** | 90 | 25 | **50** | 80 | 20 | **45** | 65 |
| | 35 | 35 | **65** | 95 | 30 | **55** | 80 | 25 | **45** | 70 |
| | 36 | 65 | **100** | 130 | 55 | **85** | 110 | 50 | **70** | 90 |
| | 37 | 40 | **70** | 100 | 30 | **60** | 85 | 30 | **50** | 70 |




RR = RL

● primera elección
○ elección alternativa

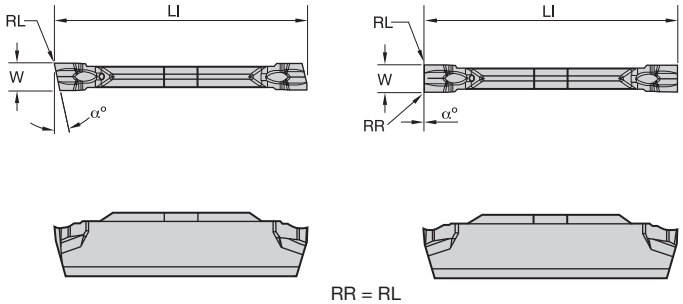
| | | | | | |
|---|---|---|---|---|---|
| P | | ○ | ● | ● |
| M | | ○ | ● | ● |
| K | | ● | ○ | ● |
| N | | ● | | ○ |
| S | | | ● | ○ |
| H | | | | ○ |

## WMT-SX

| Número de catálogo | W | LI | RR | α° | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|---|
| **583160** | 1,50 | 19,31 | 0,08 | — | N - Neutro | | | ● |
| **583125** | 2,00 | 19,21 | 0,08 | — | N - Neutro | ● | | ● |
| **583135** | 3,00 | 25,38 | 0,17 | — | N - Neutro | ● | | ● |
| **583175** | 4,00 | 25,40 | 0,17 | — | N - Neutro | ● | | ● |

| Número de catálogo | W | LI | RR | α° | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|---|
| **583162** | 1,50 | 19,31 | 0,08 | 5 | L - Izquierda | | | ● |
| **583164** | 1,50 | 19,35 | 0,08 | 12 | L - Izquierda | | | ● |
| **583127** | 2,00 | 19,26 | 0,08 | 5 | L - Izquierda | ● | | ● |
| **583129** | 2,00 | 19,28 | 0,08 | 12 | L - Izquierda | | | ● |
| **583137** | 3,00 | 25,35 | 0,17 | 5 | L - Izquierda | ● | | ● |
| **583139** | 3,00 | 25,40 | 0,17 | 12 | L - Izquierda | | | ● |
| **583177** | 4,00 | 25,44 | 0,17 | 5 | L - Izquierda | ● | | ● |
| **583179** | 4,00 | 25,45 | 0,17 | 12 | L - Izquierda | | | ● |

| Número de catálogo | W | LI | RL | α° | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|---|
| **583161** | 1,50 | 19,31 | 0,08 | 5 | R - Derecha | | | ● |
| **583163** | 1,50 | 19,35 | 0,08 | 12 | R - Derecha | | | ● |
| **583126** | 2,00 | 19,26 | 0,08 | 5 | R - Derecha | ● | | ● |
| **583128** | 2,00 | 19,28 | 0,08 | 12 | R - Derecha | | | ● |
| **583136** | 3,00 | 25,35 | 0,17 | 5 | R - Derecha | ● | | ● |
| **583138** | 3,00 | 25,40 | 0,17 | 12 | R - Derecha | | | ● |
| **583176** | 4,00 | 25,44 | 0,17 | 5 | R - Derecha | ● | | ● |
| **583178** | 4,00 | 25,45 | 0,17 | 12 | R - Derecha | | | ● |




● primera elección
○ elección alternativa

| | | | |
|---|---|---|---|
| P | ○ | ● | ● |
| M | ○ | ● | ● |
| K | ● | ○ | ● |
| N | ● | | ○ |
| S | | ● | ○ |
| H | | | ○ |

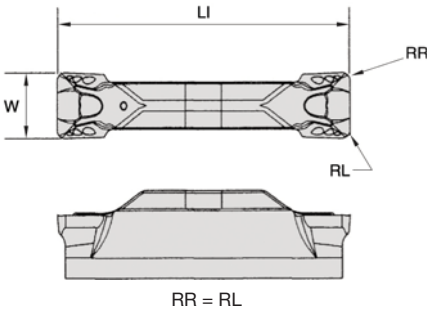


## WMT-SX-Ultra

| Número de catálogo | W | RR | LI | α° | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|---|
| **583165** | 1,50 | 0,08 | 19,31 | — | N - Neutro | | ● | |
| **583170** | 2,00 | 0,08 | 19,21 | — | N - Neutro | | ● | |
| **583155** | 3,00 | 0,17 | 25,38 | — | N - Neutro | | ● | |
| **583180** | 4,00 | 0,17 | 25,35 | — | N - Neutro | | ● | |

| Número de catálogo | W | RR | LI | α° | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|---|
| **583167** | 1,50 | 0,08 | 19,31 | 5 | L - Izquierda | | ● | |
| **583169** | 1,50 | 0,08 | 19,35 | 12 | L - Izquierda | | ● | |
| **583172** | 2,00 | 0,08 | 19,26 | 5 | L - Izquierda | | ● | |
| **583174** | 2,00 | 0,08 | 19,26 | 12 | L - Izquierda | | ● | |
| **583157** | 3,00 | 0,17 | 25,35 | 5 | L - Izquierda | | ● | |
| **583159** | 3,00 | 0,17 | 25,40 | 12 | L - Izquierda | | ● | |
| **583182** | 4,00 | 0,17 | 25,43 | 5 | L - Izquierda | | ● | |
| **583184** | 4,00 | 0,17 | 25,43 | 12 | L - Izquierda | | ● | |

| Número de catálogo | W | RL | LI | α° | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|---|
| **583166** | 1,50 | 0,08 | 19,31 | 5 | R - Derecha | | ● | |
| **583168** | 1,50 | 0,08 | 19,35 | 12 | R - Derecha | | ● | |
| **583171** | 2,00 | 0,08 | 19,26 | 5 | R - Derecha | | ● | |
| **583173** | 2,00 | 0,08 | 19,26 | 12 | R - Derecha | | ● | |
| **583156** | 3,00 | 0,17 | 25,35 | 5 | R - Derecha | | ● | |
| **583158** | 3,00 | 0,17 | 25,40 | 12 | R - Derecha | | ● | |
| **583181** | 4,00 | 0,17 | 25,43 | 5 | R - Derecha | | ● | |
| **583183** | 4,00 | 0,17 | 25,43 | 12 | R - Derecha | | ● | |




RR = RL

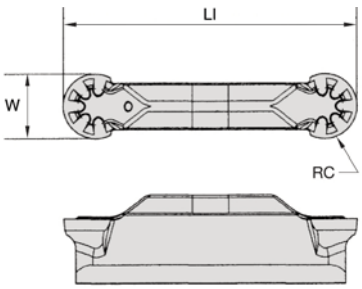
● primera elección
○ elección alternativa

| | | | |
|---|---|---|---|
| P | ○ | ● | ● |
| M | ○ | ● | ● |
| K | ● | ○ | ● |
| N | ● | | ○ |
| S | | ● | ○ |
| H | | | ○ |

## ■ WMT-PT

| Número de catálogo | W | RR | LI | mano | TN6016 | TN6026 | TN6031 |
|---|---|---|---|---|---|---|---|
| **582131** | 2,00 | 0,15 | 19,10 | N - Neutro | ● | | ● |
| **582129** | 2,00 | 0,15 | 19,10 | N - Neutro | ● | | ● |
| **582130** | 2,00 | 0,31 | 19,10 | N - Neutro | ● | | ● |
| **582113** | 3,00 | 0,31 | 25,40 | N - Neutro | ● | | ● |
| **582114** | 3,00 | 0,61 | 25,40 | N - Neutro | ● | | ● |
| **582115** | 4,00 | 0,31 | 25,40 | N - Neutro | ● | | ● |
| **582116** | 4,00 | 0,61 | 25,40 | N - Neutro | ● | | ● |
| **582117** | 5,00 | 0,31 | 28,63 | N - Neutro | ● | | ● |
| **582118** | 5,00 | 0,61 | 28,63 | N - Neutro | ● | | ● |
| **582119** | 6,00 | 0,31 | 28,63 | N - Neutro | ● | | ● |
| **582120** | 6,00 | 0,61 | 28,63 | N - Neutro | ● | | ● |
| **582122** | 8,00 | 0,61 | 28,58 | N - Neutro | ● | | ● |
| **582149** | 8,00 | 1,50 | 28,58 | N - Neutro | ● | | ● |

*NOTA: 582131 es exclusivamente para aplicaciones de diámetro interior.*




## ■ WMT-PC

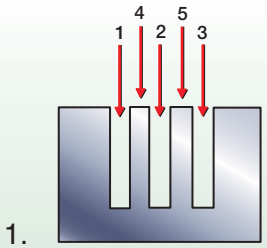
| Número de catálogo | W | RC | LI | | | |
|---|---|---|---|---|---|---|
| **581107** | 3,00 | 1,50 | 25,40 | ● | | ● |
| **581108** | 4,00 | 2,00 | 25,45 | ● | | ● |
| **581109** | 5,00 | 2,50 | 28,88 | ● | | ● |
| **581110** | 6,00 | 3,00 | 28,65 | ● | | ● |
| **581111** | 8,00 | 4,00 | 29,08 | ● | | ● |

## Solución de problemas

**Cuando el ancho de la ranura sea mayor que el de la plaquita, existen dos posibles métodos:**

**1 Ranurado de varios pasos**

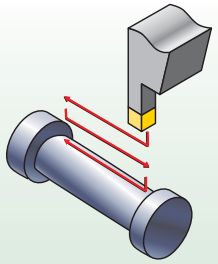
Utilice el mayor ancho de plaquita que sea posible para conseguir que el control de virutas y la vida de la herramienta sean excelentes. Haga primero las ranuras 1, 2 y 3; luego, conecte con los pasos 4 y 5. Para los pasos 4 y 5, el material evacuado no debe ser superior a 0,8 veces el ancho de la plaquita.



1.

**2 Ranurado y torneado**

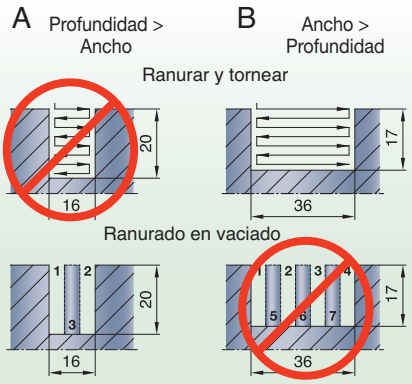
Para piezas de trabajo pequeñas e inestables, este es el mejor método para reducir vibraciones experimentadas durante el ranurado axial. La profundidad de corte en el torneado longitudinal debe ser por lo general el 60–70% del ancho de la ranura. Un torneado en ambas direcciones mejora la vida de la herramienta.


2.

**Elección del mejor método:**

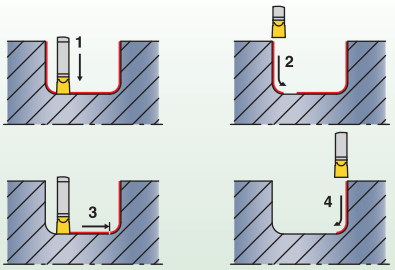
**A** Cuando la profundidad de la ranura es mayor que el ancho de la ranura, un vaciado en varios pasos ofrece los mejores resultados.

**B** Cuando el ancho de la ranura es mayor que la profundidad, es más fácil y rápido ranurar y tornear (vaciado/torneado longitudinal).




**Perfilado de acabado**

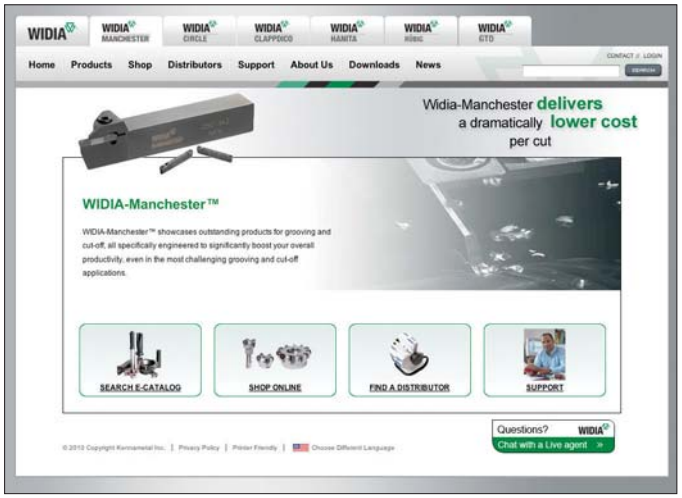
Durante el perfilado de acabado de radios o biseles internos, tenga en cuenta que la tasa de avance efectivo y la sección transversal de virutas se reducen (la herramienta corta tanto en dirección radial como axial). El dibujo de la derecha muestra la secuencia del proceso sugerido para que el paso final reduzca las vibraciones.




**Líneas generales de aplicación de herramientas de ranurado WMT**

- Emplee siempre buenas prácticas de mecanizado generales.
- Haga que la configuración de la pieza de trabajo y la máquina sea lo más rígida posible.
- Los portaherramientas de mango integral ofrecen la mejor rigidez. Deberían ser su primera opción de portaherramientas en la medida de lo posible.
- Durante el cambio de plaquitas, asegúrese de ajustar la nueva plaquita de forma segura con la parada positiva del portaherramientas.
- Nunca apriete el tornillo de amarre sin una plaquita en el bolsillo.
- Toda parte del portaherramientas que sobresalga del bloque de la herramienta debe ser lo más corta posible.
- Las plaquitas deben cortar lo más cerca del centro que sea posible, o ligeramente por encima.
- El tiempo de permanencia en la base de la ranura debe ser inferior a tres revoluciones.
- Las velocidades y avances de corte recomendadas son un punto de inicio. Ajuste según sea necesario para una vida de la herramienta y un control de virutas excelentes.

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

## *Productos WIDIA*

Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.

# WIDIA™ TopGroove™

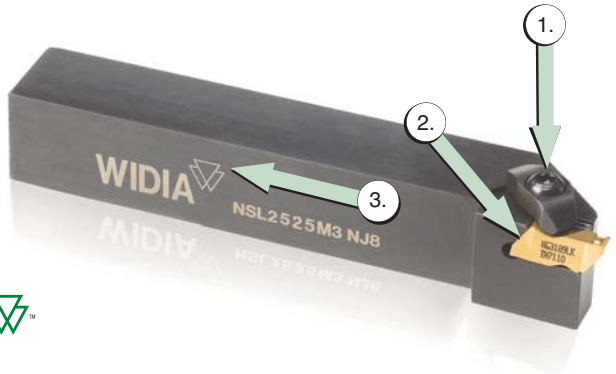
WIDIA ha establecido el estándar industrial de productividad de roscado y ranurado con el diseño de fijación TopGroove. El rendimiento demostrado de este sistema ha aumentado con la añadido de las nuevas geometrías de plaquita y la expansión a nuestro catálogo de calidades de metal duro.

Permítanos ayudarle a seleccionar la plaquita correcta para sus necesidades de aplicación o a actualizar su inventario de herramientas TopGroove actual con la inclusión de geometrías de control de virutas y las calidades de alta productividad disponibles en WIDIA.

## Rigidez, versatilidad y control de virutas

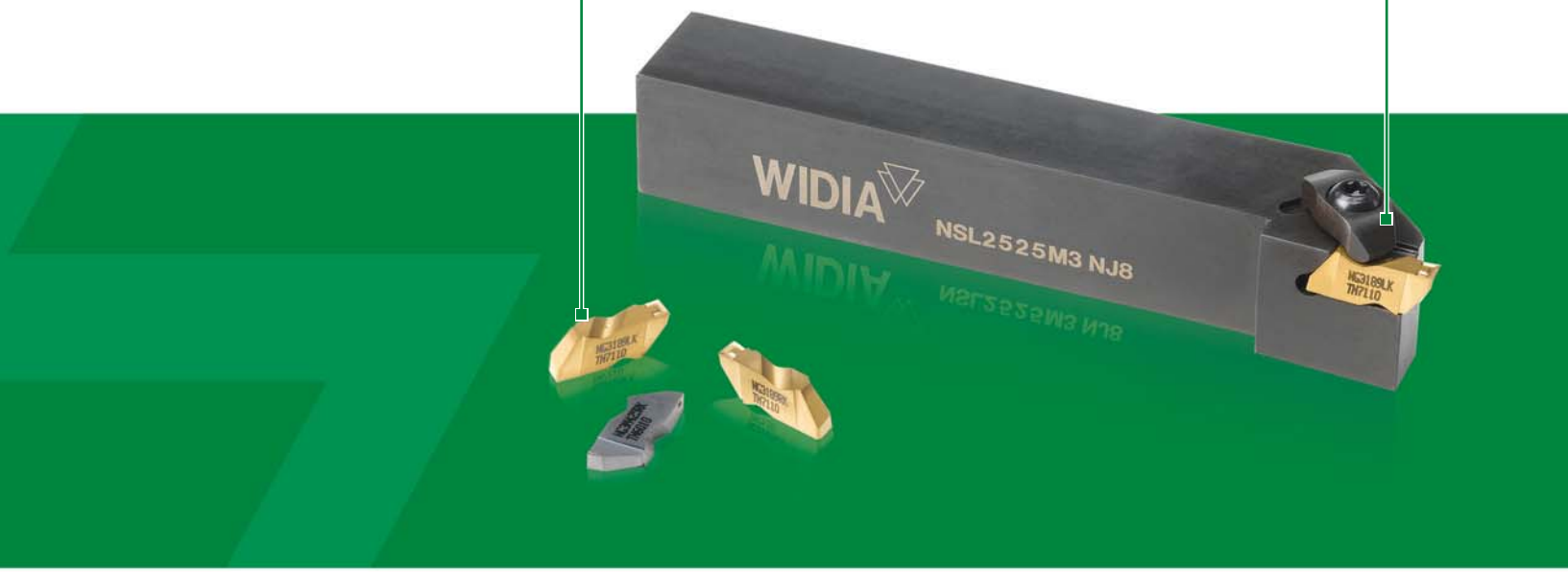
- El diseño de fijación de TopGroove cuenta con una fijación de puente resistente, ubicada en una ranura moldeada en la plaquita para proporcionar una resistencia superior a la de las fuerzas de corte radial y lateral.
- Las plaquitas TopGroove están disponibles para ranurado poco profundo, ranurado profundo, torneado ligero, perfilado, ranurado frontal profundo y poco profundo, torneado en retroceso, entallado y ranurado Poly-Vee.
- El diseño de control de virutas patentado de WIDIA funciona tanto en aplicaciones de torneado multidireccional como de avance radial, proporcionando una excelente evacuación de virutas en las aplicaciones de ranurado profundo.

*Una fijación rígida genera fuerzas de bloqueo en tres direcciones para mantener a las plaquitas en su sitio durante los cortes más duros.*



Las plaquitas TopGroove emplean una geometría exclusiva de control de desprendimiento de virutas superior que evacua de forma eficiente las virutas y produce piezas de mejor calidad más rápidamente.

El sistema de fijación TopGroove™ de WIDIA™ ofrece una línea de fijación de geometrías de ranurado y una amplia selección de calidades.




## Calidades de metal duro y soluciones demostradas para una alta productividad

- El sistema TopGroove cuenta con una calidad de metal duro que satisface las necesidades de su aplicación, que abarca calidades sin recubrir, calidades con recubrimiento de PVD, con recubrimiento de CVD y calidades de materiales avanzados, incluyendo cermets, cerámicas, PCBN y PCD.
- Nuevas calidades con recubrimiento de PVD TiAlN mejoradas y diseñadas para cortar distintos tipos de los materiales de las piezas de trabajo.
- Nueva calidad CVD TN7110.
- Un diseño versátil que permite a un único sistema manejar las operaciones de ranurado de diámetro exterior e interior, ranurado frontal, torneado en retroceso, entallado e incluso roscado.

## Las soluciones de torneado más avanzadas del sector

El sistema de fijación TopGroove de WIDIA™, perfecto para operaciones de ranurado poco profundo, ofrece una completa línea de geometrías de ranurado y una amplia selección de calidades que cumplen incluso los requisitos de aplicación más exigentes. El sistema de fijación TopGroove es la solución demostrada para una mayor rigidez, versatilidad, control de virutas y distintas opciones de calidad de metal duro.

Las plaquitas TopGroove emplean una geometría exclusiva de control de desprendimiento de virutas que evacua de forma eficiente las virutas y produce piezas de mejor calidad más rápidamente que nunca.

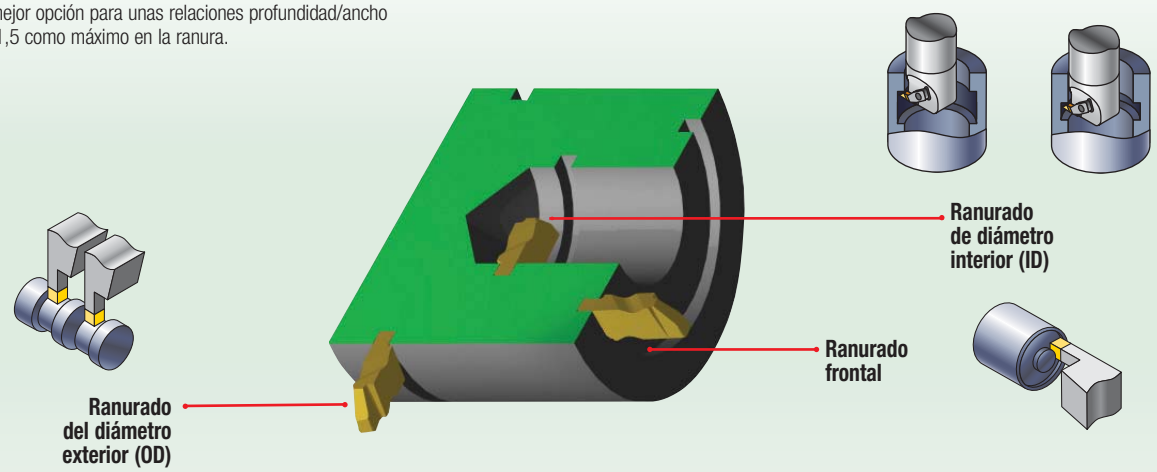
Utilice esta completa guía de fácil uso para obtener la información necesaria para identificar, elegir y seleccionar las herramientas de corte adecuadas para sus necesidades específicas.

**Le interesa saber:**

- Profundidad, ancho y perfil de la ranura.
- El material que se va a mecanizar.
- La aplicación que se llevará a cabo (ranurado frontal, de diámetro exterior o de diámetro interior).
- Los requisitos del portaherramientas (p. ej., KM™, Erickson™, mango cuadrado, derecha/izquierda).

**1 Elija la aplicación que se llevará a cabo:**

Profundidad, ancho y perfil de la ranura. TopGroove es la mejor opción para unas relaciones profundidad/ancho de 1,5 como máximo en la ranura.




*Para un ranurado profundo, utilice WMT™ en la página D4.*

### TopGroove™ para aplicaciones de ranurado interior, exterior y frontal

| Capacidades del sistema | | | mínimo | máximo |
|---|---|---|---|---|
| | Ranurado de diámetro exterior/interior | ancho | 0,79 mm | 9,53 mm |
| | | profundidad | — | 12,7 mm |
| | Ranurado frontal | ancho | 2,00 mm | 6,35 mm |
| | | profundidad | — | 12,7 mm |
| | Ranurado interior | diámetro | 11,2 mm | — |
| | Diámetro de la ranura frontal | estándar | 23,9 mm | — |
| | | profundo | — | — |
| | Ranurado profundo de diámetro exterior/interior | ancho | 1,57 mm | 6,35 mm |
| | | profundidad | — | 12,7 mm |
| | Ranurado frontal profundo | ancho | 3,18 mm | 6,35 mm |
| | | profundidad | — | 12,7 mm |

**2 Identifique el material que se va a mecanizar:**

cada herramienta tiene una marca de una letra que indica los materiales que se pueden mecanizar.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

**3 Seleccione un portaherramientas en función de la aplicación:**

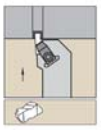
A Elija el calibre de plaquita (ancho) apropiado que necesita la aplicación.

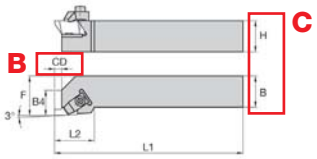
B Elija la dimensión de profundidad de corte "CD" más corta para una mayor rigidez de la herramienta.

C Seleccione las dimensiones de mango de portaherramientas "H" y "B" más grandes para la máxima rigidez.

**TopGroove™**
Toolholders

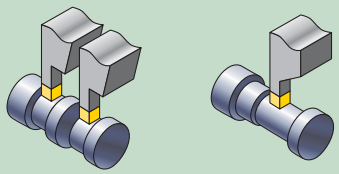
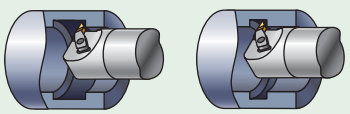
WIDIA MANCHESTER






■ NS

| order number | catalogue number | C H | C B | F | L1 | L2 | B4 | B CD | A gage insert | clamp | clamp screw | hex/ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right hand | | | | | | | | | | | |
| 3641682 | NSR1010E2 | 10,0 | 10,0 | 14,0 | 70 | 19 | 9 | 3,5 | N.2R | CM74 | MS1200 | T10 |
| 3641660 | NSR1212F2 | 12,0 | 12,0 | 16,0 | 80 | 19 | 9 | 3,5 | N.2R | CM74 | MS1200 | T10 |
| 3636542 | NSR1616H2 | 16,0 | 16,0 | 20,0 | 100 | 19 | 9 | 3,5 | N.2R | CM74 | MS1200 | T10 |
| 3638589 | NSR2020K2 | 20,0 | 20,0 | 25,0 | 125 | 19 | 9 | 3,5 | N.2R | CM74 | MS1200 | T10 |
| 3638590 | NSR2525M2 | 25,0 | 25,0 | 32,0 | 150 | 19 | 9 | 3,5 | N.2R | CM74 | MS1200 | T10 |
| 3638588 | NSR2020K3 | 20,0 | 20,0 | 25,0 | 125 | 32 | 13 | 5,3 | N.3R | CM72LP | MS2111 | 25 IP |
| 3636536 | NSR2525M3 | 25,0 | 25,0 | 32,0 | 150 | 32 | 13 | 5,3 | N.3R | CM72LP | MS2111 | 25 IP |
| 3641664 | NSR3225P3 | 32,0 | 25,0 | 32,0 | 170 | 32 | 13 | 5,3 | N.3R | CM72LP | MS2111 | 25 IP |
| 3641666 | NSR3232P3 | 32,0 | 32,0 | 40,0 | 170 | 32 | 13 | 5,3 | N.3R | CM72LP | MS2111 | 25 IP |
| 3636540 | NSR2525M4 | 25,0 | 25,0 | 32,0 | 150 | 35 | 14 | 7,5 | N.4R | CM72LP | MS2111 | 25 IP |
| 3641675 | NSR3225P4 | 32,0 | 25,0 | 32,0 | 170 | 35 | 14 | 7,5 | N.4R | CM72LP | MS2111 | 25 IP |
| 3641669 | NSR3232P4 | 32,0 | 32,0 | 40,0 | 170 | 35 | 14 | 7,5 | N.4R | CM72LP | MS2111 | 25 IP |
| 3641673 | NSR3232P5 | 32,0 | 32,0 | 40,0 | 170 | 51 | 16 | 10,5 | N.5R | CM80 | MS352 | 6mm |
| | Left hand | | | | | | | | | | | |
| 3641683 | NSL1010E2 | 10,0 | 10,0 | 14,0 | 70 | 19 | 9 | 3,5 | N.2L | CM75 | MS1200 | T10 |
| 3641681 | NSL1212F2 | 12,0 | 12,0 | 16,0 | 80 | 19 | 9 | 3,5 | N.2L | CM75 | MS1200 | T10 |
| 3636545 | NSL1616H2 | 16,0 | 16,0 | 20,0 | 100 | 19 | 9 | 3,5 | N.2L | CM75 | MS1200 | T10 |
| 3639045 | NSL2020K2 | 20,0 | 20,0 | 25,0 | 125 | 19 | 9 | 3,5 | N.2L | CM75 | MS1200 | T10 |
| 3639047 | NSL2525M2 | 25,0 | 25,0 | 32,0 | 150 | 19 | 9 | 3,5 | N.2L | CM75 | MS1200 | T10 |
| 3639046 | NSL2020K3 | 20,0 | 20,0 | 32,0 | 125 | 32 | 13 | 5,3 | N.3L | CM73LP | MS2111 | 25 IP |
| 3636539 | NSL2525M3 | 25,0 | 25,0 | 32,0 | 150 | 32 | 13 | 5,3 | N.3L | CM73LP | MS2111 | 25 IP |
| 3641670 | NSL3225P3 | 32,0 | 25,0 | 32,0 | 170 | 32 | 13 | 5,3 | N.3L | CM73LP | MS2111 | 25 IP |
| 3641671 | NSL3232P3 | 32,0 | 32,0 | 40,0 | 170 | 32 | 13 | 5,3 | N.3L | CM73LP | MS2111 | 25 IP |
| 3636544 | NSL2525M4 | 25,0 | 25,0 | 32,0 | 150 | 35 | 14 | 7,5 | N.4L | CM73LP | MS2111 | 25 IP |
| 3641678 | NSL3225P4 | 32,0 | 25,0 | 32,0 | 170 | 35 | 14 | 7,5 | N.4L | CM73LP | MS2111 | 25 IP |

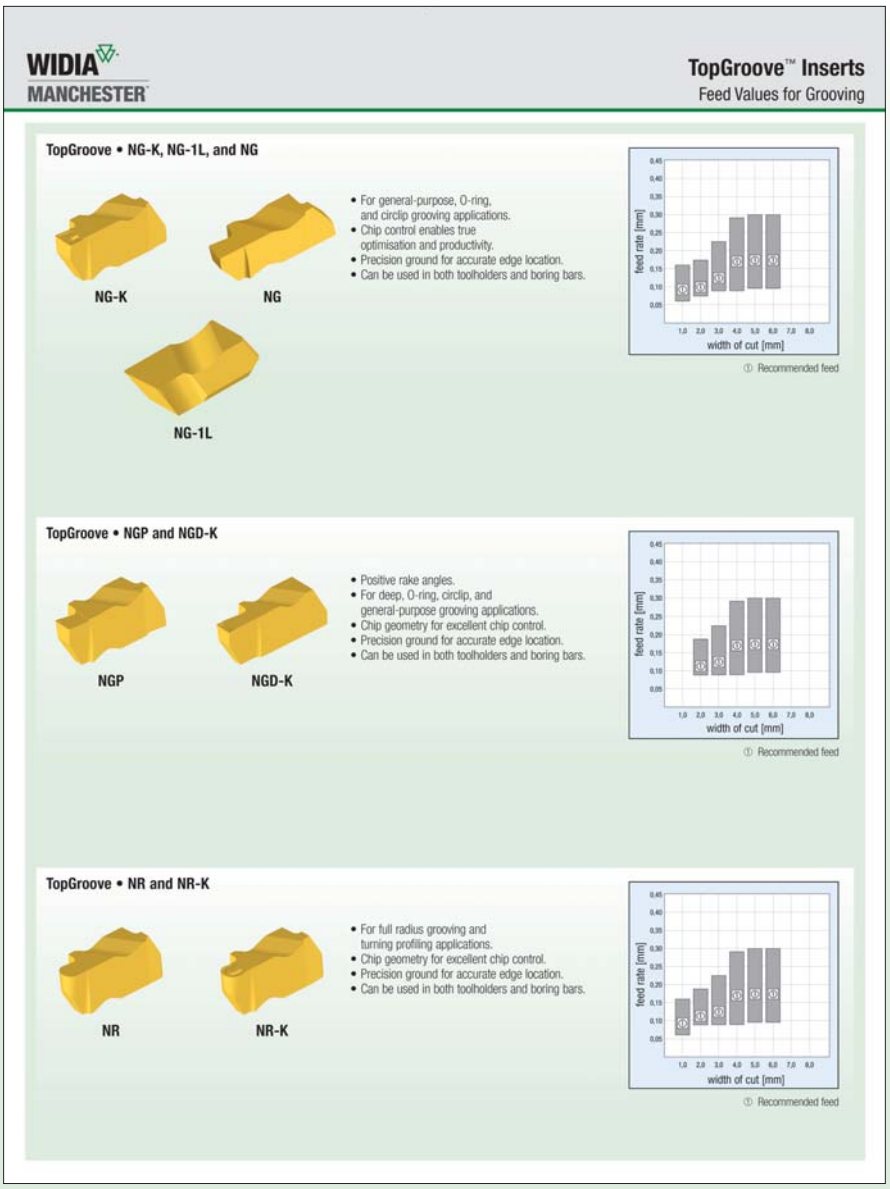
| | aplicación | portaherramientas convencionales | hojas modulares |
|---|---|---|---|
|  | Ranurado de diámetro exterior y vaciado y torneado | página D38 | — |
|  | Ranurado de diámetro interior | página D41 | — |

**4 Seleccione el rompevirutas para la aplicación:**

consulte una guía de aplicaciones en la página D42 para obtener una lista completa de los tipos de plaquita.

*NOTA: la tabla muestra las tasas de avance iniciales recomendadas.*

*Consulte la página D43.*



WIDIA MANCHESTER

**TopGroove™ Inserts**
Feed Values for Grooving

**TopGroove • NG-K, NG-1L, and NG**

NG-K

NG

NG-1L

- For general-purpose, O-ring, and circlip grooving applications.
- Chip control enables true optimisation and productivity.
- Precision ground for accurate edge location.
- Can be used in both toolholders and boring bars.



**TopGroove • NGP and NGD-K**

NGP

NGD-K

- Positive rake angles.
- For deep, O-ring, circlip, and general-purpose grooving applications.
- Chip geometry for excellent chip control.
- Precision ground for accurate edge location.
- Can be used in both toolholders and boring bars.



**TopGroove • NR and NR-K**

NR

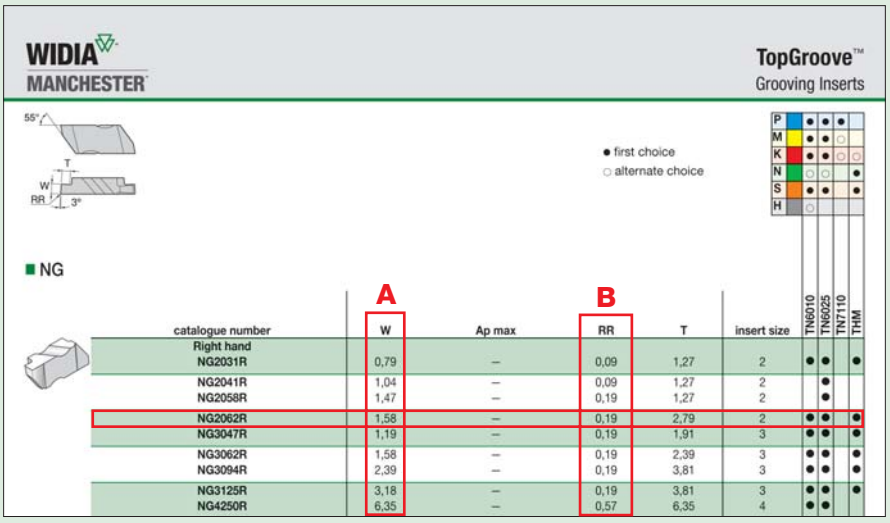
NR-K

- For full radius grooving and turning profiling applications.
- Chip geometry for excellent chip control.
- Precision ground for accurate edge location.
- Can be used in both toolholders and boring bars.



**A** Elija el ancho de plaquita "W" apropiado para su aplicación específica.

**B** Seleccione el valor necesario "RR" del radio de esquina.



WIDIA MANCHESTER

**TopGroove™**
Grooving Inserts



● first choice
○ alternate choice

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P | ● | ● | ● | | | | | | |
| M | ● | ● | ○ | | | | | | |
| K | ● | ● | ○ | ○ | | | | | |
| N | ○ | ○ | | ● | | | | | |
| S | ● | ● | | ● | | | | | |
| H | ○ | | | | | | | | |

■ NG

| catalogue number | A W | Ap max | B RR | T | insert size | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| Right hand | | | | | | | | | |
| NG2031R | 0,79 | – | 0,09 | 1,27 | 2 | ● | ● | | ● |
| NG2041R | 1,04 | – | 0,09 | 1,27 | 2 | | ● | | |
| NG2058R | 1,47 | – | 0,19 | 1,27 | 2 | | ● | | |
| NG2062R | 1,58 | – | 0,19 | 2,79 | 2 | ● | ● | | ● |
| NG3047R | 1,19 | – | 0,19 | 1,91 | 3 | ● | ● | | ● |
| NG3062R | 1,58 | – | 0,19 | 2,39 | 3 | ● | ● | | ● |
| NG3094R | 2,39 | – | 0,19 | 3,81 | 3 | ● | ● | | ● |
| NG3125R | 3,18 | – | 0,19 | 3,81 | 3 | ● | ● | | ● |
| NG4250R | 6,35 | – | 0,57 | 6,35 | 4 | ● | ● | | |

5 Seleccione la calidad:

| condición de corte | | Calidades recomendadas: acero | acero inoxidable | fundición | metales no férreos | aleaciones de alta temperatura | materiales endurecidos |
|---|---|---|---|---|---|---|---|
| corte suave, superficie pretorneada | | TN7110 | TN6010 | TN7110 | TN6010 | TN6010 | TN6010 |
| profundidad de corte, fundido o forja variables | | TN6010 | TN6010 | TN6010 | TN6010 | TN6010 | TN6010 |
| corte ligeramente interrumpido | | TN6025 | TN6025 | TN6025 | TN6025 | TN6025 | TN6025 |
| corte muy interrumpido | | TN6025 | TN6025 | TN6025 | TN6025 | TN6025 | TN6025 |

*Consulte en la página D44 las calidades y descripciones de calidades.*

6 Determine los datos de corte:

**A** Identifique la velocidad inicial (vc), en función del grupo de materiales y la calidad.

**B** La primera opción en velocidad inicial está en **negrita**.

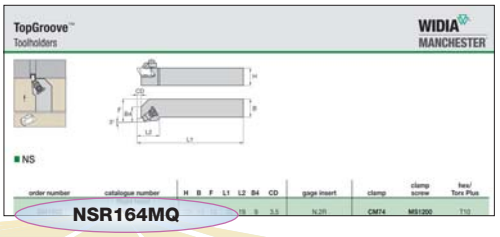
*Consulte en la página D46 los datos de corte.*

**TopGroove™**
Recommended Cutting Speed Starting Conditions

WIDIA MANCHESTER

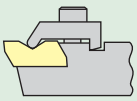
| ANSI ISO 513 | VDI 3323 | Material Group | Cutting Speed • vc m/min | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | min | Start | max | min | Start | max | min | Start | max | min | Start | max |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | | |
| P | 1 | | 140 | **175** | 210 | 130 | **140** | 150 | 200 | **215** | 230 | 90 | **95** | 100 |
| P | 2 | | 130 | **160** | 190 | 120 | **160** | 200 | 190 | **245** | 300 | 90 | **105** | 140 |
| P | 3 | A | 110 | **140** | 170 | 100 | **130** | 160 | 160 | **205** | 250 | 70 | **90** | 110 |
| P | 4 | | 120 | **150** | 180 | 120 | **150** | 180 | 180 | **230** | B 280 | 80 | **105** | 130 |
| P | 5 | | 100 | **130** | 160 | 100 | **130** | 160 | 150 | **195** | 240 | 70 | **90** | 110 |
| P | 6 | | 120 | **150** | 180 | 120 | **150** | 180 | 180 | **230** | 280 | 80 | **105** | 130 |
| P | 7 | | 100 | **130** | 160 | 90 | **125** | 160 | 140 | **190** | 240 | 60 | **85** | 110 |
| P | 8 | | 90 | **120** | 150 | 80 | **110** | 140 | 120 | **170** | 220 | 50 | **75** | 100 |
| P | 9 | | 60 | **90** | 120 | 60 | **80** | 100 | 90 | **125** | 160 | 40 | **50** | 70 |
| P | 10 | | 90 | **105** | 120 | 80 | **95** | 110 | 130 | **150** | 170 | 60 | **70** | 80 |
| P | 11 | | 50 | **65** | 80 | 50 | **65** | 80 | 80 | **105** | 130 | 40 | **50** | 60 |
| P | 12 | | 120 | **155** | 190 | 120 | **140** | 160 | 180 | **210** | 240 | 80 | **95** | 110 |
| P | 13.1 | | 90 | **120** | 150 | 80 | **105** | 130 | 130 | **165** | 200 | 60 | **75** | 90 |
| P | 13.2 | | 45 | **60** | 75 | 40 | **55** | 65 | 65 | **85** | 100 | 30 | **40** | 45 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | | |
| M | 14.1 | | 90 | **115** | 140 | 60 | **75** | 90 | | | | 60 | **75** | 90 |
| M | 14.2 | | 75 | **95** | 115 | 50 | **60** | 75 | | | | 50 | **60** | 75 |
| M | 14.3 | | 55 | **70** | 90 | 40 | **50** | 55 | | | | 40 | **50** | 55 |
| M | 14.4 | | 45 | **60** | 70 | 30 | **40** | 45 | | | | 30 | **40** | 45 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | | |
| K | 15 | | 140 | **170** | 200 | 70 | **90** | 100 | 190 | **240** | 300 | 70 | **90** | 100 |
| K | 16 | | 100 | **130** | 160 | 50 | **65** | 80 | 160 | **200** | 250 | 50 | **65** | 80 |
| K | 17 | | 120 | **150** | 180 | 60 | **70** | 80 | 180 | **230** | 280 | 60 | **70** | 80 |
| K | 18 | | 90 | **120** | 150 | 40 | **55** | 70 | 120 | **170** | 220 | 40 | **55** | 70 |
| K | 19 | | 150 | **180** | 210 | 80 | **95** | 110 | 190 | **240** | 300 | 80 | **95** | 110 |
| K | 20 | | 110 | **140** | 170 | 60 | **75** | 90 | 180 | **230** | 280 | 60 | **75** | 90 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | | |
| N | 21 | | 600 | **750** | 900 | 600 | **750** | 900 | | | | 600 | **750** | 900 |
| N | 22 | | 500 | **650** | 800 | 500 | **650** | 800 | | | | 500 | **650** | 800 |
| N | 23 | | 600 | **750** | 900 | 600 | **750** | 900 | | | | 600 | **750** | 900 |
| N | 24 | | 500 | **650** | 800 | 500 | **650** | 800 | | | | 500 | **650** | 800 |
| N | 25 | | 230 | **300** | 370 | 230 | **300** | 370 | | | | 230 | **300** | 370 |
| N | 26 | | 150 | **200** | 250 | 150 | **200** | 250 | | | | 150 | **200** | 250 |
| N | 27 | | 150 | **200** | 250 | 150 | **200** | 250 | | | | 150 | **200** | 250 |
| N | 28 | | 110 | **140** | 170 | 110 | **140** | 170 | | | | 110 | **140** | 170 |
| N | 29 | | 60 | **80** | 100 | 60 | **80** | 100 | | | | 60 | **80** | 100 |
| N | 30 | | 80 | **100** | 120 | 80 | **100** | 120 | | | | 80 | **100** | 120 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | | |
| S | 31 | | 37 | **45** | 55 | 26 | **37** | 45 | | | | 26 | **37** | 45 |
| S | 32 | | 30 | **36** | 45 | 21 | **30** | 36 | | | | 21 | **30** | 36 |
| S | 33 | | 24 | **28** | 35 | 17 | **24** | 28 | | | | 17 | **24** | 28 |
| S | 34 | | 15 | **18** | 25 | 11 | **15** | 18 | | | | 11 | **15** | 18 |
| S | 35 | | 16 | **18** | 25 | 11 | **16** | 18 | | | | 11 | **16** | 18 |
| S | 36 | | 60 | **72** | 80 | 42 | **60** | 72 | | | | 42 | **60** | 72 |
| S | 37 | | 30 | **36** | 45 | 21 | **30** | 36 | | | | 21 | **30** | 36 |

# Sistema de identificación del porta TopGroove




| N | S | R | | 16 | 4 | M | Q |
|---|---|---|---|---|---|---|---|
| Método porta-plaquita | Ubicación del montaje de plaquita | Dirección de la herramienta | Cabeza abatible | Tamaño del mango | Tamaño de la plaquita | Longitud de la herramienta | Superficie y longitud cualificadas |

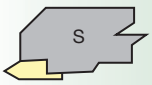
**N:** TopGroove*



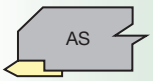
*Sólo estándar exclusivo.

**Montaje en extremo**

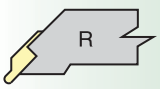
**Montaje lateral Salto**

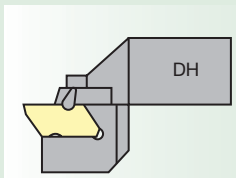



**Montaje lateral Sin salto**




**NRR Destalonado**



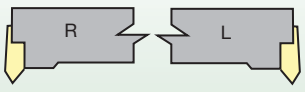




Altura y ancho del mango en mm y longitud del porta según la norma de la ISO.

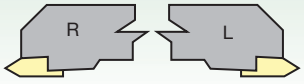
| tamaño de la plaquita | W1 |
|---|---|
| 2 | 3,81 mm |
| 3 | 4,95 mm |
| 4 | 6,98 mm |
| 5 | 9,65 mm |
| 6 | 9,73 mm |
| 8 | 11,13 mm |

| L1 | ISO |
|---|---|
| 32 | A |
| 40 | B |
| 50 | C |
| 60 | D |
| 70 | E |
| 80 | F |
| 90 | G |
| 100 | H |
| 110 | J |
| 125 | K |
| 140 | L |
| 150 | M |
| 160 | N |
| 170 | P |
| 180 | Q |
| 200 | R |
| 250 | S |
| 300 | T |
| 350 | U |
| 400 | V |
| 450 | W |
| 500 | Y |
| Diseño especial | X |

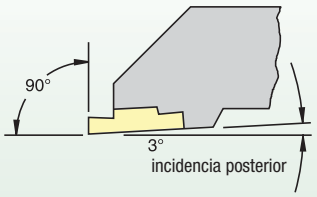
**Montaje en extremo**




**Montaje lateral**

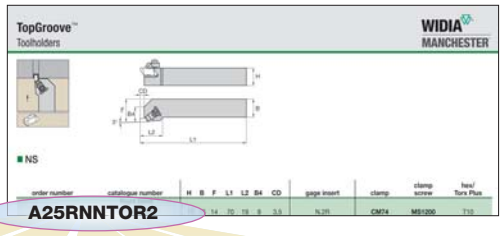



**Q:**
porta métrico cualificado



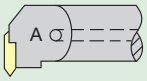

*NOTA: Los portas están diseñados para colocar la plaquita inclinada a 3° y proporcionar así una incidencia posterior en la cara abierta.*

# TopGroove
# Sistema de identificación de barras de mandrinar

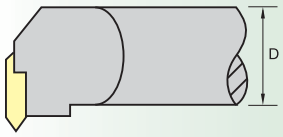


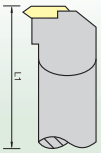

| A | 25 | R | N | N | T | O | R | 2 |
|---|---|---|---|---|---|---|---|---|
| Tipo de barra | Diámetro de barra | Longitud de la barra | Método porta-plaquita | Forma de la plaquita | Ubicación de la plaquita | Ángulo de desprendimiento | Dirección de la herramienta | Tamaño de la plaquita |

Acero con refrigeración




Diámetro de barra en milímetros

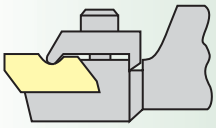


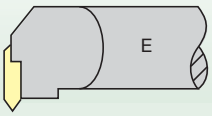

Barras (sistema métrico):

| | |
|---|---|
| M | 150,0 mm |
| Q | 180,0 mm |
| R | 200,0 mm |
| S | 250,0 mm |
| T | 300,0 mm |
| U | 350,0 mm |

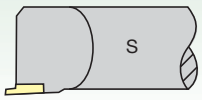
N: TopGroove



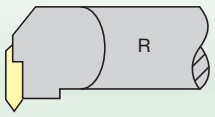
Montaje en extremo



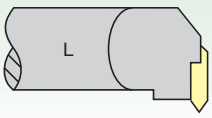

Montaje lateral

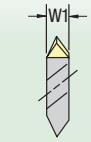



A derechas

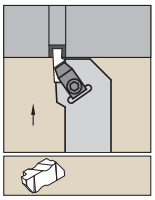


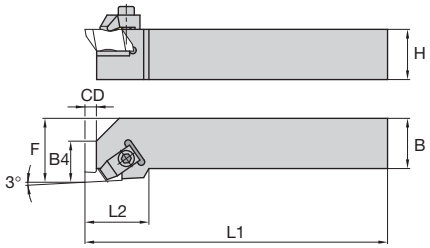

A izquierdas



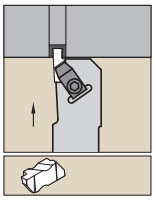

| Tamaño de la plaquita | T |
|---|---|
| 1 | 3,54 mm |
| 2 | 3,81 mm |
| 3 | 5,35 mm |
| 4 | 6,40 mm |
| 5 | 9,65 mm |
| 6 | 9,73 mm |
| 8 | 11,13 mm |

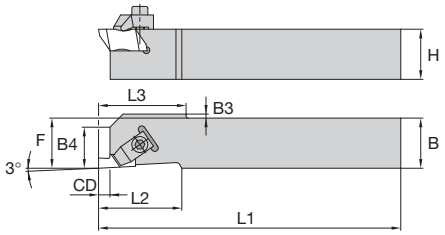





## NS

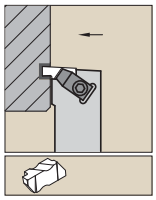
| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | B4 | CD | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **3641682** | **NSR1010E2** | 10,0 | 10,0 | 14,0 | 70 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3641660** | **NSR1212F2** | 12,0 | 12,0 | 16,0 | 80 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3636542** | **NSR1616H2** | 16,0 | 16,0 | 20,0 | 100 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3638589** | **NSR2020K2** | 20,0 | 20,0 | 25,0 | 125 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3638590** | **NSR2525M2** | 25,0 | 25,0 | 32,0 | 150 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3638588** | **NSR2020K3** | 20,0 | 20,0 | 25,0 | 125 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3636536** | **NSR2525M3** | 25,0 | 25,0 | 32,0 | 150 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641664** | **NSR3225P3** | 32,0 | 25,0 | 32,0 | 170 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641666** | **NSR3232P3** | 32,0 | 32,0 | 40,0 | 170 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3636540** | **NSR2525M4** | 25,0 | 25,0 | 32,0 | 150 | 35 | 14 | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641675** | **NSR3225P4** | 32,0 | 25,0 | 32,0 | 170 | 35 | 14 | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641669** | **NSR3232P4** | 32,0 | 32,0 | 40,0 | 170 | 35 | 14 | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641673** | **NSR3232P5** | 32,0 | 32,0 | 40,0 | 170 | 51 | 16 | 10,5 | N.5R | **CM80** | **MS352** | 6mm |
| | **A izquierdas** | | | | | | | | | | | |
| **3641683** | **NSL1010E2** | 10,0 | 10,0 | 14,0 | 70 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3641681** | **NSL1212F2** | 12,0 | 12,0 | 16,0 | 80 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3636545** | **NSL1616H2** | 16,0 | 16,0 | 20,0 | 100 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3639045** | **NSL2020K2** | 20,0 | 20,0 | 25,0 | 125 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3639047** | **NSL2525M2** | 25,0 | 25,0 | 32,0 | 150 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3639046** | **NSL2020K3** | 20,0 | 20,0 | 32,0 | 125 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3636539** | **NSL2525M3** | 25,0 | 25,0 | 32,0 | 150 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641670** | **NSL3225P3** | 32,0 | 25,0 | 32,0 | 170 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641671** | **NSL3232P3** | 32,0 | 32,0 | 40,0 | 170 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3636544** | **NSL2525M4** | 25,0 | 25,0 | 32,0 | 150 | 35 | 14 | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641678** | **NSL3225P4** | 32,0 | 25,0 | 32,0 | 170 | 35 | 14 | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641679** | **NSL3232P4** | 32,0 | 32,0 | 40,0 | 170 | 35 | 14 | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641688** | **NSL3232P5** | 32,0 | 32,0 | 40,0 | 170 | 51 | 16 | 10,5 | N.5L | **CM81** | **MS352** | 6mm |

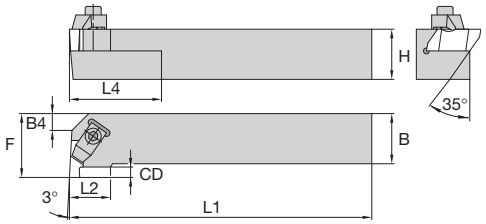





## NAS

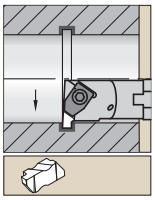
| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | B4 | CD | B3 | L3 | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **3641667** | **NASR1010M2Q** | 10,0 | 10,0 | 10,0 | 150 | 19 | 9 | 3,5 | 2,03 | 19 | N.2R | **CM182** | **MS1200** | T10 |
| **3641662** | **NASR1212M2Q** | 12,0 | 12,0 | 12,0 | 150 | 19 | 9 | 3,5 | — | — | N.2R | **CM182** | **MS1200** | T10 |
| **3639048** | **NASR1616K3Q** | 16,0 | 16,0 | 16,0 | 125 | 32 | 12 | 5,3 | — | — | N.3R | **CM184LP** | **MS2111** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | |
| **3641691** | **NASL1010M2Q** | 10,0 | 10,0 | 10,0 | 150 | 19 | 9 | 3,5 | 2,03 | 19 | N.2L | **CM183** | **MS1200** | T10 |
| **3641686** | **NASL1212M2Q** | 12,0 | 12,0 | 12,0 | 150 | 19 | 9 | 3,5 | — | — | N.2L | **CM183** | **MS1200** | T10 |
| **3641687** | **NASL1616K3Q** | 16,0 | 16,0 | 16,0 | 125 | 32 | 12 | 5,3 | — | — | N.3L | **CM185LP** | **MS2111** | 25 IP |



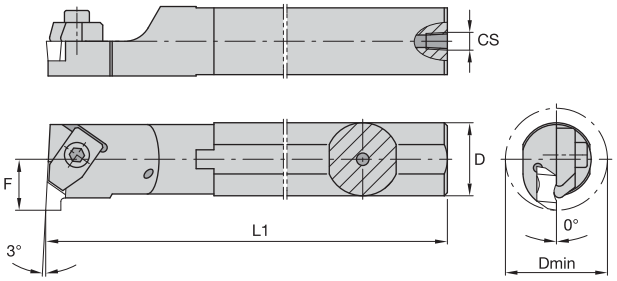



## NE

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | L4 | B4 | CD | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3641674** | **NER1616H2** | 16 | 16 | 20 | 100 | 15 | 25 | — | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3641658** | **NER2020K2** | 20 | 20 | 25 | 125 | 15 | 25 | 6 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3641665** | **NER2525M2** | 25 | 25 | 32 | 150 | 15 | 25 | 12 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3636541** | **NER2525M3** | 25 | 25 | 32 | 150 | 22 | 51 | — | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641680** | **NER3225P3** | 32 | 25 | 32 | 170 | 22 | 51 | — | 3,8 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641672** | **NER2525M4** | 25 | 25 | 35 | 150 | 24 | 51 | — | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641689** | **NER3225P4** | 32 | 25 | 35 | 170 | 24 | 51 | — | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641693** | **NER3232P4** | 32 | 32 | 40 | 170 | 24 | 51 | — | 6,4 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641692** | **NER3232P5** | 32 | 32 | 50 | 170 | 35 | 51 | — | 10,5 | N.5L | **CM81** | **MS352** | 6mm |
| | **A izquierdas** | | | | | | | | | | | | |
| **3641684** | **NEL1616H2** | 16 | 16 | 20 | 100 | 15 | 25 | — | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3641677** | **NEL2020K2** | 20 | 20 | 25 | 125 | 15 | 25 | 6 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3641676** | **NEL2525M2** | 25 | 25 | 32 | 150 | 15 | 25 | 12 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3636543** | **NEL2525M3** | 25 | 25 | 32 | 150 | 22 | 51 | — | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641685** | **NEL3225P3** | 32 | 25 | 32 | 170 | 22 | 51 | — | 3,8 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641668** | **NEL2525M4** | 25 | 25 | 35 | 150 | 24 | 51 | — | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641694** | **NEL3225P4** | 32 | 25 | 35 | 170 | 24 | 51 | — | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641696** | **NEL3232P4** | 32 | 32 | 40 | 170 | 24 | 51 | — | 6,4 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641695** | **NEL3232P5** | 32 | 32 | 50 | 170 | 35 | 51 | — | 10,5 | N.5R | **CM80** | **MS352** | 6mm |



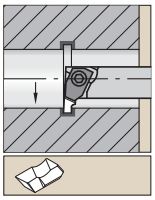
Mango de acero con refrigeración interior



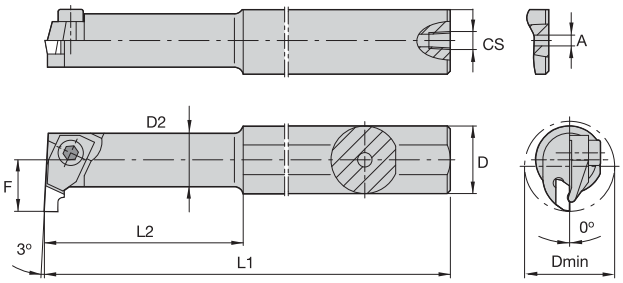

## A-NNT

| Número de pedido | Número de catálogo | D | D min | L1 | F | CS | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **3641644** | **A12MNNTOR2** | 12 | 18,5 | 150 | 11 | 1/16-27 NPT | N.2L | **CM147** | **MS1200** | 2.5mm |
| **3641643** | **A16MNNTOR2** | 16 | 22,0 | 150 | 11 | 1/8-27 NPT | N.2L | **CM75** | **MS1200** | 2.5mm |
| **3641645** | **A20QNNTOR2** | 20 | 26,0 | 180 | 13 | 1/8-27 NPT | N.2L | **CM75** | **MS1200** | 2.5mm |
| **3641651** | **A25RNNTOR2** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.2L | **CM75** | **MS1200** | 2.5mm |
| **3641622** | **A25RNNTOR3** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641646** | **A32SNNTOR3** | 32 | 44,0 | 250 | 22 | 1/4-18 NPT | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641653** | **A40TNNTOR3** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641654** | **A40TNNTOR4** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641661** | **A50UNNTOR4** | 50 | 70,0 | 350 | 35 | 1/4-18 NPT | N.4L | **CM73LP** | **MS2111** | 25 IP |
| | **A izquierdas** | | | | | | | | | |
| **3641655** | **A12MNNTOL2** | 12 | 18,5 | 150 | 11 | 1/16-27 NPT | N.2R | **CM146** | **MS1200** | 2.5mm |
| **3641649** | **A16MNNTOL2** | 16 | 22,0 | 150 | 11 | 1/8-27 NPT | N.2R | **CM74** | **MS1200** | 2.5mm |
| **3641652** | **A20QNNTOL2** | 20 | 26,0 | 180 | 13 | 1/8-27 NPT | N.2R | **CM74** | **MS1200** | 2.5mm |
| **3641657** | **A25RNNTOL2** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.2R | **CM74** | **MS1200** | 2.5mm |
| **3641650** | **A25RNNTOL3** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641656** | **A32SNNTOL3** | 32 | 44,0 | 250 | 22 | 1/4-18 NPT | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641659** | **A40TNNTOL3** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641663** | **A40TNNTOL4** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641690** | **A50UNNTOL4** | 50 | 70,0 | 350 | 35 | 1/4-18 NPT | N.4R | **CM72LP** | **MS2111** | 25 IP |

*NOTA: la capacidad de mandrinado mínimo varía según la profundidad de la ranura. Consulte las páginas D64 y D65 para obtener más detalles.*



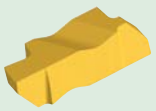
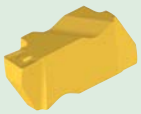
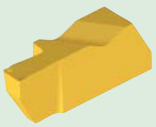
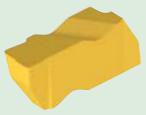
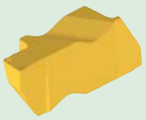
Mango de acero con cuello reducido y refrigeración interior.

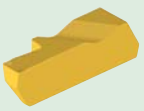
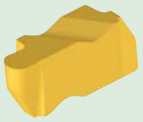
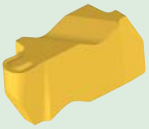
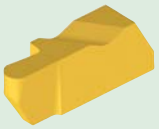
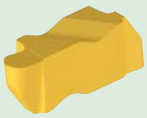
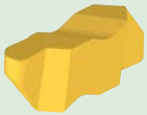
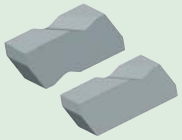



## A-NNT-1

| Número de pedido | Número de catálogo | D | D min | D2 | L1 | L2 | F | A | CS | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3641648** | **A10KNNTOR1** | 10 | 11,5 | 8,7 | 125 | 31,75 | 7 | 3,2 | — | N.1L | **CM109** | **MS1034** | 1.5mm |
| **3641647** | **A12MNNTOR1** | 12 | 11,5 | 8,7 | 150 | 31,30 | 7 | 4,0 | 1/16-27 NPT | N.1L | **CM109** | **MS1034** | 1.5mm |

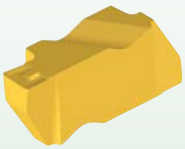
*NOTA: la capacidad de mandrinado mínimo varía según la profundidad de la ranura. Consulte las páginas D64 y D65 para obtener más detalles.*

| tipo de plaquita | aplicación | ángulo de desprendimiento | página(s) |
|---|---|---|---|
| **NG**  | • Ranurado general.<br>• Ranurado de junta tórica.<br>• Ranurado Circlip. | neutral | **D47** |
| **NG-K**  | • Geometría de control de virutas.<br>• Ranurado general.<br>• Ranurado de junta tórica.<br>• Ranurado Circlip.<br>• Torneado ligero. | 10° positivo | **D48** |
| **NGC-K*** | • Rotura de filo biselado y ranura combinada en un vaciado positivo con control de virutas.<br>• Diseñada para ranuras de resorte estándar DIN 471/472. | 10° positivo | — |
| **NGD*** | • Ranurado profundo. | neutral | — |
| **NGD-K**  | • Geometría de control de virutas.<br>• Ranurado profundo.<br>• Torneado ligero. | 10° positivo | **D51** |
| **NGP** | • Ranurado general.<br>• Ranurado de junta tórica.<br>• Ranurado Circlip. | 5° positivo | **D52** |
| **NF***  | • Ranurado frontal.<br>• Holgura lateral adicional. | neutral | — |
| **NF-K** | • Ranurado frontal con control de virutas.<br>• Holgura lateral adicional. | 10° positivo | **D53** |
| **NFD-K**  | • Ranurado frontal profundo con control de virutas.<br>• Holgura lateral adicional. | 10° positivo | **D53** |

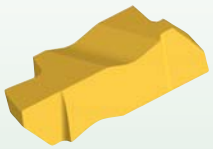
| tipo de plaquita | aplicación | ángulo de desprendimiento | página(s) |
|---|---|---|---|
| **NFD-KI***  | • Ranurado frontal profundo interno con control de virutas.<br>• Para usar en barras de mandrinar para ranuras frontales internas. | 10° positivo | — |
| **NP-K**<br>**NPK-K** | • Torneado.<br>• Torneado trasero positivo.<br>• Perfilado con control de virutas. | 10° positivo | **D54** |
| **NR**  | • Ranurado de radio completo.<br>• Torneado y perfilado. | neutral | **D55** |
| **NR-K**  | • Geometría de control de virutas.<br>• Ranurado, torneado y perfilado de radio completo. | 10° positivo | **D56** |
| **NRD**  | • Ranurado profundo.<br>• Forma final de radio completo. | neutral | **D56** |
| **NRP***  | • Ranurado de radio completo.<br>• Perfilado de torneado ligero. | 5° positivo | — |
| **NU***  | • Destalonado. | neutral | — |
| **NV*** | • Ranurado Poly-Vee. | neutral | — |
| **NB/NBD**  | • Materiales en bruto.<br>• Materiales en bruto para ranurado profundo.<br>• Disponible sólo en calidades sin recubrir. | — | **D57** |

*Las plaquitas están disponibles como soluciones a medida.

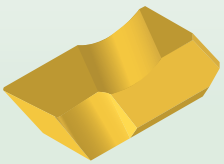
## TopGroove • NG-K, NG-1L y NG



NG-K

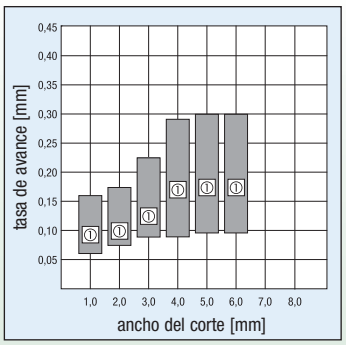


NG



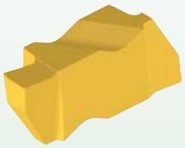
NG-1L

- Para aplicaciones de ranurado general, junta tórica y Circlip.
- Un control de virutas que permite una auténtica optimización y productividad.
- Rectificado de precisión para filos precisos.
- Se puede utilizar tanto en portaherramientas como en barras de mandrinar.

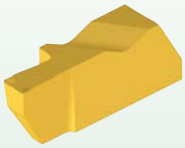



① Avance recomendado

## TopGroove • NGP y NGD-K

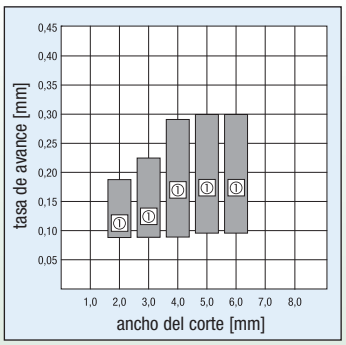


NGP



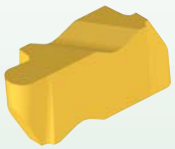
NGD-K

- Ángulos de desprendimiento positivo.
- Para aplicaciones de ranurado profundo, de usos generales, circlip y junta tórica.
- Geometría para virutas diseñada para un excelente control de virutas.
- Rectificado de precisión para filos precisos.
- Se puede utilizar tanto en portaherramientas como en barras de mandrinar.

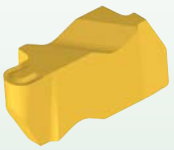



① Avance recomendado

## TopGroove • NR y NR-K

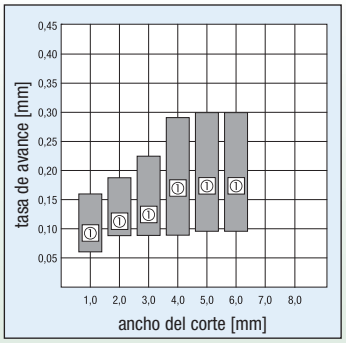


NR

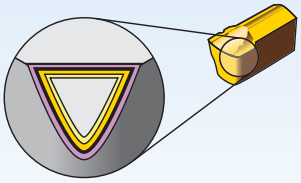


NR-K

- Para aplicaciones de perfilado, torneado y ranurado de radio completo.
- Geometría para virutas diseñada para un excelente control de virutas.
- Rectificado de precisión para filos precisos.
- Se puede utilizar tanto en portaherramientas como en barras de mandrinar.



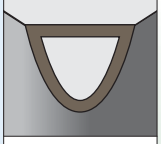
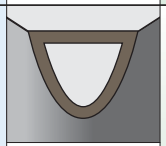
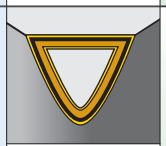
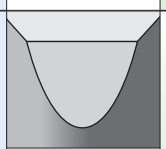

① Avance recomendado



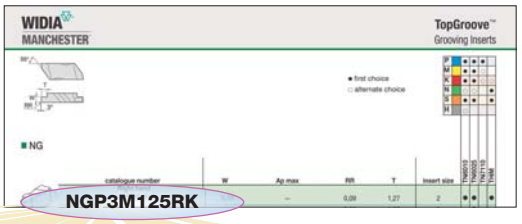
**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

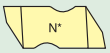
| Recubrimiento | | Descripción de la calidad | | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TN6010 |  HC-S10 | Metal duro recubierto. Nanomulticapa de PVD — TiAlN. Mecanizado ligero. Para aleaciones difíciles de mecanizar. | P | | | | | | | | | |
| | | | M | | | | | | | | | |
| | | | K | | | | | | | | | |
| | | | N | | | | | | | | | |
| | | | S | | | | | | | | | |
| | | | H | | | | | | | | | |
| TN6025 |  HC-S25 | Metal duro recubierto. Nanomulticapa de PVD — TiAlN. Mecanizado ligero y medio. Para aleaciones difíciles de mecanizar. | P | | | | | | | | | |
| | | | M | | | | | | | | | |
| | | | K | | | | | | | | | |
| | | | N | | | | | | | | | |
| | | | S | | | | | | | | | |
| | | | | | | | | | | | | |
| TN7110 |  HC-P10 | Metal duro recubierto. MTCVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Muy resistente al desgaste. Mecanizado ligero y medio. Para aceros y fundición nodular. | P | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | K | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| THM |  HW-K15 | Metal duro sin recubrir. Equilibrio extraordinariamente bueno de dureza, resistencia al desgaste, estabilidad del filo y tenacidad. Mecanizado ligero y medio. Para fundición, todos los metales no férreos y materiales no metálicos. Útil en condiciones desfavorables. | P | | | | | | | | | |
| | | | M | | | | | | | | | |
| | | | K | | | | | | | | | |
| | | | N | | | | | | | | | |
| | | | S | | | | | | | | | |
| | | | H | | | | | | | | | |

# Sistema de identificación de plaquita TopGroove




| N | G | P | 3 | M | 125 | R | | K | |
|---|---|---|---|---|---|---|---|---|---|
| Tipo de plaquita | Estilo de plaquita | Información adicional | Tamaño de la plaquita | Identificación del tamaño | Tamaño de la ranura** | Dirección de la plaquita | Corte Profundidad | Diseño de rompevirutas | Definición de plaquitas |

N: TopGroove




B: Material en bruto (para formas especiales)

F: Ranurado frontal

G: Ranurado

P: Torneado en retroceso

R: Radio completo

U: Destalonado (o entallado)

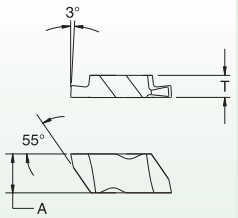
V: Poly-Vee

D: Ranurado profundo

P: Positivo

C: Ranurado y biselado

| Tamaño de la plaquita | S | W1 |
|---|---|---|
| 1 | 2,54 | 2,54 mm |
| 2 | 5,56 | 3,81 mm |
| 3 | 8,74 | 4,95 mm |
| 4 | 11,51 | 6,98 mm |
| 5 | 17,48 | 9,65 mm |
| 6 | 11,51 | 9,73 mm |




M: Ancho de la ranura de la plaquita (sistema métrico)

C: El ancho de la placa de ranura Circlip es nominal tamaño circlip

Ancho de ranura para plaquitas de estilo F, G y U; radios para plaquitas con ranura de estilo R y tamaño de ranura de resorte para plaquitas con ranura y biselado. Dimensión en 0,01 mm.

125 = 1,25 mm

Tolerancia de ancho: ±0,025 mm a menos que se especifique lo contrario

**Omitir la posición de los materiales en bruto estilo NB TopGroove

**L** = a izquierdas

**R** = a derechas

Aparece en plaquitas con ranura y biselado en aumentos de 0,01 mm.

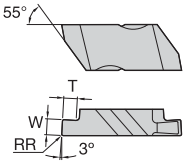
K:
Control de virutas estándar

E:
Sólo con redondeo

Tamaño de la ranura

J o L: Plaquitas Poly-vee
I: Ranurado frontal interior

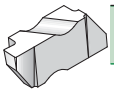
| ANSI ISO 513 | VDI 3323 | Velocidad de corte • vc m/min | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | |
| P | 1 | 140 | **175** | 210 | 130 | **140** | 150 | 200 | **215** | 230 | 90 | **95** | 100 |
| | 2 | 130 | **160** | 190 | 120 | **160** | 200 | 190 | **245** | 300 | 90 | **105** | 140 |
| | 3 | 110 | **140** | 170 | 100 | **130** | 160 | 160 | **205** | 250 | 70 | **90** | 110 |
| | 4 | 120 | **150** | 180 | 120 | **150** | 180 | 180 | **230** | 280 | 80 | **105** | 130 |
| | 5 | 100 | **130** | 160 | 100 | **130** | 160 | 150 | **195** | 240 | 70 | **90** | 110 |
| | 6 | 120 | **150** | 180 | 120 | **150** | 180 | 180 | **230** | 280 | 80 | **105** | 130 |
| | 7 | 100 | **130** | 160 | 90 | **125** | 160 | 140 | **190** | 240 | 60 | **85** | 110 |
| | 8 | 90 | **120** | 150 | 80 | **110** | 140 | 120 | **170** | 220 | 50 | **75** | 100 |
| | 9 | 60 | **90** | 120 | 60 | **80** | 100 | 90 | **125** | 160 | 40 | **50** | 70 |
| | 10 | 90 | **105** | 120 | 80 | **95** | 110 | 130 | **150** | 170 | 60 | **70** | 80 |
| | 11 | 50 | **65** | 80 | 50 | **65** | 80 | 80 | **105** | 130 | 40 | **50** | 60 |
| | 12 | 120 | **155** | 190 | 120 | **140** | 160 | 180 | **210** | 240 | 80 | **95** | 110 |
| | 13.1 | 90 | **120** | 150 | 80 | **105** | 130 | 130 | **165** | 200 | 60 | **75** | 90 |
| | 13.2 | 45 | **60** | 75 | 40 | **55** | 65 | 65 | **85** | 100 | 30 | **40** | 45 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | |
| M | 14.1 | 90 | **115** | 140 | 60 | **75** | 90 | | | | 60 | **75** | 90 |
| | 14.2 | 75 | **95** | 115 | 50 | **60** | 75 | | | | 50 | **60** | 75 |
| | 14.3 | 55 | **70** | 90 | 40 | **50** | 55 | | | | 40 | **50** | 55 |
| | 14.4 | 45 | **60** | 70 | 30 | **40** | 45 | | | | 30 | **40** | 45 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | |
| K | 15 | 140 | **170** | 200 | 70 | **90** | 100 | 190 | **240** | 300 | 70 | **90** | 100 |
| | 16 | 100 | **130** | 160 | 50 | **65** | 80 | 160 | **200** | 250 | 50 | **65** | 80 |
| | 17 | 120 | **150** | 180 | 60 | **70** | 80 | 180 | **230** | 280 | 60 | **70** | 80 |
| | 18 | 90 | **120** | 150 | 40 | **55** | 70 | 120 | **170** | 220 | 40 | **55** | 70 |
| | 19 | 150 | **180** | 210 | 80 | **95** | 110 | 190 | **240** | 300 | 80 | **95** | 110 |
| | 20 | 110 | **140** | 170 | 60 | **75** | 90 | 180 | **230** | 280 | 60 | **75** | 90 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | |
| N | 21 | 600 | **750** | 900 | 600 | **750** | 900 | | | | 600 | **750** | 900 |
| | 22 | 500 | **650** | 800 | 500 | **650** | 800 | | | | 500 | **650** | 800 |
| | 23 | 600 | **750** | 900 | 600 | **750** | 900 | | | | 600 | **750** | 900 |
| | 24 | 500 | **650** | 800 | 500 | **650** | 800 | | | | 500 | **650** | 800 |
| | 25 | 230 | **300** | 370 | 230 | **300** | 370 | | | | 230 | **300** | 370 |
| | 26 | 150 | **200** | 250 | 150 | **200** | 250 | | | | 150 | **200** | 250 |
| | 27 | 150 | **200** | 250 | 150 | **200** | 250 | | | | 150 | **200** | 250 |
| | 28 | 110 | **140** | 170 | 110 | **140** | 170 | | | | 110 | **140** | 170 |
| | 29 | 60 | **80** | 100 | 60 | **80** | 100 | | | | 60 | **80** | 100 |
| | 30 | 80 | **100** | 120 | 80 | **100** | 120 | | | | 80 | **100** | 120 |
| | | | TN6010 | | | TN6025 | | | TN7110 | | | THM | |
| S | 31 | 37 | **45** | 55 | 26 | **37** | 45 | | | | 26 | **37** | 45 |
| | 32 | 30 | **36** | 45 | 21 | **30** | 36 | | | | 21 | **30** | 36 |
| | 33 | 24 | **28** | 35 | 17 | **24** | 28 | | | | 17 | **24** | 28 |
| | 34 | 15 | **18** | 25 | 11 | **15** | 18 | | | | 11 | **15** | 18 |
| | 35 | 16 | **18** | 25 | 11 | **16** | 18 | | | | 11 | **16** | 18 |
| | 36 | 60 | **72** | 80 | 42 | **60** | 72 | | | | 42 | **60** | 72 |
| | 37 | 30 | **36** | 45 | 21 | **30** | 36 | | | | 21 | **30** | 36 |




● primera elección
○ elección alternativa

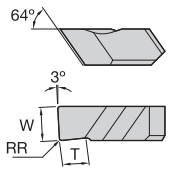
| | | | | |
|---|---|---|---|---|
| P | ● | ● | ● | |
| M | ● | ● | ○ | |
| K | ● | ● | ○ | ○ |
| N | ○ | ○ | | ● |
| S | ● | ● | | ● |
| H | ○ | | | |

## ■ NG

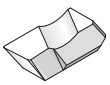


| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NG2031R** | 0,79 | – | 0,09 | 1,27 | 2 | ● | ● | | ● |
| **NG2041R** | 1,04 | – | 0,09 | 1,27 | 2 | | ● | | |
| **NG2058R** | 1,47 | – | 0,19 | 1,27 | 2 | | ● | | |
| **NG2062R** | 1,58 | – | 0,19 | 2,79 | 2 | ● | ● | | ● |
| **NG3047R** | 1,19 | – | 0,19 | 1,91 | 3 | ● | ● | | ● |
| **NG3062R** | 1,58 | – | 0,19 | 2,39 | 3 | ● | ● | | ● |
| **NG3094R** | 2,39 | – | 0,19 | 3,81 | 3 | ● | ● | | ● |
| **NG3125R** | 3,18 | – | 0,19 | 3,81 | 3 | ● | ● | | ● |
| **NG4250R** | 6,35 | – | 0,57 | 6,35 | 4 | ● | ● | | |
| **A izquierdas** | | | | | | | | | |
| **NG2031L** | 0,79 | – | 0,09 | 1,27 | 2 | | ● | | |
| **NG2058L** | 1,47 | – | 0,19 | 1,27 | 2 | | ● | | |
| **NG2062L** | 1,58 | – | 0,19 | 2,79 | 2 | | ● | | |
| **NG3047L** | 1,19 | – | 0,19 | 1,91 | 3 | ● | ● | | ● |
| **NG3062L** | 1,58 | – | 0,19 | 2,39 | 3 | ● | ● | | ● |
| **NG3094L** | 2,39 | – | 0,19 | 3,81 | 3 | ● | ● | | ● |
| **NG3125L** | 3,18 | – | 0,19 | 3,81 | 3 | ● | ● | | ● |
| **NG4250L** | 6,35 | – | 0,57 | 6,35 | 4 | ● | ● | | |
| **NG5M500L** | 5,00 | – | 0,32 | 9,52 | 5 | | ● | | |

*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*

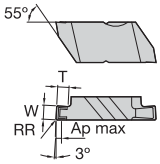



## ■ NG-1L



| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | filos del corte | TN6025 |
|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | |
| **NG1047L** | 1,19 | – | 0,19 | 1,91 | 1 | 1 | ● |
| **NG1062L** | 1,58 | – | 0,19 | 1,91 | 1 | 1 | ● |
| **NG1094L** | 2,39 | – | 0,19 | 1,91 | 1 | 1 | ● |

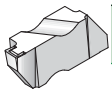
*NOTA: la tolerancia de ancho es de +/- 0,076 mm en las plaquitas NG-1L.*




● primera elección
○ elección alternativa

| | | | | |
|---|---|---|---|---|
| P | ● | ● | ● | |
| M | ● | ● | ○ | |
| K | ● | ● | ○ | ○ |
| N | ○ | ○ | | ● |
| S | ● | ● | | ● |
| H | ○ | | | |

## ■ NG-K

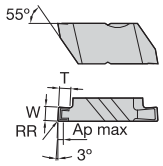


| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NG2M050RK** | 0,50 | 0,64 | 0,09 | 0,64 | 2 | ● | ● | | |
| **NG2031RK** | 0,79 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M080RK** | 0,80 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M100RK** | 1,00 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2047RK** | 1,19 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M120RK** | 1,20 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M140RK** | 1,40 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M150RK** | 1,50 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2062RK** | 1,58 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M170RK** | 1,70 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M175RK** | 1,75 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2M195RK** | 1,95 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M200RK** | 2,00 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M220RK** | 2,20 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2M225RK** | 2,25 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2094RK** | 2,39 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M250RK** | 2,50 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2M275RK** | 2,75 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M300RK** | 3,00 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2125RK** | 3,18 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M325RK** | 3,25 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG3M100RK** | 1,00 | 0,76 | 0,19 | 1,91 | 3 | | ● | | |
| **NG3047RK** | 1,19 | 0,76 | 0,19 | 1,91 | 3 | ● | ● | | |
| **NG3M120RK** | 1,20 | 0,76 | 0,19 | 1,91 | 3 | ● | ● | | |
| **NG3M150RK** | 1,50 | 1,02 | 0,19 | 2,39 | 3 | | ● | ● | |
| **NG3062RK** | 1,58 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | ● | |
| **NG3M175RK** | 1,75 | 1,02 | 0,19 | 2,39 | 3 | | ● | | |
| **NG3072RK** | 1,83 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | | |
| **NG3078RK** | 1,98 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | | |
| **NG3M200RK** | 2,00 | 1,02 | 0,19 | 2,39 | 3 | | ● | ● | |
| **NG3M220RK** | 2,20 | 1,02 | 0,19 | 2,39 | 3 | | ● | | |
| **NG3M225RK** | 2,25 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | ● | |
| **NG3094RK** | 2,39 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M250RK** | 2,50 | 1,02 | 0,19 | 3,81 | 3 | | ● | ● | |
| **NG3M275RK** | 2,75 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M300RK** | 3,00 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | ● | |
| **NG3125RK** | 3,18 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M320RK** | 3,20 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **NG3M325RK** | 3,25 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |

*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*

*(continuación)*

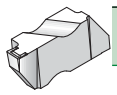
*(continuación)*




● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | ● | ● | ● | | |
| M | ● | ● | ○ | | |
| K | ● | ● | ○ | ○ | |
| N | ○ | ○ | | ● | |
| S | ● | ● | | ● | |
| H | ○ | | | | |

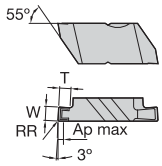
## ■ NG-K



| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **NG3M350RK** | 3,50 | 2,92 | 0,32 | 3,81 | 3 | | ● | | |
| **NG3156RK** | 3,96 | 2,92 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M400RK** | 4,00 | 2,92 | 0,32 | 3,81 | 3 | ● | ● | ● | |
| **NG3M425RK** | 4,25 | 2,92 | 0,32 | 3,81 | 3 | ● | ● | | |
| **NG3M450RK** | 4,50 | 2,92 | 0,32 | 3,81 | 3 | | ● | | |
| **NG3189RK** | 4,80 | 2,92 | 0,57 | 3,81 | 3 | ● | ● | ● | |
| **NG4M300RK** | 3,00 | 1,02 | 0,19 | 3,81 | 4 | | ● | | |
| **NG4125RK** | 3,18 | 1,02 | 0,19 | 3,81 | 4 | ● | ● | | |
| **NG4M350RK** | 3,50 | 2,92 | 0,57 | 6,35 | 4 | | ● | ● | |
| **NG4M400RK** | 4,00 | 2,92 | 0,57 | 6,35 | 4 | ● | ● | ● | |
| **NG4M450RK** | 4,50 | 2,92 | 0,57 | 6,35 | 4 | | ● | | |
| **NG4189RK** | 4,80 | 2,92 | 0,57 | 6,35 | 4 | ● | ● | | |
| **NG4M500RK** | 5,00 | 2,92 | 0,32 | 6,35 | 4 | ● | ● | ● | |
| **NG4M550RK** | 5,50 | 3,81 | 0,57 | 6,35 | 4 | | ● | | |
| **NG4M600RK** | 6,00 | 3,81 | 0,57 | 6,35 | 4 | | ● | ● | |
| **NG4250RK** | 6,35 | 3,81 | 0,57 | 6,35 | 4 | ● | ● | | |
| **A izquierdas** | | | | | | | | | |
| **NG2M050LK** | 0,50 | 0,64 | 0,09 | 0,64 | 2 | ● | ● | | |
| **NG2031LK** | 0,79 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M080LK** | 0,80 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M100LK** | 1,00 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2047LK** | 1,19 | 0,76 | 0,09 | 1,27 | 2 | | ● | | |
| **NG2M120LK** | 1,20 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M140LK** | 1,40 | 0,76 | 0,09 | 1,27 | 2 | ● | ● | | |
| **NG2M150LK** | 1,50 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2062LK** | 1,58 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M170LK** | 1,70 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M175LK** | 1,75 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2M195LK** | 1,95 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M200LK** | 2,00 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M220LK** | 2,20 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2M225LK** | 2,25 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2094LK** | 2,39 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M250LK** | 2,50 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG2M275LK** | 2,75 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M300LK** | 3,00 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2125LK** | 3,18 | 1,09 | 0,19 | 2,79 | 2 | ● | ● | | |
| **NG2M325LK** | 3,25 | 1,09 | 0,19 | 2,79 | 2 | | ● | | |
| **NG3M100LK** | 1,00 | 0,76 | 0,19 | 1,91 | 3 | | ● | | |
| **NG3047LK** | 1,19 | 0,76 | 0,19 | 1,91 | 3 | ● | ● | | |

*(continuación)*

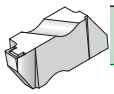
*(continuación)*



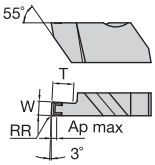

● primera elección
○ elección alternativa

| | | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|
| P | | ● | ● | ● | |
| M | | ● | ● | ○ | |
| K | | ● | ● | ○ | ○ |
| N | | ○ | ○ | | ● |
| S | | ● | ● | | ● |
| H | | ○ | | | |

## ■ NG-K



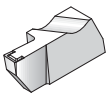
| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **NG3M120LK** | 1,20 | 0,76 | 0,19 | 1,91 | 3 | ● | ● | | |
| **NG3M150LK** | 1,50 | 1,02 | 0,19 | 2,39 | 3 | | ● | ● | |
| **NG3062LK** | 1,58 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | ● | |
| **NG3M175LK** | 1,75 | 1,02 | 0,19 | 2,39 | 3 | | ● | | |
| **NG3072LK** | 1,83 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | | |
| **NG3078LK** | 1,98 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | | |
| **NG3M200LK** | 2,00 | 1,02 | 0,19 | 2,39 | 3 | | ● | ● | |
| **NG3M220LK** | 2,20 | 1,02 | 0,19 | 2,39 | 3 | | ● | | |
| **NG3M225LK** | 2,25 | 1,02 | 0,19 | 2,39 | 3 | ● | ● | ● | |
| **NG3094LK** | 2,39 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M250LK** | 2,50 | 1,02 | 0,19 | 3,81 | 3 | | ● | ● | |
| **NG3M275LK** | 2,75 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M300LK** | 3,00 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | ● | |
| **NG3125LK** | 3,18 | 1,02 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M320LK** | 3,20 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **NG3M325LK** | 3,25 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **NG3M350LK** | 3,50 | 2,92 | 0,32 | 3,81 | 3 | | ● | | |
| **NG3156LK** | 3,96 | 2,92 | 0,19 | 3,81 | 3 | ● | ● | | |
| **NG3M400LK** | 4,00 | 2,92 | 0,32 | 3,81 | 3 | ● | ● | ● | |
| **NG3M425LK** | 4,25 | 2,92 | 0,32 | 3,81 | 3 | ● | ● | | |
| **NG3M450LK** | 4,50 | 2,92 | 0,32 | 3,81 | 3 | | ● | | |
| **NG3189LK** | 4,80 | 2,92 | 0,57 | 3,81 | 3 | ● | ● | ● | |
| **NG4M300LK** | 3,00 | 1,02 | 0,19 | 3,81 | 4 | | ● | | |
| **NG4125LK** | 3,18 | 1,02 | 0,19 | 3,81 | 4 | ● | ● | | |
| **NG4M350LK** | 3,50 | 2,92 | 0,57 | 6,35 | 4 | | ● | ● | |
| **NG4M400LK** | 4,00 | 2,92 | 0,57 | 6,35 | 4 | ● | ● | ● | |
| **NG4M450LK** | 4,50 | 2,92 | 0,57 | 6,35 | 4 | | ● | | |
| **NG4189LK** | 4,80 | 2,92 | 0,57 | 6,35 | 4 | ● | ● | | |
| **NG4M500LK** | 5,00 | 2,92 | 0,32 | 6,35 | 4 | ● | ● | ● | |
| **NG4M550LK** | 5,50 | 3,81 | 0,57 | 6,35 | 4 | | ● | | |
| **NG4M600LK** | 6,00 | 3,81 | 0,57 | 6,35 | 4 | | ● | ● | |
| **NG4250LK** | 6,35 | 3,81 | 0,57 | 6,35 | 4 | ● | ● | | |




● primera elección
○ elección alternativa

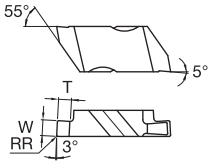
| | | | | | |
|---|---|---|---|---|---|
| P | ● | ● | ● | | |
| M | ● | ● | ○ | | |
| K | ● | ● | ○ | ○ | |
| N | ○ | ○ | | ● | |
| S | ● | ● | | ● | |
| H | ○ | | | | |

## ■ NGD-K



| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | filos del corte | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NGD2M150RK** | 1,50 | 1,09 | 0,19 | 4,06 | 2 | 1 | ● | ● | | |
| **NGD2M200RK** | 2,00 | 1,09 | 0,19 | 5,08 | 2 | 1 | ● | ● | | |
| **NGD2M250RK** | 2,50 | 1,09 | 0,19 | 5,08 | 2 | 1 | ● | ● | | |
| **NGD3062RK** | 1,58 | 1,02 | 0,19 | 3,18 | 3 | 2 | ● | ● | | |
| **NGD3M200RK** | 2,00 | 1,02 | 0,19 | 4,06 | 3 | 1 | ● | ● | | |
| **NGD3094RK** | 2,39 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | ● |
| **NGD3M250RK** | 2,50 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3M300RK** | 3,00 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3125RK** | 3,18 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3M350RK** | 3,50 | 2,92 | 0,32 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3M400RK** | 4,00 | 2,92 | 0,32 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3189RK** | 4,80 | 2,92 | 0,57 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD4125RK** | 3,18 | 1,02 | 0,19 | 6,35 | 4 | 2 | ● | ● | | |
| **NGD4M400RK** | 4,00 | 2,92 | 0,57 | 9,53 | 4 | 1 | ● | ● | | |
| **NGD4M450RK** | 4,50 | 2,92 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **NGD4189RK** | 4,80 | 2,92 | 0,57 | 9,53 | 4 | 1 | ● | ● | | |
| **NGD4M500RK** | 5,00 | 2,92 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **NGD4M550RK** | 5,50 | 3,81 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **NGD4250RK** | 6,35 | 3,81 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **NGD2M150LK** | 1,50 | 1,09 | 0,19 | 4,06 | 2 | 1 | ● | ● | | |
| **NGD2M200LK** | 2,00 | 1,09 | 0,19 | 5,08 | 2 | 1 | ● | ● | | |
| **NGD2M250LK** | 2,50 | 1,09 | 0,19 | 5,08 | 2 | 1 | ● | ● | | |
| **NGD3062LK** | 1,58 | 1,02 | 0,19 | 3,18 | 3 | 2 | ● | ● | | |
| **NGD3M200LK** | 2,00 | 1,02 | 0,19 | 4,06 | 3 | 1 | ● | ● | | |
| **NGD3094LK** | 2,39 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | ● |
| **NGD3M250LK** | 2,50 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3M300LK** | 3,00 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3125LK** | 3,18 | 1,02 | 0,19 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3M350LK** | 3,50 | 2,92 | 0,32 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3M400LK** | 4,00 | 2,92 | 0,32 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD3189LK** | 4,80 | 2,92 | 0,57 | 6,35 | 3 | 1 | ● | ● | | |
| **NGD4125LK** | 3,18 | 1,02 | 0,19 | 6,35 | 4 | 2 | ● | ● | | |
| **NGD4M400LK** | 4,00 | 2,92 | 0,57 | 9,53 | 4 | 1 | ● | ● | | |
| **NGD4M450LK** | 4,50 | 2,92 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **NGD4189LK** | 4,80 | 2,92 | 0,57 | 9,53 | 4 | 1 | ● | ● | | |
| **NGD4M500LK** | 5,00 | 2,92 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **NGD4M550LK** | 5,50 | 3,81 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |
| **NGD4250LK** | 6,35 | 3,81 | 0,57 | 12,70 | 4 | 1 | ● | ● | | |

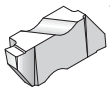
*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*




● primera elección
○ elección alternativa

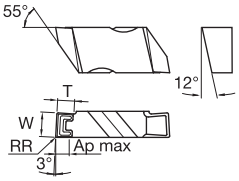
| | | | | |
|---|---|---|---|---|
| P | ● | ● | ● | |
| M | ● | ● | ○ | |
| K | ● | ● | ○ | ○ |
| N | ○ | ○ | | ● |
| S | ● | ● | | ● |
| H | ○ | | | |

## ■ NGP



| Número de catálogo | W | Ap max | T | RR | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NGP2M150R** | 1,50 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP2062R** | 1,58 | – | 2,79 | 0,19 | 2 | ● | | | |
| **NGP2M200R** | 2,00 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP2M250R** | 2,50 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP2M300R** | 3,00 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP3M150R** | 1,50 | – | 1,90 | 0,19 | 3 | ● | | | ● |
| **NGP3M200R** | 2,00 | – | 2,79 | 0,19 | 3 | ● | | | ● |
| **NGP3M250R** | 2,50 | – | 3,81 | 0,19 | 3 | ● | | | ● |
| **NGP3M300R** | 3,00 | – | 3,81 | 0,19 | 3 | ● | | | ● |
| **A izquierdas** | | | | | | | | | |
| **NGP2M150L** | 1,50 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP2062L** | 1,58 | – | 2,79 | 0,19 | 2 | ● | | | |
| **NGP2M200L** | 2,00 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP2M250L** | 2,50 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP2M300L** | 3,00 | – | 2,79 | 0,19 | 2 | ● | | | ● |
| **NGP3M150L** | 1,50 | – | 1,90 | 0,19 | 3 | ● | | | ● |
| **NGP3M200L** | 2,00 | – | 2,79 | 0,19 | 3 | ● | | | ● |
| **NGP3M250L** | 2,50 | – | 3,81 | 0,19 | 3 | ● | | | ● |
| **NGP3M300L** | 3,00 | – | 3,81 | 0,19 | 3 | ● | | | ● |

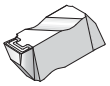
*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*




● primera elección
○ elección alternativa

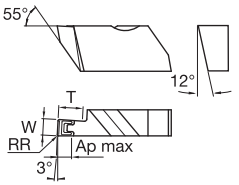
| | | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|
| P | | ● | ● | ● | |
| M | | ● | ● | ○ | |
| K | | ● | ● | ○ | ○ |
| N | | ○ | ○ | | ● |
| S | | ● | ● | | ● |
| H | | ○ | | | |

## ■ NF-K

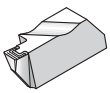


| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NF3M200RK** | 2,00 | 1,02 | 0,19 | 1,78 | 3 | | ● | | |
| **NF3M300RK** | 3,00 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **NF3125RK** | 3,18 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **A izquierdas** | | | | | | | | | |
| **NF3M200LK** | 2,00 | 1,02 | 0,19 | 1,78 | 3 | | ● | | |
| **NF3M300LK** | 3,00 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **NF3125LK** | 3,18 | 1,02 | 0,19 | 3,81 | 3 | | ● | | |
| **NF3156LK** | 3,96 | 2,92 | 0,19 | 3,81 | 3 | | ● | | |

*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*

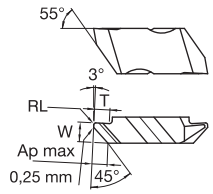



## ■ NFD-K



| Número de catálogo | W | Ap max | RR | T | tamaño de la plaquita | filos del corte | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NFD3M300RK** | 3,00 | 1,02 | 0,19 | 6,35 | 3 | 1 | | ● | | |
| **NFD3125RK** | 3,18 | 1,02 | 0,19 | 6,35 | 3 | 1 | | ● | | |
| **NFD4189RK** | 4,80 | 2,92 | 0,57 | 9,53 | 4 | 1 | | ● | | |
| **NFD4250RK** | 6,35 | 3,81 | 0,57 | 12,70 | 4 | 1 | | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **NFD3M300LK** | 3,00 | 1,02 | 0,19 | 6,35 | 3 | 1 | | ● | | |
| **NFD3125LK** | 3,18 | 1,02 | 0,19 | 6,35 | 3 | 1 | | ● | | |
| **NFD4189LK** | 4,80 | 2,92 | 0,57 | 9,53 | 4 | 1 | | ● | | |

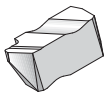
*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*




● primera elección
○ elección alternativa

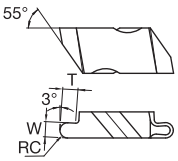
| | | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|
| P | | ● | ● | ● | |
| M | | ● | ● | ○ | |
| K | | ● | ● | ○ | ○ |
| N | | ○ | ○ | | ● |
| S | | ● | ● | | ● |
| H | | ○ | | | |

## NP-K



| Número de catálogo | W | Ap max | RL | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NP2002RK** | 3,68 | — | 0,25 | 2,79 | 2 | ● | ● | | |
| **NP3002RK** | 4,83 | — | 0,25 | 5,08 | 3 | ● | ● | | |
| **NP3012RK** | 4,83 | — | 0,25 | 5,08 | 3 | | ● | | |

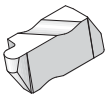
*NOTA: la plaquita que se muestra es de tipo “a derechas”; la plaquita “a izquierdas” es una imagen espejo.*
*La tolerancia de ancho es de +/- 0,13 mm.*




● primera elección
○ elección alternativa

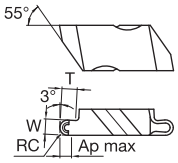
| | | | | | |
|---|---|---|---|---|---|
| P | ● | ● | ● | | |
| M | ● | ● | ○ | | |
| K | ● | ● | ○ | ○ | |
| N | ○ | ○ | | ● | |
| S | ● | ● | | ● | |
| H | ○ | | | | |

## ■ NR



| Número de catálogo | W | Ap max | RC | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NR2M050R** | 1,00 | – | 0,50 | 1,27 | 2 | ● | ● | ● | |
| **NR2M075R** | 1,50 | – | 0,75 | 2,79 | 2 | ● | ● | ● | |
| **NR2031R** | 1,58 | – | 0,79 | 2,79 | 2 | ● | ● | | |
| **NR2M100R** | 2,00 | – | 1,00 | 2,79 | 2 | ● | ● | ● | |
| **NR2047R** | 2,39 | – | 1,19 | 2,79 | 2 | | ● | | |
| **NR2M125R** | 2,50 | – | 1,25 | 2,79 | 2 | ● | ● | ● | |
| **NR2M150R** | 3,00 | – | 1,50 | 2,79 | 2 | ● | ● | ● | |
| **NR2M175R** | 3,50 | – | 1,75 | 2,79 | 2 | ● | ● | ● | |
| **NR3031R** | 1,58 | – | 0,79 | 2,39 | 3 | ● | ● | | ● |
| **NR3M100R** | 2,00 | – | 1,00 | 2,39 | 3 | ● | ● | ● | |
| **NR3047R** | 2,39 | – | 1,19 | 3,81 | 3 | ● | ● | | ● |
| **NR3M125R** | 2,50 | – | 1,25 | 3,81 | 3 | ● | ● | ● | |
| **NR3M150R** | 3,00 | – | 1,50 | 3,81 | 3 | ● | ● | ● | |
| **NR3062R** | 3,18 | – | 1,59 | 3,81 | 3 | ● | ● | | ● |
| **NR3M175R** | 3,50 | – | 1,75 | 3,81 | 3 | ● | ● | ● | |
| **NR3M200R** | 4,00 | – | 2,00 | 3,81 | 3 | ● | ● | ● | |
| **NR3M225R** | 4,50 | – | 2,25 | 3,81 | 3 | ● | ● | ● | |
| **NR3094R** | 4,78 | – | 2,39 | 3,81 | 3 | ● | ● | | |
| **NR4M200R** | 4,00 | – | 2,00 | 6,35 | 4 | ● | ● | ● | |
| **NR4M225R** | 4,50 | – | 2,25 | 6,35 | 4 | ● | ● | ● | |
| **NR4M250R** | 5,00 | – | 2,50 | 6,35 | 4 | ● | ● | ● | |
| **NR4125R** | 6,35 | – | 3,18 | 6,35 | 4 | ● | ● | | |
| **A izquierdas** | | | | | | | | | |
| **NR2M050L** | 1,00 | – | 0,50 | 1,27 | 2 | ● | ● | ● | |
| **NR2M075L** | 1,50 | – | 0,75 | 2,79 | 2 | ● | ● | ● | |
| **NR2031L** | 1,58 | – | 0,79 | 2,79 | 2 | ● | ● | | |
| **NR2M100L** | 2,00 | – | 1,00 | 2,79 | 2 | ● | ● | ● | |
| **NR2047L** | 2,39 | – | 1,19 | 2,79 | 2 | | ● | | |
| **NR2M125L** | 2,50 | – | 1,25 | 2,79 | 2 | ● | ● | ● | |
| **NR2M150L** | 3,00 | – | 1,50 | 2,79 | 2 | ● | ● | ● | |
| **NR2M175L** | 3,50 | – | 1,75 | 2,79 | 2 | ● | ● | ● | |
| **NR3031L** | 1,58 | – | 0,79 | 2,39 | 3 | ● | ● | | ● |
| **NR3M100L** | 2,00 | – | 1,00 | 2,39 | 3 | ● | ● | ● | |
| **NR3047L** | 2,39 | – | 1,19 | 3,81 | 3 | ● | ● | | ● |
| **NR3M125L** | 2,50 | – | 1,25 | 3,81 | 3 | ● | ● | ● | |
| **NR3M150L** | 3,00 | – | 1,50 | 3,81 | 3 | ● | ● | ● | |
| **NR3062L** | 3,18 | – | 1,59 | 3,81 | 3 | ● | ● | | ● |
| **NR3M175L** | 3,50 | – | 1,75 | 3,81 | 3 | ● | ● | ● | |
| **NR3M200L** | 4,00 | – | 2,00 | 3,81 | 3 | ● | ● | ● | |
| **NR3M225L** | 4,50 | – | 2,25 | 3,81 | 3 | ● | ● | ● | |
| **NR3094L** | 4,78 | – | 2,39 | 3,81 | 3 | ● | ● | | |
| **NR4M200L** | 4,00 | – | 2,00 | 6,35 | 4 | ● | ● | ● | |
| **NR4M225L** | 4,50 | – | 2,25 | 6,35 | 4 | ● | ● | ● | |
| **NR4M250L** | 5,00 | – | 2,50 | 6,35 | 4 | ● | ● | ● | |
| **NR4125L** | 6,35 | – | 3,18 | 6,35 | 4 | ● | ● | | |

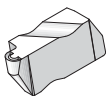
*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*




● primera elección
○ elección alternativa

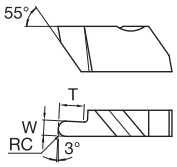
| | | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|
| P | | ● | ● | ● | |
| M | | ● | ● | ○ | |
| K | | ● | ● | ○ | ○ |
| N | | ○ | ○ | | ● |
| S | | ● | ● | | ● |
| H | | ○ | | | |

## ■ NR-K

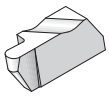


| Número de catálogo | W | Ap max | RC | T | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NR3031RK** | 1,58 | 1,98 | 0,79 | 2,39 | 3 | ● | ● | | |
| **NR3047RK** | 2,39 | 1,91 | 1,19 | 3,81 | 3 | ● | ● | | |
| **NR3062RK** | 3,18 | 2,92 | 1,59 | 3,81 | 3 | ● | ● | | |
| **NR3078RK** | 3,96 | 2,54 | 1,98 | 3,81 | 3 | ● | ● | | |
| **NR4062RK** | 3,18 | 2,92 | 1,59 | 3,81 | 4 | ● | ● | | |
| **NR4094RK** | 4,78 | 3,81 | 2,39 | 6,35 | 4 | ● | ● | | |
| **NR4125RK** | 6,35 | 3,81 | 3,18 | 6,35 | 4 | ● | ● | | |
| **A izquierdas** | | | | | | | | | |
| **NR3031LK** | 1,58 | 1,98 | 0,79 | 2,39 | 3 | ● | ● | | |
| **NR3047LK** | 2,39 | 1,91 | 1,19 | 3,81 | 3 | ● | ● | | |
| **NR3062LK** | 3,18 | 2,92 | 1,59 | 3,81 | 3 | ● | ● | | |
| **NR3078LK** | 3,96 | 2,54 | 1,98 | 3,81 | 3 | ● | ● | | |
| **NR4062LK** | 3,18 | 2,92 | 1,59 | 3,81 | 4 | ● | ● | | |
| **NR4094LK** | 4,78 | 3,81 | 2,39 | 6,35 | 4 | ● | ● | | |
| **NR4125LK** | 6,35 | 3,81 | 3,18 | 6,35 | 4 | ● | ● | | |

*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*

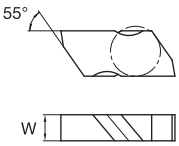



## ■ NRD



| Número de catálogo | W | Ap max | RC | T | tamaño de la plaquita | filos del corte | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NRD3031R** | 1,58 | — | 0,79 | 3,18 | 3 | 2 | ● | ● | | |
| **NRD3062R** | 3,18 | — | 1,59 | 6,35 | 3 | 1 | ● | ● | | |
| **NRD4062R** | 3,18 | — | 1,59 | 6,35 | 4 | 2 | ● | ● | | |
| **NRD4125R** | 6,35 | — | 3,18 | 12,70 | 4 | 1 | ● | ● | | |
| **A izquierdas** | | | | | | | | | | |
| **NRD3031L** | 1,58 | — | 0,79 | 3,18 | 3 | 2 | ● | ● | | |
| **NRD3062L** | 3,18 | — | 1,59 | 6,35 | 3 | 1 | ● | ● | | |
| **NRD4062L** | 3,18 | — | 1,59 | 6,35 | 4 | 2 | ● | ● | | |
| **NRD4125L** | 6,35 | — | 3,18 | 12,70 | 4 | 1 | ● | ● | | |

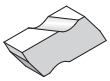
*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*




● primera elección
○ elección alternativa

| | | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|
| P | | ● | ● | ● | |
| M | | ● | ● | ○ | |
| K | | ● | ● | ○ | ○ |
| N | | ○ | ○ | | ● |
| S | | ● | ● | | ● |
| H | | ○ | | | |

## ■ NB



| Número de catálogo | W | tamaño de la plaquita | TN6010 | TN6025 | TN7110 | THM |
|---|---|---|---|---|---|---|
| **A derechas** | | | | | | |
| **NB2R** | 3,81 | 2 | | | | ● |
| **NB3R** | 4,95 | 3 | | | | ● |
| **A izquierdas** | | | | | | |
| **NB2L** | 3,81 | 2 | | | | ● |
| **NB3L** | 4,95 | 3 | | | | ● |

*NOTA: la plaquita que se muestra es de tipo "a derechas"; la plaquita "a izquierdas" es una imagen espejo.*
*Las piezas de material en bruto NB están diseñadas para permitir la modificación de la dimensión W y la forma final.*
*Se proporciona la dimensión W para indicar el ancho máximo posible.*
*Disponible únicamente en calidades sin recubrir.*

## Plaquitas TopGroove: La mejor plataforma para soluciones a medida

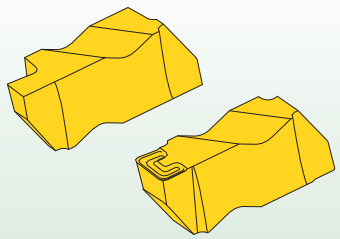
Todas las plaquitas a medida de TopGroove disfrutan de la rigidez superior de nuestro sistema de fijación y portaherramientas TopGroove. Para mayor productividad, la mayoría de pedidos a medida pueden incorporarse a las plaquitas de doble extremo.

Los pedidos a medida emplean la tecnología WIDIA™ probada de calidades de metal duro como base para optimizar el rendimiento de las herramientas. Los ángulos de desprendimiento positivo también están disponibles en la mayoría de plaquitas.

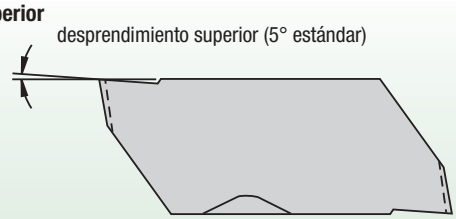
Un ultramoderno diseño asistido por ordenador permite un rápido desarrollo del diseño a medida de la plaquita. Para mayor comodidad, siempre hay un plano conceptual disponible para facilitar el desarrollo de una plaquita.

Existen innumerables variantes del diseño de punta plana de TopGroove. Además, el control de virutas en los estilos más comunes permite una auténtica optimización y productividad. WIDIA también ofrece hojas para plaquitas estilo NB y NBD. Puede rectificar estos materiales y darles su forma final en su propio taller.

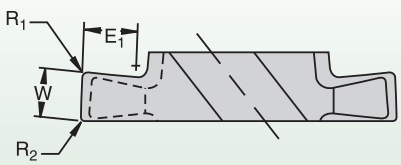
Sean cuales sean sus requisitos de ranurado especiales, WIDIA puede proporcionar una solución eficaz. Disponemos de los conocimientos técnicos, los recursos y el compromiso para ayudarle a desarrollar diseños de plaquita que satisfagan las necesidades de sus aplicaciones de mecanizado.



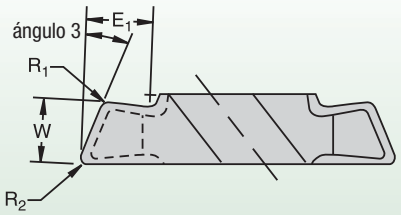
**desprendimiento superior**



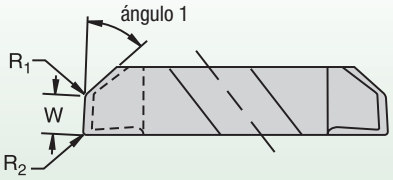

**estilo A**



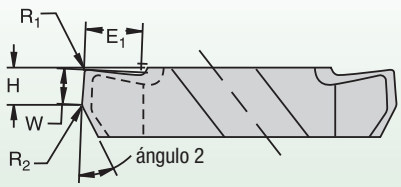

**estilo B1**



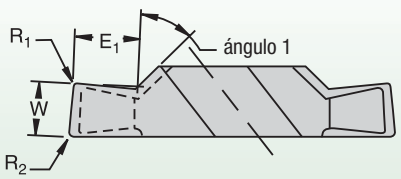

**estilo B2**



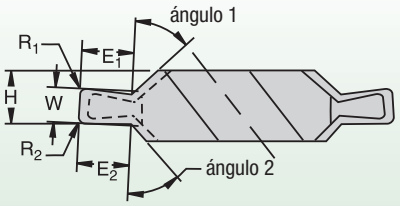

**estilo B3**



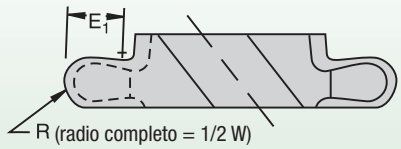

**estilo B4**



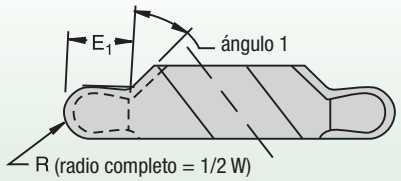

**estilo C1**



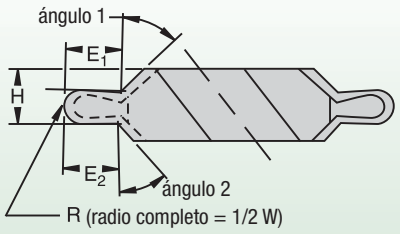

**estilo D**




**estilo F**




**estilo G**




*NOTA: Los estilos comunes que aquí se muestran son versiones a derechas. También hay versiones a izquierdas disponibles.*

## Sistemas de ranurado TopGroove™

Utilice esta hoja de trabajo de pedido a medida para modificar cualquiera de nuestros productos y satisfacer sus propias especificaciones. Si sus requisitos personales no entran en estas categorías, póngase en contacto con su distribuidor de WIDIA™.

Confíe en nuestros experimentados distribuidores y nuestro equipo de diseñadores de WIDIA: diseñarán la mejor solución para usted.

**Fecha** / /

### Dimensiones especificadas por el cliente

**Estilo** (marque uno con un círculo) A B1 B2 B3 B4 C1 D F G

**Orientación** (marque uno con un círculo) a izquierdas a derechas

| | | | |
|---|---|---|---|
| **Desprendimiento superior** | | **Ancho total (T)** | |
| **Ancho de corte (W)** | | **Ángulo 1** | |
| **Radio de esquina 1 ($R_1$)** | | **Ángulo 2** | |
| **Radio de esquina 2 ($R_2$)** | | **Compensación (H)** | |
| **Profundidad de corte ($E_1$)** | | **Otros** (especifique) | |

**Instrucciones especiales** (haga las anotaciones o bocetos que considere necesarios necesarios en la casilla de la derecha)

**Estándar de catálogo más próximo**

**Cliente**

**Distribuidor**

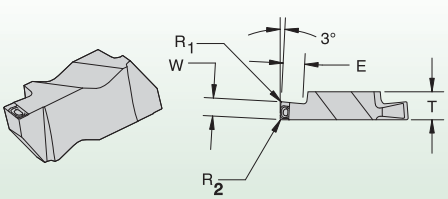
**Requisitos de envío**

*Aviso a distribuidores: utilicen esta hoja de trabajo para recopilar información para el cliente.*

☐ Por tierra ☐ Aéreo 1 día ☐ Aéreo 2 días ☐ Aéreo 3 días

## Especiales A-SK

- Acción de corte positivo de 10º
- Ranurado
- Ranurado frontal



| número de catálogo de plaquitas | | rango de anchos W | rango de radios de esquinas $R_1$ y $R_2$ | E | T | calidades |
|---|---|---|---|---|---|---|
| a derechas | a izquierdas | | | | | |
| **NG2-R-SK o NF2-R-SK** | **NG2-L-SK o NF2-L-SK** | 0,66–1,42<br>1,45–3,43 | 0,00–0,18<br>0,08–0,33 | 1,27<br>2,79 | 3,810 | calidades de metal duro oferta previa solicitud. **Consulte la página D44.** |
| **NG3-R-SK o NF3-R-SK** | **NG3-L-SK o NF3-L-SK** | 1,07–1,70<br>1,73–1,93<br>1,96–2,39<br>2,41–2,67<br>2,69–3,18<br>3,20–3,40<br>3,43–3,96<br>3,99–4,42<br>4,67–4,98 | 0,08–0,33<br>0,13–0,51<br>0,13–0,76<br>0,13–0,51<br>0,13–0,76<br>0,13–0,51<br>0,13–0,76<br>0,20–0,46<br>0,46–0,71 | 2,39<br>2,39<br>3,81<br>3,81<br>3,81<br>3,81<br>3,81<br>3,81<br>3,81 | 4,950 | |
| **NG4-R-SK o NF4-R-SK** | **NG4-L-SK o NF4-L-SK** | 2,54–2,79<br>2,82–3,18<br>3,20–3,33<br>3,35–3,96<br>3,99–4,11<br>3,89–4,80<br>4,83–4,85<br>4,88–5,18<br>6,22–6,53 | 0,13–0,51<br>0,13–0,76<br>0,13–0,51<br>0,13–0,76<br>0,13–0,51<br>0,13–0,76<br>0,46–0,71<br>0,20–0,46<br>0,46–0,64 | 3,81<br>3,81<br>3,81<br>3,81<br>3,81<br>6,35<br>6,35<br>6,35<br>6,35 | 6,480 | |

*Las plaquitas NG-SK, NF-SK, NGD-SK y NFD-SK pueden pedirse de forma especial, dentro de las especificaciones enumeradas en las tablas anteriores.*

*Ejemplo de pedido: NF3R-SK W=2,29; $R_1$=0,25; $R_2$=0,25; calidad TN6010.*

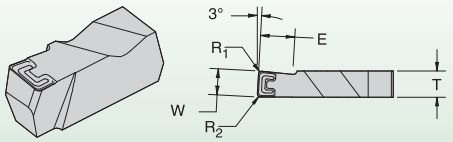
*Se aplicará una tolerancia estándar de ±0,03 mm en el ancho (W) a menos que se especifique lo contrario. Se aplicará una tolerancia estándar de ±0,06 mm en los radios ($R_1$ y $R_2$) a menos que se especifique lo contrario.*

*En caso de ser necesaria una profundidad de corte (E) mayor, especifíquela. Consulte el plano de la aplicación y las tablas para obtener las profundidades de ranura frontal máximas y los diámetros de ranura frontal mínimos.*

*Además de las líneas generales descritas, puede ser necesario ofertar plaquitas de ranura frontal con radio completo. El rendimiento del control de virutas de los tipos de plaquita estándar puede variar en ciertas condiciones.*

## Especiales

- Acción de corte positivo de 10º
- Ranurado profundo
- Ranurado frontal profundo



| número de catálogo de plaquitas | | rango de anchos W | rango de radios de esquinas $R_1$ y $R_2$ | E | T | calidades |
|---|---|---|---|---|---|---|
| a derechas | a izquierdas | | | | | |
| **NGD3-R-SK o NFD3-R-SK** | **NGD3-L-SK o NFD3-L-SK** | 1,45–1,75<br>2,26–2,57*<br>3,05–3,35*<br>4,67–4,98* | .008–.033<br>.008–.033<br>.008–.033<br>.046–.071 | 3,18<br>6,35<br>6,35<br>6,35 | 4,95 | calidades de metal duro presupuestadas previa solicitud. |
| **NGD4-R-SK o NFD4-R-SK** | **NGD4-L-SK o NFD4-L-SK** | 3,05–3,35*<br>4,57–4,98*<br>6,22–6,53* | .008–.033<br>.046–.071<br>.046–.071 | 6,35<br>9,53<br>12,70 | 6,48 | **Consulte la página D44.** |

**Un filo de corte.*

*Las plaquitas NG-SK, NF-SK, NGD-SK y NFD-SK pueden pedirse de forma especial, dentro de las especificaciones enumeradas en las tablas anteriores.*

*Ejemplo de pedido: NF3R-SK W=2,0; $R_1$=0,09; $R_2$=0,09; calidad TN6010.*

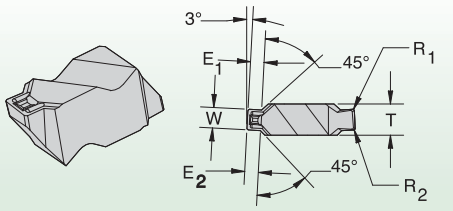
*A menos que se especifique lo contrario, se aplicará una tolerancia estándar de ±0,025 mm en el ancho (W) y una tolerancia estándar de ±0,063 mm en los radios ($R_1$ y $R_2$).*

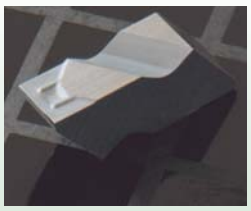
*En caso de ser necesaria una profundidad de corte (E) mayor, especifíquela. Consulte el plano de la aplicación y las tablas para obtener las profundidades de ranura frontal máximas y los diámetros de ranura frontal mínimos.*

*Además de las líneas generales descritas, puede ser necesario presupuestar plaquitas de ranura frontal con radio completo. El rendimiento del control de virutas de los tipos de plaquita estándar puede variar en ciertas condiciones.*

## Especiales C1-SK

- Ranurado y biselado

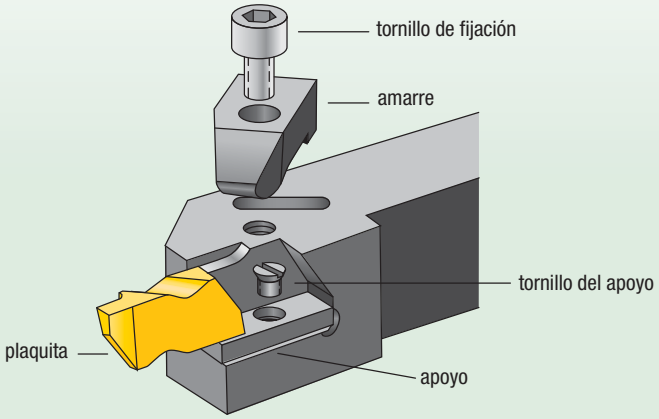


| número de catálogo de plaquitas | | rango de anchos W | rango de radios de esquinas $R_1$ y $R_2$ | E | T | calidades |
|---|---|---|---|---|---|---|
| a derechas | a izquierdas | | | | | |
| **NB2-R-K** | **NB2-L-K** | 1,19–3,18 | 0,13–0,38 | 2,54 | 3,81 | calidades de metal duro presupuestadas previa solicitud. |
| **NB3-R-K** | **NB3-L-K** | 2,39–4,32 | 0,13–0,64 | 3,81 | 4,95 | **Consulte la página D44.** |

*NOTA: el estilo de plaquita anterior es para las operaciones de ranurado y biselado simultáneas con control de virutas.*

## Portaherramientas y barras de mandrinar TopGroove




| tamaño y tipo de plaquita | amarre | tornillo de fijación | apoyo | tornillo del apoyo |
|---|---|---|---|---|
| NG-1L | CM-109 | S-304 | – | – |
| NG-2R | CM-182 | S-310 | – | – |
| NG-2L | CM-183 | S-310 | – | – |
| NG-2R | CM-74 | S-310 | – | – |
| NG-2L | CM-75 | S-310 | – | – |
| NG-3R | CM-184 | S-412 | – | – |
| NG-3L | CM-185 | S-412 | – | – |
| NG-3R | CM-72 | S-412 | – | – |
| NG-3L | CM-73 | S-412 | – | – |
| NG-3R* | CM-78 | S-412 | – | – |
| NG-3L* | CM-70 | S-412 | – | – |
| NG-4R | CM-72 | S-412 | SM-420 | SL-344 |
| NG-4L | CM-73 | S-412 | SM-420 | SL-344 |
| NG-5R | CM-80 | S-352 | – | – |
| NG-5L | CM-81 | S-352 | – | – |
| NG-6R | CM-120 | S-412 | SM-416 | S-111 |
| NG-6L | CM-121 | S-412 | SM-416 | S-111 |
| Ranurado de desahogo TopGroove | | | | |
| NU-3125R | CM-72 | S-412 | – | – |
| NU-3125L | CM-73 | S-412 | – | – |
| NU-3125R** | CM-72 | S-618 | – | – |
| NU-3125L** | CM-73 | S-618 | – | – |
| Aplicación de roscado | | | | |
| NTU-4R | CM-72 | S-412 | – | – |
| NTU-4L | CM-73 | S-412 | – | – |

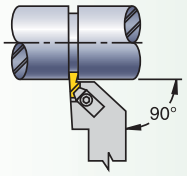
**Cabeza de mandrinar de 25,0 mm de diámetro.*

***Cabeza de mandrinar.*

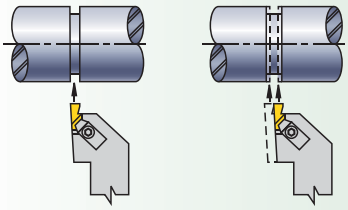
## Guía de fallos y soluciones de herramientas de ranurado

### Soluciones prácticas para problemas de ranurado comunes

#### Posición de los portas para la operación de ranurado

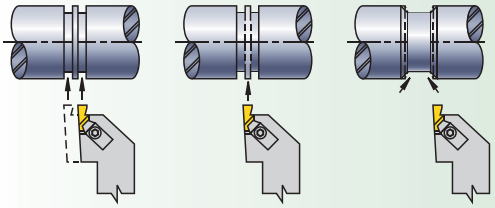



#### Cómo cortar una ranura ligeramente más ancha que la herramienta de ranurado



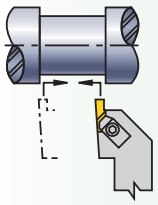
1. Vacíe el centro de la ranura.
2. Vacíe cada lado de la ranura para conseguir el ancho especificado. Utilice una tasa de avance más lenta al cortar los lados de la ranura.

#### Cómo cortar ranuras más anchas



1. Vacíe ambos lados del ancho de ranura.
2. Vacíe el área central para eliminar el material restante.
3. Vacíe ambos lados de la ranura en el ángulo requerido, utilizando aproximadamente la mitad del ancho de la herramienta de ranurado para lograr el máximo ancho de corte.

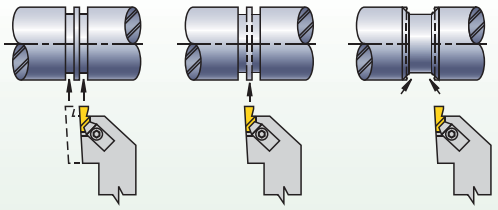
#### Torneado en acabado de la ranura



1. Siga las recomendaciones anteriores.
2. Para evitar el astillamiento de la plaquita y conseguir la perpendicularidad de las paredes de la ranura, siga la dirección que se muestra aquí para la herramienta.
3. Utilice la profundidad de corte más ligera pero que siga permitiendo un buen acabado superficial.

| problema | solución |
|---|---|
| rebaba | 1. Asegurar la altura central de la herramienta.<br>2. Utilizar una herramienta afilada (indexe más a menudo).<br>3. Utilizar una plaquita con desprendimiento positivo y recubrimiento de PVD.<br>4. Utilizar la calidad correcta para el material de la pieza de trabajo.<br>5. Utilizar la geometría correcta (p. ej. desprendimiento positivo para material endurecido por medios mecánicos).<br>6. Biselar antes de ranurar.<br>7. Cambiar la dirección de la herramienta. |
| pobre acabado superficial | 1. Aumentar la velocidad.<br>2. Utilizar una herramienta afilada (indexar más a menudo).<br>3. Llevar a cabo 1–3 revoluciones (máx.) con la herramienta en la parte inferior.<br>4. Utilizar una geometría de control de virutas adecuada.<br>5. Aumentar la concentración o el flujo de refrigerante.<br>6. Asegurar una configuración adecuada (voladizo, tamaño del mango).<br>7. Utilizar la geometría correcta (p. ej. desprendimiento positivo para material endurecido por medios mecánicos). |
| la parte inferior de la ranura no es plana | 1. Utilizar una herramienta afilada (indexar más a menudo).<br>2. Llevar a cabo una permanencia de 1–3 revoluciones (máx.) con la herramienta en la parte inferior.<br>3. Reducir el voladizo de la herramienta (aumentar la rigidez).<br>4. Asegurar la correcta alineación de la herramienta.<br>5. Reducir la tasa de avance en la parte inferior de la ranura.<br>6. Utilizar una plaquita wiper.<br>7. Asegurar la altura central de la herramienta. |
| pobre control de virutas | 1. Utilizar una plaquita con geometría de control de virutas “K”.<br>2. Utilizar una herramienta afilada (indexar más a menudo).<br>3. Aumentar la concentración de refrigerante.<br>4. Ajustar el avance (por lo general, aumentar primero). |
| vibración | 1. Reducir el voladizo de la pieza de trabajo y la herramienta.<br>2. Ajustar la velocidad y el avance (por lo general, aumentar primero).<br>3. Asegurar la altura central. |
| plaquita astillamiento | 1. Utilizar la calidad correcta para el material de la pieza de trabajo.<br>2. Aumentar la velocidad.<br>3. Reducir el avance.<br>4. Utilizar una calidad más fuerte.<br>5. Aumentar la rigidez de la configuración y la herramienta. |
| paredes laterales no rectas | 1. Comprobar que la alineación de la herramienta esté recta.<br>2. Utilizar la mano de plaquita correcta.<br>3. Reducir el voladizo de la herramienta y la pieza de trabajo.<br>4. Utilizar una plaquita afilada (indexar más a menudo). |

## Directrices de mecanizado para control de virutas • Ranurado



Cuando el diámetro apropiado para la fresa no esté disponible, se conseguirán resultados positivos con un posicionamiento apropiado de la fresa.

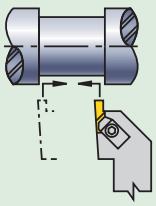
- La altura central de la plaquita debe posicionarse en el centro de la pieza de trabajo o hasta 0,13 mm por encima.
- No se recomienda permanecer en la parte inferior de la ranura demasiado tiempo (más de tres revoluciones).
- El control de virutas está relacionado con la tasa de avance y debe ajustarse a la situación en particular. El rango de avances recomendado es de 0,08–0,3 mm/rev.

## Directrices de mecanizado para control de virutas • Torneado/perfilado

La profundidad de corte máxima para el corte lateral (torneado/perfilado) depende del material que se vaya a cortar y del ancho de la herramienta.

- Una plaquita con un ancho de 0,79 mm–1,6 mm puede cortar hasta una profundidad máxima de 0,6 mm.
- Una plaquita con un ancho de 1,7 mm–3,3 mm puede cortar hasta una profundidad máxima de 1,0 mm.
- Una plaquita con un ancho de 3,5 mm–4,8 mm puede cortar hasta una profundidad máxima de 2,0 mm.
- Una plaquita con un ancho de 5,0 mm–6,35 mm puede cortar hasta una profundidad máxima de 3,0 mm.

### Torneado en acabado de la ranura



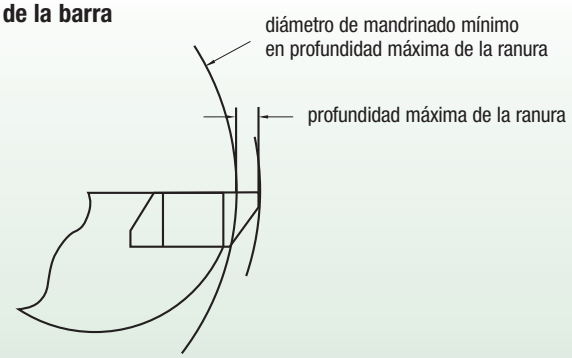
1. Vacíe ambos lados del ancho de ranura.
2. Vacíe el área central para eliminar el material restante.
3. Para evitar el astillamiento de la plaquita y conseguir la perpendicularidad de las paredes de la ranura, siga la dirección que se muestra para la herramienta.
4. Utilice la profundidad de corte más ligera pero que siga permitiendo un buen astillamiento, así como una larga vida de la herramienta y un buen acabado superficial.

| Límites de ranura | | |
|---|---|---|
| número de catálogo de plaquitas | profundidad interior máxima de la ranura<br>mm | diámetro de agujero mínimo<br>mm |
| NG-1094L | 1,91<br>1,02 | 20,32<br>11,18 |
| NG-2031R/L<br>NG-2041R/L<br>NG-2047R/L<br>NG-2058R/L | 1,27 | 18,54 |
| NG-2062R/L<br>NG-2094R/L<br>NG-2125R/L | 2,79<br>2,59<br>2,49<br>2,03<br>1,40 | 63,50<br>44,45<br>38,10<br>25,40<br>18,54 |
| NG-3047R/L<br>NG-3062R/L<br>NG-3072R/L<br>NG-3078R/L<br>NG-3088R/L | 2,39<br>2,29<br>1,91 | 44,45<br>41,28<br>34,93 |
| NG-3094R/L<br>NG-3097R/L<br>NG-3105R/L<br>NG-3110R/L<br>NG-3122R/L<br>NG-3125R/L<br>NG-3142R/L<br>NG-3156R/L<br>NG-3178R/L<br>NG-3185R/L<br>NG-3189R/L | 3,81<br>3,68<br>3,51<br>3,18<br>2,79 | 60,33<br>53,98<br>47,63<br>41,28<br>34,93 |
| NG-4125R/L | 3,81 | 69,85 |
| NG-4189R/L<br>NG-4213R/L<br>NG-4219R/L<br>NG-4250R/L | 6,35<br>6,22<br>6,10<br>5,54<br>5,08 | 146,05<br>127,00<br>114,30<br>82,55<br>63,50 |

*NOTA: se aplican la misma profundidad máxima de ranura y el mismo diámetro de mandrinado mínimo en las plaquitas métricas NG-K (control de virutas) y NR (radio completo) de tamaño similar.*

*Los mismos límites de profundidad del ranurado interior son una función del contraste entre la incidencia de las barras y los diámetros de mandrinado.*

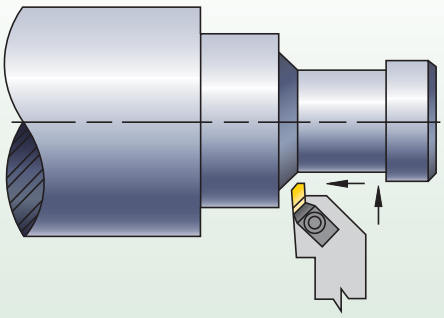
## Profundidad de ranurado interior frente a interferencia de la barra




*NOTA: los límites de profundidad del ranurado interior son una función del contraste entre la incidencia de las barras y los diámetros de mandrinado.*

## Directrices de mecanización para torneado en retroceso/torneado/perfilado

Las plaquitas TopGroove de tipo NP-K fueron diseñadas específicamente para el torneado en retroceso en tornos automáticos pequeños, pero también encuentran aplicaciones para otras operaciones de torneado ligero y de perfilado. Para aplicaciones generales, la profundidad de corte máxima no debe sobrepasar de 2,74 mm para las plaquitas de tamaño 2 o de 3,84 mm para las de tamaño 3.



## Directrices de mecanizado para el uso de plaquitas de ranurado profundo TopGroove (NGD)

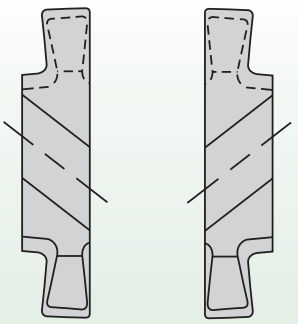
Por lo general, las plaquitas de tipo NGD y NRD con dos filos de corte no requieren cambios de salto en la máquina. Sin embargo, sí lo necesitan las plaquitas con un solo filo de corte. Consulte esta tabla para asegurar unos ajustes de salto adecuados.

| número de catálogo de plaquitas | añadir a la dimensión C | añadir a la dimensión F |
|---|---|---|
| NGD-3062 | 0,00 | 0,00 |
| NGD-3094 | 2,54 | 2,54 |
| NGD-3125 | 2,54 | 2,54 |
| NGD-3189 | 2,54 | 2,54 |
| NGD-4125 | 0,00 | 0,00 |
| NGD-4189 | 3,18 | 3,18 |
| NGD-4250 | 6,35 | 6,35 |
| NRD-3031 | 0,00 | 0,00 |
| NRD-3062 | 2,54 | 2,54 |
| NRD-4062 | 0,00 | 0,00 |
| NRD-4094 | 6,35 | 6,35 |
| NRD-4125 | 6,35 | 6,35 |

## Guía para la selección de plaquitas TopGroove

- Todas las plaquitas TopGroove han sido rectificadas con precisión para proporcionar una ubicación precisa del filo y asegurar un bloqueo de la plaquita en el alojamiento del portaherramientas.
- Las plaquitas TopGroove pueden utilizarse tanto en portaherramientas como en barras de mandrinar.
- Los portaherramientas TopGroove a derechas emplean plaquitas a derechas. Los portaherramientas TopGroove a izquierdas emplean plaquitas a izquierdas.
- Las barras de mandrinar TopGroove a derechas emplean plaquitas a izquierdas. Las barras de mandrinar TopGroove a izquierdas emplean plaquitas a derechas.

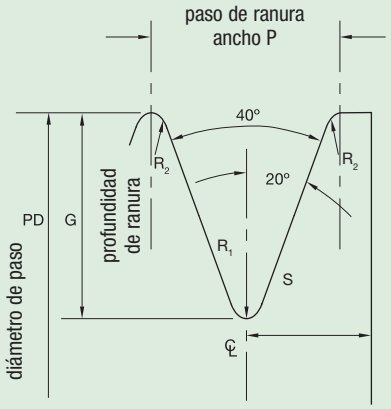
*Consulte la selección de calidades de metal duro y más información técnica en la página D44.*



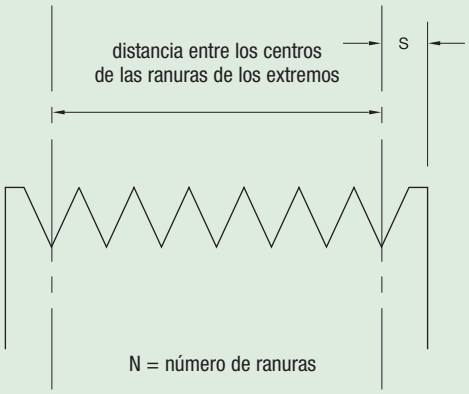
## Directrices de mecanizado para el ranurado Poly-Vee con solución a medida y plaquitas TopGroove NV (NV3-J y NV4-L)

- Para mecanizar la sección transversal “J”, utilice la plaquita NV3-J.
- Para mecanizar la sección transversal “L”, utilice la plaquita NV4-L.

**Sección J**




**Sección L**

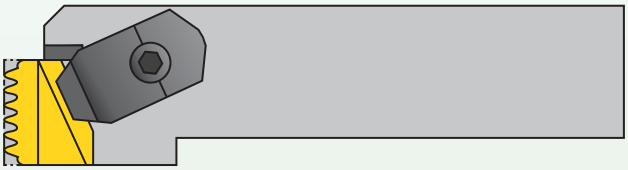


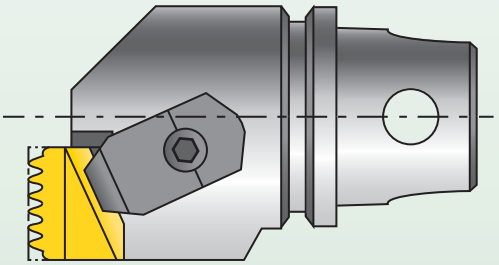

### Tolerancias y dimensiones de ranuras para poleas

| sección transversal de la ranura | ancho del paso (P) | profundidad de ranura (G) | radio mínimo (R2) | radio (R1) | distancia de los extremos | distancia entre los centros de las ranuras de los extremos y la tolerancia máxima acumulada |
|---|---|---|---|---|---|---|
| J | 2,34 ±0,03 | 2,21 ±0,13 | 0,20 | 0,32 ±0,06 | 3,18 | (N-1)4,88 ±0,25 |
| L | 4,70 ±0,05 | 5,11 ±0,13 | 0,38 | 0,32 ±0,06 | 9,53 | (N-1)4,70 ±0,25 |

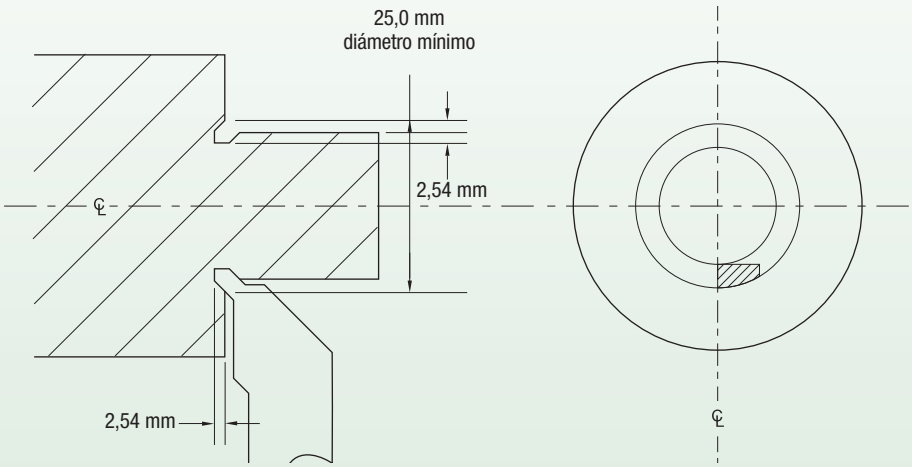
## Ranurado Poly-Vee multi-diente

Deje que WIDIA™ oferte sus aplicaciones de ranurado Poly-Vee multi-diente. Portas y plaquitas semiestándar disponibles. El resistente diseño de TopGroove mantiene rígida a la plaquita y supera a cualquier otro sistema de herramientas para esta aplicación.



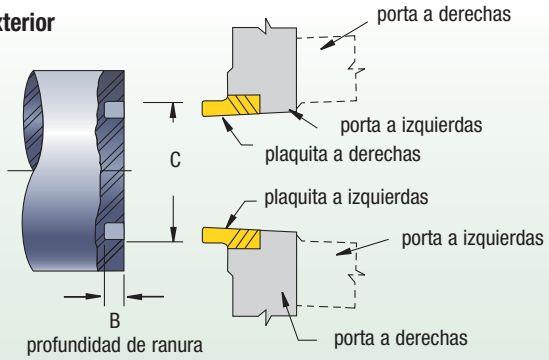


## Directrices de mecanizado para operaciones de destalonado con solución a medida y plaquitas TopGroove NU (NU3094, NU3125 y NU3156)



## Directrices de mecanizado para operaciones de ranurado frontal • Exterior

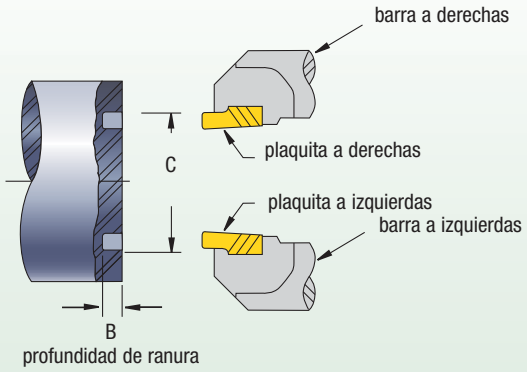
**Portaherramientas**




| Plaquitas NF/NDF estándar | | |
|---|---|---|
| familia de plaquitas | profundidad máxima de ranura B<br>mm | diámetro mínimo de ranura C<br>mm |
| NF-3 | 1,52 | 23,9 |
| NF-3 | 2,39 | 30,5 |
| NF-3 | 3,18 | 36,1 |
| NF-3 | 3,81 | 41,3 |
| NFD-3 | 6,35 | 47,6 |
| NFD-4 | 9,53 | 57,2 |
| NFD-4 | 12,70 | 57,2 |

## Directrices de mecanizado para operaciones de ranurado frontal • Exterior

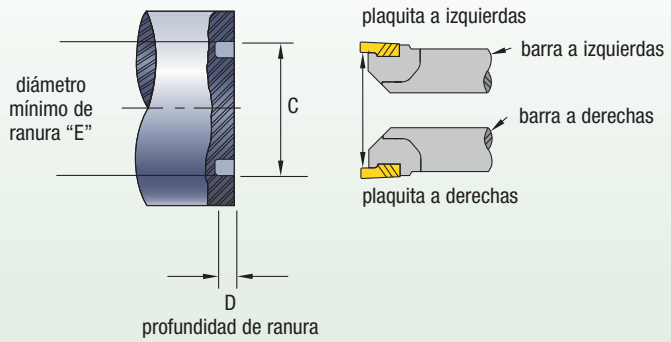
**Barras de mandrinar**




| Plaquitas NG/NGD estándar | | |
|---|---|---|
| familia de plaquitas | profundidad máxima de ranura B<br>mm | diámetro mínimo de ranura C<br>mm |
| NG-2 | 1,27 | 54,0 |
| NG-2 | 2,79 | 88,9 |
| NG-3 | 2,39 | 101,6 |
| NG-3 | 3,18 | 127,0 |
| NG-3 | 3,81 | 139,7 |
| NGD-3 | 6,35 | 174,6 |
| NG-4 | 3,81 | 152,4 |
| NG-4 | 6,35 | 209,6 |
| NGD-4 | 9,53 | 222,3 |
| NGD-4 | 12,70 | 222,3 |

## Directrices de mecanizado para operaciones de ranurado frontal • Interior

**Barras de mandrinar**



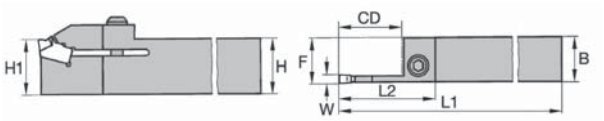

| Plaquitas NG/NGD estándar | | |
|---|---|---|
| **familia de plaquitas** | **profundidad máxima de ranura D**<br>**mm** | **diámetro mínimo de ranura E**<br>**mm** |
| NFD-3-KI | 6,35 | 63,5<br>*NOTA: Compruebe también el diámetro de mandrinado mínimo de la barra de mandrinar. Consulte la página D41.* |

# ProGroove™

*Ranurado y tronzado ProGroove™*

## Características y ventajas:

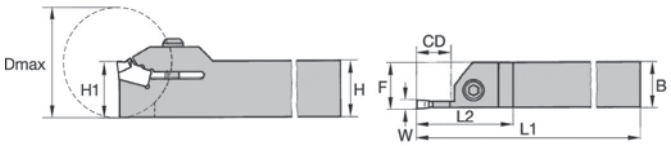
- Plaquitas de tronzado y ranurado de un solo acabado.
- Incluye hojas y portaherramientas integrales.
- Capacidades de tronzado y ranurado profundo y poco profundo.
- Disponible en cuatro geometrías distintas.




Herramienta a derechas

## Ranurado y tronzado

| Número de pedido | Número de catálogo | W | CD | H | B | F | L1 | L2 | H1 | tornillo de cabeza | llave |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **2007136** | **12251782000** | 2,00 | 16,0 | 16 | 16 | 16,2 | 100 | 27 | 16 | **12146012600** | **12148041100** |
| **2022560** | **12251783000** | 3,00 | 20,0 | 20 | 20 | 20,3 | 125 | 32 | 20 | **12148596200** | **12148041200** |
| **2007142** | **12251783200** | 3,00 | 25,0 | 25 | 25 | 25,3 | 150 | 40 | 25 | **12148596200** | **12148041200** |
| **2008153** | **12251783600** | 3,00 | 25,0 | 32 | 25 | 25,3 | 170 | 40 | 32 | **12148596200** | **12148041200** |
| **2022562** | **12251784000** | 4,00 | 25,0 | 20 | 20 | 20,4 | 125 | 40 | 20 | **12148596200** | **12148041200** |
| **2007148** | **12251784200** | 4,00 | 25,0 | 25 | 25 | 25,4 | 150 | 40 | 25 | **12148596200** | **12148041200** |
| **2015814** | **12251784400** | 4,00 | 32,0 | 32 | 25 | 25,4 | 170 | 53 | 32 | **12148596200** | **12148041200** |
| **2022564** | **12251785200** | 5,00 | 32,0 | 25 | 25 | 25,4 | 150 | 53 | 25 | **12148596200** | **12148041200** |
| **2022566** | **12251785400** | 5,00 | 32,0 | 32 | 25 | 25,4 | 170 | 53 | 32 | **12148596200** | **12148041200** |
| **2022568** | **12251786400** | 6,00 | 32,0 | 32 | 25 | 25,5 | 170 | 53 | 32 | **12146012700** | **12148041300** |
| **2022569** | **12251788400** | 8,00 | 40,0 | 32 | 25 | 25,6 | 170 | 66 | 32 | **12146012700** | **12148041300** |
| | **A izquierdas** | | | | | | | | | | |
| **2007139** | **12251782100** | 2,00 | 16,0 | 16 | 16 | 16,2 | 100 | 27 | 16 | **12146012600** | **12148041100** |
| **2022561** | **12251783100** | 3,00 | 20,0 | 20 | 20 | 20,3 | 125 | 32 | 20 | **12148596200** | **12148041200** |
| **2007145** | **12251783300** | 3,00 | 25,0 | 25 | 25 | 25,3 | 150 | 40 | 25 | **12148596200** | **12148041200** |
| **2008150** | **12251783700** | 3,00 | 25,0 | 32 | 25 | 25,3 | 170 | 40 | 32 | **12148596200** | **12148041200** |
| **2022563** | **12251784100** | 4,00 | 25,0 | 20 | 20 | 20,4 | 125 | 40 | 20 | **12148596200** | **12148041200** |
| **2007151** | **12251784300** | 4,00 | 25,0 | 25 | 25 | 25,4 | 150 | 40 | 25 | **12148596200** | **12148041200** |
| **2015816** | **12251784500** | 4,00 | 32,0 | 32 | 25 | 25,4 | 170 | 53 | 32 | **12148596200** | **12148041200** |
| **2022565** | **12251785300** | 5,00 | 32,0 | 25 | 25 | 25,4 | 150 | 53 | 25 | **12148596200** | **12148041200** |
| **2022567** | **12251785500** | 5,00 | 32,0 | 32 | 25 | 25,4 | 170 | 53 | 32 | **12148596200** | **12148041200** |
| **2015839** | **12251786500** | 6,00 | 32,0 | 32 | 25 | 25,5 | 170 | 53 | 32 | **12146012700** | **12148041300** |
| **2015842** | **12251788500** | 8,00 | 40,0 | 32 | 25 | 25,6 | 170 | 66 | 32 | **12146012700** | **12148041300** |

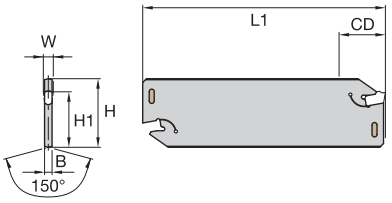



Herramienta a derechas

## Ranurado y perfilado

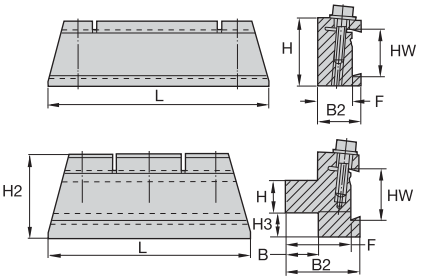
| Número de pedido | Número de catálogo | W | CD | D max | H | B | F | L1 | L2 | H1 | tornillo de cabeza | llave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2007105** | **12251762000** | 2,00 | 10,0 | 25,4 | 16 | 16 | 16,2 | 100 | 26 | 16 | **12146012600** | **12148041100** |
| **2007832** | **12251762200** | 2,00 | 10,0 | 25,4 | 20 | 20 | 20,2 | 125 | 26 | 25 | **12146012600** | **12148041100** |
| **2021637** | **12251762400** | 2,00 | 10,0 | 25,4 | 25 | 25 | 25,2 | 150 | 26 | 25 | **12146012600** | **12148041100** |
| **2007127** | **12251763400** | 3,00 | 10,0 | 25,4 | 16 | 16 | 16,3 | 100 | 26 | 25 | **12148596200** | **12148041200** |
| **2015754** | **12251763000** | 3,00 | 10,0 | 25,4 | 20 | 20 | 20,3 | 125 | 26 | 25 | **12148596200** | **12148041200** |
| **2007111** | **12251763200** | 3,00 | 10,0 | 25,4 | 25 | 25 | 25,3 | 150 | 26 | 20 | **12148596200** | **12148041200** |
| **2022548** | **12251764000** | 4,00 | 12,5 | 32,0 | 20 | 20 | 20,4 | 125 | 31 | 20 | **12148596200** | **12148041200** |
| **2007130** | **12251764200** | 4,00 | 12,5 | 32,0 | 25 | 25 | 25,4 | 150 | 31 | 25 | **12148596200** | **12148041200** |
| **2022550** | **12251764400** | 4,00 | 12,5 | 32,0 | 32 | 25 | 25,4 | 170 | 31 | 32 | **12148596200** | **12148041200** |
| **2022552** | **12251765200** | 5,00 | 12,5 | — | 25 | 25 | 25,5 | 150 | 31 | 25 | **12148596200** | **12148041200** |
| **2022554** | **12251765400** | 5,00 | 12,5 | — | 32 | 25 | 25,5 | 170 | 31 | 32 | **12148596200** | **12148041200** |
| **2022555** | **12251766200** | 6,00 | 16,0 | — | 25 | 25 | 25,6 | 150 | 35 | 25 | **12146012700** | **12148041300** |
| **2022557** | **12251766400** | 6,00 | 16,0 | — | 32 | 25 | 25,6 | 170 | 35 | 32 | **12146012700** | **12148041300** |
| **2021638** | **12251768200** | 8,00 | 16,0 | — | 25 | 25 | 25,7 | 150 | 36 | 25 | **12146012700** | **12148041300** |
| **2015792** | **12251768400** | 8,00 | 16,0 | — | 32 | 25 | 25,7 | 170 | 36 | 32 | **12146012700** | **12148041300** |
| | **A izquierdas** | | | | | | | | | | | |
| **2007108** | **12251762100** | 2,00 | 10,0 | 25,4 | 16 | 16 | 16,2 | 100 | 26 | 16 | **12146012600** | **12148041100** |
| **2021631** | **12251762300** | 2,00 | 10,0 | 25,4 | 20 | 20 | 20,2 | 125 | 26 | 16 | **12146012600** | **12148041100** |
| **2021636** | **12251762500** | 2,00 | 10,0 | 25,4 | 25 | 25 | 25,2 | 150 | 26 | 25 | **12146012600** | **12148041100** |
| **2021627** | **12251763500** | 3,00 | 10,0 | 25,4 | 16 | 16 | 16,3 | 100 | 26 | 32 | **12148596200** | **12148041200** |
| **2022547** | **12251763100** | 3,00 | 10,0 | 25,4 | 20 | 20 | 20,3 | 125 | 26 | 20 | **12148596200** | **12148041200** |
| **2007124** | **12251763300** | 3,00 | 10,0 | 25,4 | 25 | 25 | 25,3 | 150 | 26 | 20 | **12148596200** | **12148041200** |
| **2022549** | **12251764100** | 4,00 | 12,5 | 32,0 | 20 | 20 | 20,4 | 125 | 31 | 20 | **12148596200** | **12148041200** |
| **2007133** | **12251764300** | 4,00 | 12,5 | 32,0 | 25 | 25 | 25,4 | 150 | 31 | 25 | **12148596200** | **12148041200** |
| **2022551** | **12251764500** | 4,00 | 12,5 | 32,0 | 32 | 25 | 25,4 | 170 | 31 | 32 | **12148596200** | **12148041200** |
| **2022553** | **12251765300** | 5,00 | 12,5 | — | 25 | 25 | 25,5 | 150 | 31 | 25 | **12148596200** | **12148041200** |
| **2015782** | **12251765500** | 5,00 | 12,5 | — | 32 | 25 | 25,5 | 170 | 31 | 20 | **12148596200** | **12148041200** |
| **2022556** | **12251766300** | 6,00 | 16,0 | — | 25 | 25 | 25,6 | 150 | 35 | 25 | **12146012700** | **12148041300** |
| **2022558** | **12251766500** | 6,00 | 16,0 | — | 32 | 25 | 25,6 | 170 | 35 | 32 | **12146012700** | **12148041300** |
| **2007863** | **12251768300** | 8,00 | 16,0 | — | 25 | 25 | 25,7 | 150 | 36 | 25 | **12146012700** | **12148041300** |
| **2022559** | **12251768500** | 8,00 | 16,0 | — | 32 | 25 | 25,7 | 170 | 36 | 32 | **12146012700** | **12148041300** |

*NOTA: seleccione la dimensión CD más corta para una mayor estabilidad.*



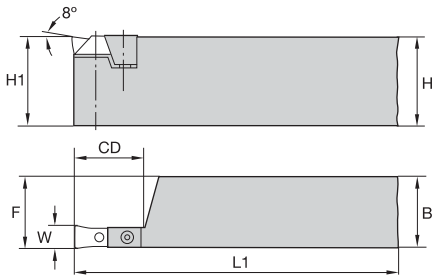

## Lamas de tronzar

| Número de pedido | Número de catálogo | W | H | H1 | L1 | B | CD | llave |
|---|---|---|---|---|---|---|---|---|
| **2021629** | **12251332000** | 2,0 | 19 | 15,7 | 90 | 1,7 | 20 | **12146003800** |
| **2021639** | **12251342000** | 2,0 | 26 | 21,4 | 110 | 1,7 | 25 | **12146003800** |
| **2008113** | **12251352000** | 2,0 | 32 | 25,0 | 150 | 1,7 | 25 | **12146003800** |
| **2021640** | **12251343000** | 3,0 | 26 | 21,4 | 110 | 2,4 | 40 | **12146003800** |
| **2008116** | **12251353000** | 3,0 | 32 | 25,0 | 150 | 2,4 | 50 | **12146003800** |
| **2021641** | **12251344000** | 4,0 | 26 | 21,4 | 110 | 3,2 | 40 | **12146003800** |
| **2008119** | **12251354000** | 4,0 | 32 | 25,0 | 150 | 3,2 | 50 | **12146003800** |
| **2008122** | **12251355000** | 5,0 | 32 | 25,0 | 150 | 4,2 | 60 | **12146003800** |
| **2008135** | **12251356000** | 6,0 | 32 | 25,0 | 150 | 5,0 | 60 | **12146009500** |
| **2008138** | **12251358000** | 8,0 | 32 | 25,0 | 150 | 6,8 | 60 | **12146009500** |
| **2021743** | **12251368000** | 8,0 | 53 | 45,0 | 250 | 6,8 | 100 | **12146009500** |




## Portalamas de tronzar

| Número de pedido | Número de catálogo | HW | H | B | F | H2 | B2 | H3 | L | tornillo de cabeza | llave |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2021625** | **12251221900** | 19 | 16 | 16 | 28,3 | 30 | 30 | 4 | 100 | **12148036000** | **12148041300** |
| **2021634** | **12251212500** | 19 | 25 | 19 | 17,3 | 25 | 19 | — | 100 | **12148036000** | **12148041300** |
| **2021626** | **12251221600** | 26 | 16 | 16 | 31,0 | 40 | 36 | 12 | 100 | **12148036000** | **12148041300** |
| **2007826** | **12251222000** | 26 | 20 | 18 | 33,0 | 40 | 38 | 8 | 100 | **12148036000** | **12148041300** |
| **2008141** | **12251213200** | 26 | 32 | 20 | 15,0 | 32 | 20 | — | 125 | **12148036000** | **12148041300** |
| **2021635** | **12251222500** | 32 | 25 | 20 | 35,0 | 50 | 40 | 10 | 125 | **12148036000** | **12148041300** |
| **2008156** | **12251223200** | 32 | 32 | 25 | 40,0 | 50 | 45 | 3 | 125 | **12146013400** | **12148041400** |
| **2008159** | **12251233200** | 53 | 32 | 25 | 50,0 | 82 | 57 | 30 | 160 | **12146013400** | **12148041400** |
| **2021723** | **12251234000** | 53 | 40 | 40 | 58,0 | 82 | 65 | 22 | 160 | **12146013400** | **12148041400** |




Herramienta a derechas

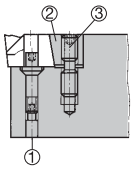


## Ranurado

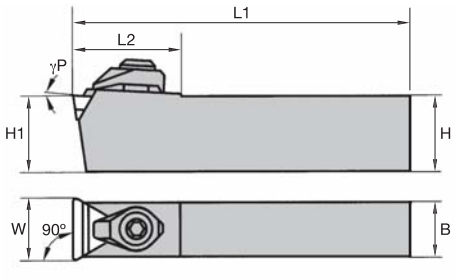
| Número de pedido | Número de catálogo | W | CD | H | H1 | B | L1 | F |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **2022446** | **12250110100** | 8 | 20 | 32 | 32 | 25 | 170 | 25,5 |
| **2008147** | **12250110300** | 10 | 20 | 32 | 32 | 25 | 170 | 25,5 |
| **2021719** | **12250110500** | 12 | 25 | 40 | 40 | 32 | 200 | 33,0 |
| **2021721** | **12250110700** | 14 | 28 | 40 | 40 | 32 | 200 | 33,0 |
| **2008521** | **12250110900** | 16 | 32 | 40 | 40 | 32 | 200 | 33,0 |
| | **A izquierdas** | | | | | | | |
| **2022447** | **12250110200** | 8 | 20 | 32 | 32 | 25 | 170 | 25,5 |
| **2008144** | **12250110400** | 10 | 20 | 32 | 32 | 25 | 170 | 25,5 |
| **2021718** | **12250110600** | 12 | 25 | 40 | 40 | 32 | 200 | 33,0 |
| **2021720** | **12250110800** | 14 | 28 | 40 | 40 | 32 | 200 | 33,0 |
| **2021722** | **12250111000** | 16 | 32 | 40 | 40 | 32 | 200 | 33,0 |

## Recambios

| Número de catálogo | tornillo de fijación | fijación de cuña | tornillo de amarre | llave para tornillo de amarre | llave para tornillo de amarre |
|---|---|---|---|---|---|
| **A derechas** | | | | | |
| **12250110100** | **12148060600** | **12148094300** | **12148574100** | **12148041000** | **12148046000** |
| **12250110300** | **12148060600** | **12148094400** | **12148574900** | **12148041100** | **12148046000** |
| **12250110500** | **12148060700** | **12148094500** | **12148574900** | **12148041100** | **12148040900** |
| **12250110700** | **12148060700** | **12148094600** | **12148574000** | **12148041200** | **12148040900** |
| **12250110900** | **12148060800** | **12148094700** | **12148574000** | **12148041200** | **12148041000** |
| **A izquierdas** | | | | | |
| **12250110200** | **12148060600** | **12148094300** | **12148574100** | **12148041000** | **12148046000** |
| **12250110400** | **12148060600** | **12148094400** | **12148574900** | **12148041100** | **12148046000** |
| **12250110600** | **12148060700** | **12148094500** | **12148574900** | **12148041100** | **12148040900** |
| **12250110800** | **12148060700** | **12148094600** | **12148574000** | **12148041200** | **12148040900** |
| **12250111000** | **12148060800** | **12148094700** | **12148574000** | **12148041200** | **12148041000** |




*1. Tornillo de fijación*
*2. Fijación por cuña*
*3. Tornillo de amarre*




## Ranurado

| Número de pedido | Número de catálogo | W | H1 | H | B | L1 | L2 | γP° | Plaquita 1 |
|---|---|---|---|---|---|---|---|---|---|
| **2022921** | **12191061900** | 10,4 | 20 | 20 | 9,5 | 125 | 21 | 3 | TP..1103../TP..22.. |
| **2007414** | **12191062086** | 15,3 | 20 | 20 | 13,0 | 150 | 27 | 3 | TP..1603../TP..32.. |
| **2022922** | **12191062586** | 15,3 | 25 | 25 | 13,0 | 150 | 27 | 3 | TP..1603../TP..32.. |
| **2058066** | **12191062686** | 20,2 | 25 | 25 | 18,0 | 150 | 35 | 3 | TP..2204../TP..43.. |
| **2022923** | **12191063286** | 20,2 | 32 | 32 | 18,0 | 180 | 35 | 3 | TP..2204../TP..43.. |

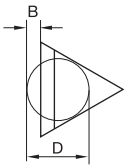
*NOTA: los portas 276-STP carecen de rompevirutas. Consulte a continuación los Números de pedido de rompevirutas.*

## Para ranurado sin rompevirutas

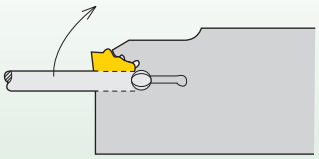
| Número de catálogo | amarre | tornillo de amarre | apoyo | tornillo del apoyo | arandela | llave |
|---|---|---|---|---|---|---|
| **12191061900** | **12148589300** | **12148589800** | **12148032586** | **12148021900** | **–** | **12148041100** |
| **12191062086** | **12148583800** | **12148586000** | **12148031686** | **12148024100** | **12148024200** | **12148041200** |
| **12191062586** | **12148583800** | **12148586000** | **12148031686** | **12148024100** | **12148024200** | **12148041200** |
| **12191062686** | **12148586900** | **12148021100** | **12148032086** | **12148024500** | **12148024800** | **12148041200** |
| **12191063286** | **12148586900** | **12148021100** | **12148032086** | **12148024500** | **12148024800** | **12148041200** |

## Para ranurado con rompevirutas (pida un amarre y un rompevirutas adicionales)

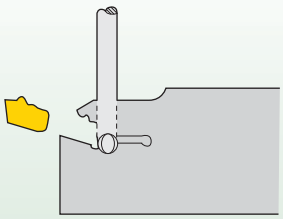
| | | | Rompevirutas | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | B – Ancho de filo | | | | | |
| plaquita | amarre con rompevirutas | D | 0,4 mm | 1,2 mm | 1,8 mm | 2,5 mm | 3,2 mm | 4,0 mm |
| **TP...1103...** | **12148589200** | 6,35 | **12148591011** | **12148588211** | **12148588311** | **12148588411** | **–** | **–** |
| **TP...1603...** | **12148589300** | 9,52 | **12148591111** | **12148586611** | **12148587011** | **12148587111** | **12148580011** | **–** |
| **TP...2204...** | **12148586900** | 12,70 | **–** | **–** | **12148580411** | **12148580511** | **12148580611** | **12148582511** |



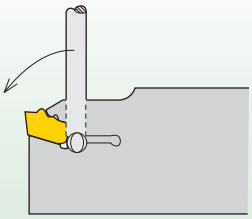
## Sistema Progroove



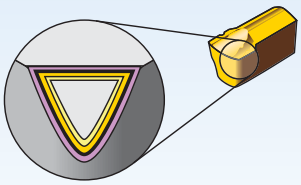
Para cambiar la plaquita de corte, coloque la llave dentro de la abertura de la hoja. La boca de la lama se abre torneando a 90°.



En esta posición, la llave se bloquea automáticamente, dejando ambas manos libres para cambiar la plaquita de corte.



La plaquita de corte se presiona contra el asiento trasero de la boca de la hoja, liberando la llave. La plaquita se posiciona adecuadamente y se fija de forma segura.



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

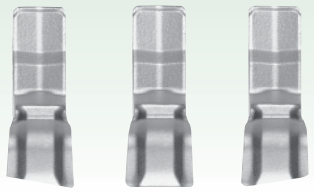
- Reducen los ciclos de tiempo: velocidad y avance mayores.
- Vida más larga de la herramienta: un nuevo recubrimiento multicapa proporciona una mejor resistencia al desgaste.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

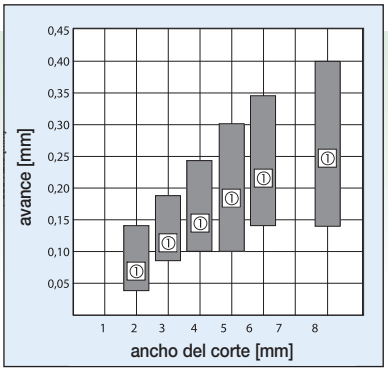
| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TN6030 | HC-P30 | Metal duro recubierto con nanomulticapa de PVD — TiAlN. Mecanizado medio y pesado para aceros y fundiciones nodulares. Recomendada en velocidades de corte media cuando sean necesarias buenas propiedades de dureza. | P | P | P | P | P | P | P | | |
| | | | M | M | M | M | M | M | M | | |
| | | | K | K | K | K | K | K | K | | |
| TN7525 | HC-P25 | Metal duro recubierto con MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Mecanizado ligero y medio para aceros y fundiciones nodulares. | P | P | P | P | P | P | | | |
| | | | K | K | K | K | K | K | | | |
| TN7535 | HC-P35 | Metal duro recubierto con MT-CVD/CVD — TiN-TiCN-$Al_2O_3$. Mecanizado medio y pesado para aceros y fundición nodular. | P | P | P | P | P | P | P | | |
| | | | K | K | K | K | K | K | K | | |
| TN8025 | HC-M25 | Metal duro recubierto con MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-ZrCN. Mecanizado ligero y medio para todos los aceros inoxidables. Puede usarse con o sin refrigerante. | M | M | M | M | M | M | | | |
| THM | HW-K15 | Metal duro sin recubrir para mecanizado ligero y medio. Para fundición, todos los metales no ferrosos y materiales no metálicos. También apta para el mecanizado de materiales endurecidos a bajas velocidades de corte. | K | K | K | K | | | | | |
| | | | N | N | N | N | | | | | |
| | | | S | S | S | S | | | | | |
| | | | H | H | H | H | | | | | |
| TTM | HW-P25 | Metal duro sin recubrir con buenas propiedades de desgaste y tenacidad. Mecanizado medio para aceros. | P | P | P | P | P | P | P | | |
| | | | M | M | M | M | M | M | M | | |

## ProGroove • U



a izquierdas neutro a derechas

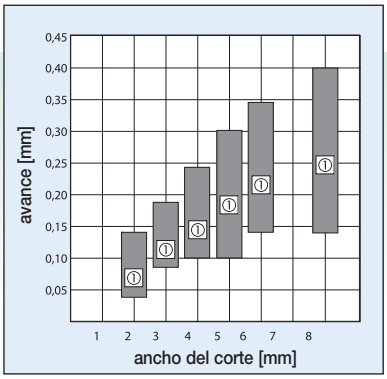
Para las operaciones de ranurado y tronzado de uso universal. Ranura de rompevirutas positiva para una acción de corte ligera. Estilos a derechas y a izquierdas con ángulo frontal de 6º.




① Avance recomendado

## ProGroove • M

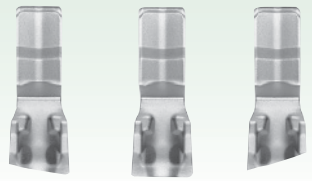
neutro




① Avance recomendado

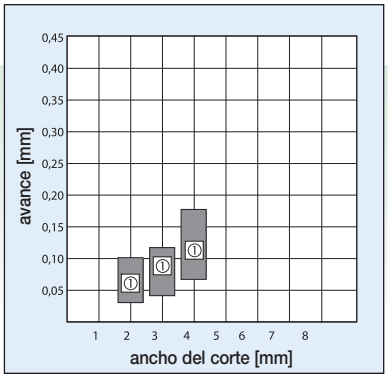
Para ranurado y tronzado; también para torneado copiado y recto, así como biselado. Con un elemento adicional formador de virutas para un buen control de virutas con distintas profundidades de corte.

## ProGroove • S

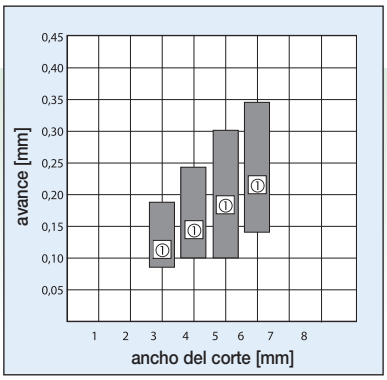


a izquierdas neutro a derechas

Para un tronzado con pocas rebabas, flancos rectos y acabados superficiales suaves. Todas las plaquitas están recomendadas para el tronzado y ranurado de piezas de trabajo delgadas, con un diámetro parcial <32,0 mm y tubos de paredes delgadas.



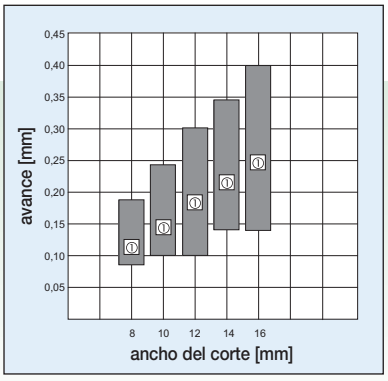

① Avance recomendado




① Avance recomendado

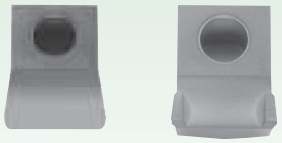
## ProGroove • R

Plaquitas redondas para perfilado, ranurado y torneado copiado. Control de virutas muy bueno para usos generales. Colocación de filo de corte preciso y reproducible.




① Avance recomendado

## Sistema LG • 0 y 1

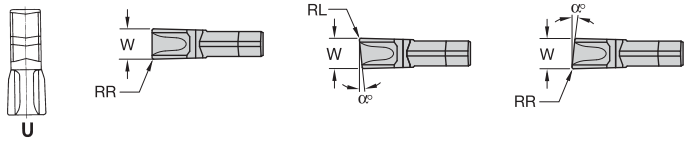


0 1

…0
Plaquitas con amplia gama de aplicaciones en ranurado y ranurado profundo. Con un elemento adicional de control de virutas para un buen control de virutas, incluso con distintas profundidades de corte.

…1
Plaquitas con amplia gama de usos en ranurado y ranurado profundo de materiales con virutas cortas.

| ANSI ISO 513 | VDI 3323 | Velocidad de corte • vc m/min | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | TN6030 | | | TN7525 | | | TN7535 | | | TN8025 | | | THM | | | TTM | | |
| P | 1 | 130 | **140** | 150 | 200 | **215** | 230 | 140 | **175** | 210 | | | | | | | 90 | **95** | 100 |
| | 2 | 120 | **160** | 200 | 190 | **245** | 300 | 130 | **160** | 190 | | | | | | | 90 | **105** | 140 |
| | 3 | 100 | **130** | 160 | 160 | **205** | 250 | 110 | **140** | 170 | | | | | | | 70 | **90** | 110 |
| | 4 | 120 | **150** | 180 | 180 | **230** | 280 | 120 | **150** | 180 | | | | | | | 80 | **105** | 130 |
| | 5 | 100 | **130** | 160 | 150 | **195** | 240 | 100 | **130** | 160 | | | | | | | 70 | **90** | 110 |
| | 6 | 120 | **150** | 180 | 180 | **230** | 280 | 120 | **150** | 180 | | | | | | | 80 | **105** | 130 |
| | 7 | 90 | **125** | 160 | 140 | **190** | 240 | 100 | **130** | 160 | | | | | | | 60 | **85** | 110 |
| | 8 | 80 | **110** | 140 | 120 | **170** | 220 | 90 | **120** | 150 | | | | | | | 50 | **75** | 100 |
| | 9 | 60 | **80** | 100 | 90 | **125** | 160 | 60 | **90** | 120 | | | | | | | 40 | **50** | 70 |
| | 10 | 80 | **95** | 110 | 130 | **150** | 170 | 90 | **105** | 120 | | | | | | | 60 | **70** | 80 |
| | 11 | 50 | **65** | 80 | 80 | **105** | 130 | 50 | **65** | 80 | | | | | | | 40 | **50** | 60 |
| | 12 | 120 | **140** | 160 | 180 | **210** | 240 | 120 | **155** | 190 | | | | | | | 80 | **95** | 110 |
| | 13.1 | 80 | **105** | 130 | 130 | **165** | 200 | 90 | **120** | 150 | | | | | | | 60 | **75** | 90 |
| | 13.2 | 40 | **55** | 65 | 65 | **85** | 100 | 45 | **60** | 75 | | | | | | | 30 | **40** | 45 |
| | | TN6030 | | | TN7525 | | | TN7535 | | | TN8025 | | | THM | | | TTM | | |
| M | 14.1 | 90 | **110** | 140 | | | | | | | 90 | **120** | 150 | | | | 60 | **75** | 90 |
| | 14.2 | 75 | **90** | 115 | | | | | | | 75 | **100** | 120 | | | | 50 | **60** | 75 |
| | 14.3 | 55 | **70** | 90 | | | | | | | 55 | **75** | 95 | | | | 40 | **50** | 55 |
| | 14.4 | 45 | **60** | 70 | | | | | | | 45 | **60** | 75 | | | | 30 | **40** | 45 |
| | | TN6030 | | | TN7525 | | | TN7535 | | | TN8025 | | | THM | | | TTM | | |
| K | 15 | 70 | **90** | 100 | 140 | **170** | 200 | | | | | | | 70 | **90** | 100 | | | |
| | 16 | 50 | **65** | 80 | 100 | **130** | 160 | | | | | | | 50 | **65** | 80 | | | |
| | 17 | 60 | **70** | 80 | 120 | **150** | 180 | | | | | | | 60 | **70** | 80 | | | |
| | 18 | 40 | **55** | 70 | 90 | **120** | 150 | | | | | | | 40 | **55** | 70 | | | |
| | 19 | 80 | **95** | 110 | 150 | **180** | 210 | | | | | | | 80 | **95** | 110 | | | |
| | 20 | 60 | **75** | 90 | 110 | **140** | 170 | | | | | | | 60 | **75** | 90 | | | |
| | | TN6030 | | | TN7525 | | | TN7535 | | | TN8025 | | | THM | | | TTM | | |
| N | 21 | | | | | | | | | | | | | 600 | **750** | 900 | | | |
| | 22 | | | | | | | | | | | | | 500 | **650** | 800 | | | |
| | 23 | | | | | | | | | | | | | 600 | **750** | 900 | | | |
| | 24 | | | | | | | | | | | | | 500 | **650** | 800 | | | |
| | 25 | | | | | | | | | | | | | 230 | **300** | 370 | | | |
| | 26 | | | | | | | | | | | | | 150 | **200** | 250 | | | |
| | 27 | | | | | | | | | | | | | 150 | **200** | 250 | | | |
| | 28 | | | | | | | | | | | | | 110 | **140** | 170 | | | |
| | 29 | | | | | | | | | | | | | 60 | **80** | 100 | | | |
| | 30 | | | | | | | | | | | | | 80 | **100** | 120 | | | |
| | | TN6030 | | | TN7525 | | | TN7535 | | | TN8025 | | | THM | | | TTM | | |
| S | 31 | | | | | | | | | | | | | 26 | **37** | 45 | | | |
| | 32 | | | | | | | | | | | | | 21 | **30** | 36 | | | |
| | 33 | | | | | | | | | | | | | 17 | **24** | 28 | | | |
| | 34 | | | | | | | | | | | | | 11 | **15** | 18 | | | |
| | 35 | | | | | | | | | | | | | 11 | **16** | 18 | | | |
| | 36 | | | | | | | | | | | | | 42 | **60** | 72 | | | |
| | 37 | | | | | | | | | | | | | 21 | **30** | 36 | | | |




● primera elección
○ elección alternativa

| | | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | | ● |
| M | | ● | ● | ● | ● | | ● |
| K | | ● | ● | ● | | ● | |
| N | | | | | | ● | |
| S | | | | | | ● | |
| H | | | | | | ● | |



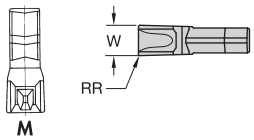
## ■ PGU

| Número de catálogo | W | RR | α° | mano | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|---|
| **123567320** | 2,10 | 0,20 | — | N - Neutro | ● | ● | ● | ● | ● | |
| **123567330** | 3,10 | 0,30 | — | N - Neutro | ● | ● | ● | ● | ● | |
| **123567340** | 4,10 | 0,30 | — | N - Neutro | ● | ● | ● | | ● | |
| **123567350** | 5,10 | 0,30 | — | N - Neutro | ● | ● | ● | ● | ● | |
| **123567360** | 6,10 | 0,40 | — | N - Neutro | ● | ● | ● | ● | ● | |
| **123567380** | 8,15 | 0,60 | — | N - Neutro | ● | ● | ● | ● | ● | |

| Número de catálogo | W | RR | α° | mano | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|---|
| **123567231** | 3,10 | 0,25 | 6 | L - Izquierda | ● | ● | ● | | | |
| **123567241** | 4,10 | 0,25 | 6 | L - Izquierda | ● | ● | ● | | | |

| Número de catálogo | W | RL | α° | mano | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|---|
| **123567230** | 3,10 | 0,25 | 6 | R - Derecha | ● | ● | ● | | | |
| **123567240** | 4,10 | 0,25 | 6 | R - Derecha | ● | ● | ● | | | |

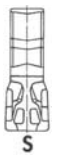
*NOTA: tolerancia de ancho en todas = ±0,05 mm.*

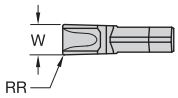


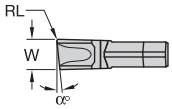

## ■ PGM

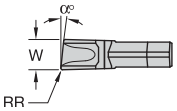
| Número de catálogo | W | RR | α° | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|
| **123567420** | 2,10 | 0,20 | — | ● | ● | ● | | | |
| **123567430** | 3,10 | 0,30 | — | ● | ● | ● | | | |
| **123567440** | 4,10 | 0,30 | — | ● | ● | ● | | | |
| **123567450** | 5,10 | 0,30 | — | ● | ● | ● | | | |
| **123567460** | 6,10 | 0,40 | — | ● | ● | ● | | | |
| **123567480** | 8,15 | 0,60 | — | ● | ● | ● | | | |

*NOTA: tolerancia de ancho en todas = ±0,05 mm.*




● primera elección
○ elección alternativa

| | | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | | ● |
| M | | ● | ● | ● | ● | | ● |
| K | | ● | ● | ● | | ● | |
| N | | | | | | ● | |
| S | | | | | | ● | |
| H | | | | | | ● | |

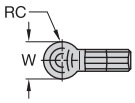
## PGS

| Número de catálogo | W | RR | α° | mano | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|---|
| **123567702** | 2,25 | 0,20 | — | N - Neutro | | | ● | ● | | |
| **123567703** | 3,25 | 0,20 | — | N - Neutro | | | ● | ● | | |
| **123567704** | 4,25 | 0,20 | — | N - Neutro | | | ● | ● | | |

| Número de catálogo | W | RR | α° | mano | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|---|
| **123567721** | 2,25 | 0,20 | 6 | L - Izquierda | | | ● | ● | | |
| **123567731** | 3,25 | 0,20 | 6 | L - Izquierda | | | ● | ● | | |
| **123567741** | 4,25 | 0,20 | 6 | L - Izquierda | | | ● | ● | | |

| Número de catálogo | W | RL | α° | mano | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|---|---|
| **123567720** | 2,25 | 0,20 | 6 | R - Derecha | | | ● | ● | | |
| **123567730** | 3,25 | 0,20 | 6 | R - Derecha | | | ● | ● | | |
| **123567740** | 4,25 | 0,20 | 6 | R - Derecha | | | ● | ● | | |

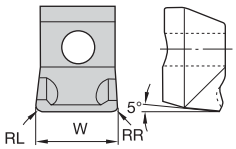
*NOTA: tolerancia de ancho en todas = ±0,05 mm.*




## PGR

| Número de catálogo | W | RC | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|
| **123567803** | 3,00 | 1,50 | | ● | | | | |
| **123567804** | 4,00 | 2,00 | | ● | | | | |
| **123567805** | 5,00 | 2,50 | | ● | | | | |
| **123567806** | 6,00 | 3,00 | | ● | | | | |

*NOTA: tolerancia de ancho en todas = ±0,05 mm.*




RR = RL

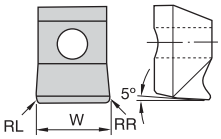
● primera elección
○ elección alternativa

| | | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | | ● |
| M | | ● | ● | ● | ● | | ● |
| K | | ● | ● | ● | | ● | |
| N | | | | | | ● | |
| S | | | | | | ● | |
| H | | | | | | ● | |

## ■ LGN0

| Número de catálogo | W | RR | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|
| **123568080** | 8,15 | 0,80 | | ● | ● | | ● | ● |
| **123568100** | 10,15 | 0,80 | | ● | ● | | ● | ● |
| **123568120** | 12,20 | 0,80 | | ● | ● | | ● | ● |
| **123568140** | 14,20 | 0,80 | | ● | ● | | ● | ● |
| **123568160** | 16,20 | 0,80 | | ● | ● | | ● | ● |

*NOTA: W tolerancia de ancho en todas = ±0,05 mm.*




RR = RL

## ■ LGN1

| Número de catálogo | W | RR | TN6030 | TN7525 | TN7535 | TN8025 | THM | TTM |
|---|---|---|---|---|---|---|---|---|
| **123568081** | 8,15 | 0,80 | | | | | ● | |
| **123568101** | 10,15 | 0,80 | | | | | ● | |
| **123568121** | 12,20 | 0,80 | | | | | ● | |
| **123568141** | 14,20 | 0,80 | | | | | ● | |
| **123568161** | 16,20 | 0,80 | | | | | ● | |

*NOTA: W tolerancia de ancho en todas = ±0,05 mm.*

# WIN WITH WIDIA™

WIDIA™

## ProGroove™

El sistema ProGroove asegura un rendimiento preciso, fiable y reproducible del filo de corte, con unas plaquitas de cambio fácil disponibles en múltiples calidades de metal duro y alto rendimiento.

**Ranurado y tronzado ProGroove**

- Plaquitas de tronzado y ranurado de una sola cara.
- Incluye hojas y portaherramientas integrales.
- Capacidades de tronzado y ranurado profundo y poco profundo.
- Disponible en cuatro geometrías distintas.

WIDIA™
Win with WIDIA™

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

# Separator™

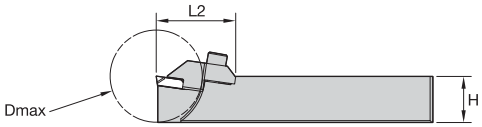
Diseñado específicamente para ofrecer una flexibilidad de portaherramientas con diseños de componentes integrales, universales y tipo lama.

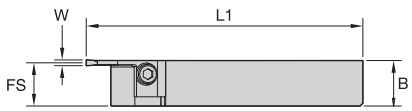
## Características:

- Anchos de plaquita de 2,0 mm a 4,0 mm.
- Tamaños de mangos de portaherramientas de 10,0 mm a 31,75 mm.
- Tronzado de hasta 76,0 mm de capacidad de la barra.

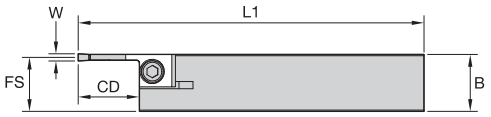
## Ventajas:

- Indexado de plaquita rápido y fiable.
- Sujeción mecánica positiva.
- Mango cuadrado CNC y portaherramientas de tipo lama PL.




Herramienta a izquierdas

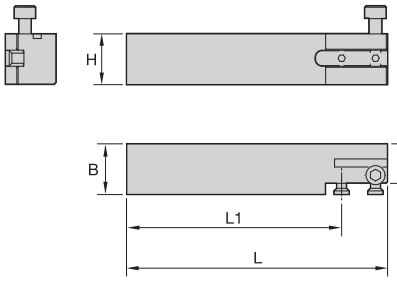



Herramienta a izquierdas

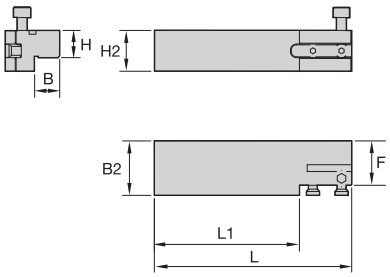
Herramienta a derechas

## Mango cuadrado

| Número de pedido | Número de catálogo | W | D max | CD | B | FS | H | L2 | L1 | amarre | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | |
| **3614290** | **206445** | 2,00 | 20,00 | — | 9,86 | 9,00 | 10,00 | 21,55 | 75,00 | **435200** | **MS318** |
| **3538751** | **206446** | 2,00 | 20,00 | — | 11,86 | 11,00 | 12,00 | 21,55 | 90,00 | **435200** | **MS318** |
| **3538752** | **206447** | 2,00 | 26,00 | — | 9,86 | 9,00 | 10,00 | 24,83 | 150,00 | **435201** | **MS318** |
| **3587590** | **206448** | 2,00 | 26,00 | — | 11,86 | 11,00 | 12,00 | 24,83 | 150,00 | **435201** | **MS318** |
| **3615308** | **206449** | 2,00 | 38,00 | — | 15,86 | 15,00 | 16,00 | 32,83 | 100,00 | **435202** | **MS412** |
| **3538753** | **206450** | 2,00 | 38,00 | — | 19,86 | 19,00 | 20,00 | 32,84 | 125,00 | **435202** | **MS412** |
| **3538704** | **206263** | 2,50 | 20,00 | — | 9,75 | 8,80 | 10,00 | 21,51 | 74,96 | **435170** | **MS318** |
| **3538706** | **206265** | 2,50 | 20,00 | — | 11,74 | 10,81 | 12,00 | 21,51 | 89,95 | **435170** | **MS318** |
| **3538718** | **206279** | 2,50 | 26,00 | — | 9,75 | 8,81 | 10,00 | 24,80 | 150,00 | **435152** | **MS318** |
| **3538719** | **206280** | 2,50 | 26,00 | — | 11,73 | 10,80 | 12,00 | 24,80 | 150,00 | **435152** | **MS318** |
| **3538721** | **206282** | 2,50 | 38,00 | — | 15,75 | 14,81 | 16,00 | 32,80 | 100,00 | **435140** | **MS412** |
| **3538723** | **206284** | 2,50 | 38,00 | — | 19,74 | 18,80 | 20,00 | 32,80 | 125,00 | **435140** | **MS412** |
| **3538720** | **206281** | 3,00 | 26,00 | — | 11,68 | 10,39 | 12,00 | 23,62 | 150,00 | **435130** | **MS318** |
| **3538722** | **206283** | 3,00 | 38,00 | — | 15,70 | 14,40 | 16,00 | 32,85 | 100,00 | **435126** | **MS412** |
| **3565364** | **206285** | 3,00 | 38,00 | — | 19,68 | 18,39 | 20,00 | 32,85 | 125,00 | **435126** | **MS412** |
| **3538741** | **206417** | 3,00 | — | 25,00 | 24,74 | 23,50 | 25,00 | 42,92 | 150,00 | **435180** | **619168** |
| **3538742** | **206418** | 4,00 | — | 25,00 | 24,69 | 23,00 | 25,00 | 42,97 | 150,00 | **435180** | **619168** |
| | **A izquierdas** | | | | | | | | | | |
| **3614291** | **206451** | 2,00 | 20,00 | — | 9,86 | 9,00 | 10,00 | 21,55 | 75,00 | **435203** | **MS318** |
| **3538754** | **206452** | 2,00 | 20,00 | — | 11,86 | 11,00 | 12,00 | 21,55 | 90,00 | **435203** | **MS318** |
| **3614292** | **206453** | 2,00 | 26,00 | — | 9,86 | 9,00 | 10,00 | 24,83 | 150,00 | **435204** | **MS318** |
| **3538755** | **206454** | 2,00 | 26,00 | — | 11,00 | 11,00 | 12,00 | 24,83 | 150,00 | **435204** | **MS318** |
| **3538756** | **206455** | 2,00 | 38,00 | — | 15,86 | 15,00 | 16,00 | 32,83 | 100,00 | **435205** | **MS412** |
| **3615309** | **206456** | 2,01 | 38,00 | — | 19,86 | 19,00 | 20,00 | 32,84 | 125,00 | **435205** | **MS412** |
| **3538705** | **206264** | 2,50 | 20,00 | — | 9,75 | 8,80 | 10,00 | 21,51 | 74,96 | **435171** | **MS318** |
| **3538707** | **206266** | 2,50 | 20,00 | — | 11,74 | 10,81 | 12,00 | 21,51 | 89,95 | **435171** | **MS318** |
| **3538711** | **206272** | 2,50 | 26,00 | — | 9,75 | 8,81 | 10,00 | 24,80 | 150,00 | **435153** | **MS318** |
| **3538712** | **206273** | 2,50 | 26,00 | — | 11,73 | 10,80 | 12,00 | 24,80 | 150,00 | **435153** | **MS318** |
| **3538714** | **206275** | 2,50 | 38,00 | — | 15,75 | 14,81 | 16,00 | 32,80 | 100,00 | **435141** | **MS412** |
| **3538716** | **206277** | 2,50 | 38,00 | — | 19,74 | 18,80 | 20,00 | 32,80 | 125,00 | **435141** | **MS412** |
| **3538713** | **206274** | 3,00 | 26,00 | — | 11,68 | 10,39 | 12,00 | 23,62 | 150,00 | **435131** | **MS318** |
| **3538715** | **206276** | 3,00 | 38,00 | — | 15,70 | 14,40 | 16,00 | 32,85 | 100,00 | **435127** | **MS412** |
| **3538717** | **206278** | 3,00 | 38,00 | — | 19,68 | 18,39 | 20,00 | 32,85 | 125,00 | **435127** | **MS412** |
| **3538743** | **206419** | 3,00 | — | 25,00 | 24,74 | 23,50 | 25,00 | 42,92 | 150,00 | **435181** | **619168** |
| **3615303** | **206424** | 4,00 | — | 25,00 | 24,69 | 23,00 | 25,00 | 42,96 | 150,00 | **435181** | **619168** |



Herramienta a izquierdas



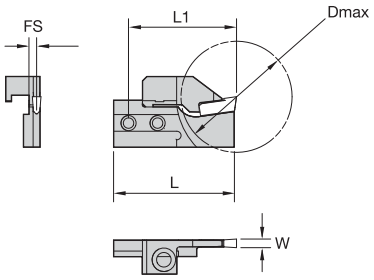
Herramienta a izquierdas

Herramienta a derechas

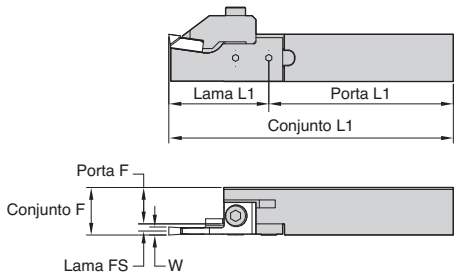


## Portaherramientas con mango de 12,00 mm y 20,0 mm

| Número de pedido | Número de catálogo | H | B | B2 | L | L1 | H2 | F | tornillo de lama soporte | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **3538772** | **206518** | 11,91 | 11,54 | 24,99 | 102,77 | 84,68 | 19,05 | 20,56 | **606247** | **MS1495** |
| **3614344** | **206522** | 20,00 | 20,00 | — | 102,77 | 84,68 | — | 15,55 | **606247** | **MS1495** |
| | **A izquierdas** | | | | | | | | | |
| **3538773** | **206519** | 11,91 | 11,54 | 25,00 | 102,77 | 84,68 | 19,05 | 20,55 | **606247** | **MS1495** |
| **3538774** | **206523** | 20,00 | 20,00 | — | 102,77 | 84,68 | — | 15,55 | **606247** | **MS1495** |



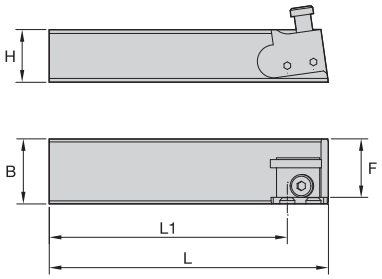
Herramienta a derechas




Conjunto L1 = L1 (porta) + L1 (lama)
Conjunto F = F (porta) + FS (lama) + W/2

## Lamas con mango de 12,00 mm y 20,0 mm

| Número de pedido | Número de catálogo | W | D max | FS | L | L1 | amarre |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3539522** | **333111** | 2,00 | 41,28 | 3,40 | 44,88 | 40,13 | **435194** |
| **3539515** | **333101** | 2,50 | 41,28 | 3,25 | 44,88 | 40,13 | **435154** |
| **3539516** | **333102** | 3,00 | 41,28 | 2,84 | 44,88 | 40,13 | **435155** |
| | **A izquierdas** | | | | | | |
| **3539517** | **333103** | 2,50 | 41,28 | 3,25 | 44,88 | 40,13 | **435156** |
| **3539518** | **333104** | 3,00 | 41,28 | 2,84 | 44,88 | 40,13 | **435157** |

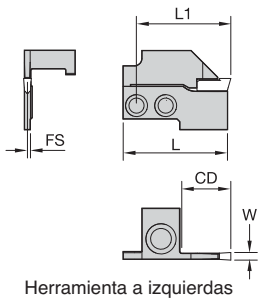


Herramienta a izquierdas

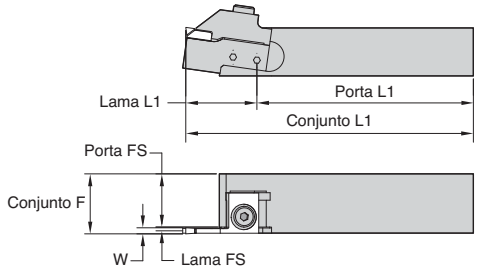
Herramienta a derechas

## Portaherramientas con mango de 25,0 mm y 32,0 mm

| Número de pedido | Número de catálogo | H | B | L | L1 | F | tornillo de lama soporte | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | |
| **3538710** | **206271** | 25,00 | 24,61 | 131,90 | 112,16 | 21,41 | **MS1073** | **MS1071** |
| **3538749** | **206439** | 32,00 | 31,60 | 132,03 | 112,18 | 28,42 | **MS1073** | **MS1071** |
| | **A izquierdas** | | | | | | | |
| **3538703** | **206262** | 25,00 | 24,61 | 131,91 | 112,17 | 21,41 | **MS1073** | **MS1071** |
| **3615305** | **206440** | 32,00 | 31,60 | 132,03 | 112,18 | 28,42 | **MS1073** | **MS1071** |



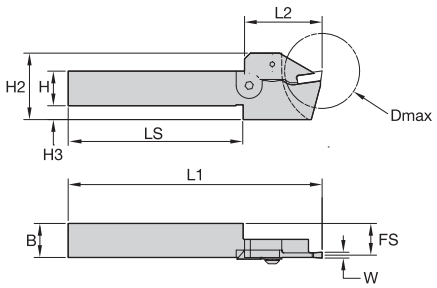
Herramienta a izquierdas



Conjunto L1 = L1 (porta) + L1 (lama)
Conjunto F = F (porta) + FS (lama) + W/2

## Lamas con mango de 25,0 mm y 32,0 mm

| Número de pedido | Número de catálogo | W | CD | FS | L1 | L | amarre |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3563591** | **331117** | 2,50 | 12,70 | 2,39 | 29,60 | 36,03 | **435142** |
| **3539504** | **331101** | 3,00 | 20,64 | 1,98 | 37,63 | 43,80 | **435128** |
| **3539508** | **331109** | 4,00 | 20,64 | 1,98 | 37,63 | 43,80 | **435128** |
| | **A izquierdas** | | | | | | |
| **3539510** | **331118** | 2,50 | 12,70 | 2,39 | 29,60 | 36,03 | **435143** |
| **3539505** | **331102** | 3,00 | 20,64 | 1,98 | 37,63 | 43,80 | **435129** |
| **3539509** | **331110** | 4,00 | 20,64 | 1,98 | 37,63 | 43,80 | **435129** |




Herramienta a izquierdas

## Subhusillo

| Número de pedido | Número de catálogo | W | D max | B | FS | H | H2 | H3 | L1 | LS | L2 | tornillo de cabeza de botón | amarre | tornillo de cabeza plana | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **3538768** | **206508** | 2,50 | 42,00 | 19,75 | 18,81 | 20,00 | 37,71 | 7,62 | 140,00 | 96,57 | 42,66 | **MS518** | **409184** | **606244** | **613139** |
| **3538770** | **206510** | 3,00 | 42,00 | 19,76 | 18,50 | 20,00 | 37,50 | 7,62 | 140,00 | 96,57 | 42,68 | **MS518** | **409186** | **606244** | **613139** |
| **3538766** | **206506** | 3,00 | 66,70 | 24,76 | 23,50 | 25,00 | 44,45 | 9,52 | 150,00 | 89,05 | 60,31 | **MS518** | **409182** | **606243** | **613139** |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **3538769** | **206509** | 2,50 | 42,00 | 19,75 | 18,80 | 20,00 | 37,65 | 7,62 | 140,00 | 96,57 | 42,66 | **MS518** | **409185** | **606244** | **613139** |
| **3538771** | **206511** | 3,00 | 42,00 | 19,77 | 18,50 | 20,00 | 37,52 | 7,62 | 140,00 | 96,57 | 42,68 | **MS518** | **409187** | **606244** | **613139** |
| **3538767** | **206507** | 3,00 | 66,70 | 24,76 | 23,50 | 25,00 | 44,45 | 9,52 | 150,00 | 89,05 | 60,32 | **MS518** | **409183** | **606243** | **613139** |

# WIN WITH WIDIA™

WIDIA™

## Separator™

Diseñado específicamente para ofrecer una flexibilidad de portaherramientas con diseños de componentes integrales y universales de tipo lama.

**Plaquitas y portaherramientas Separator**

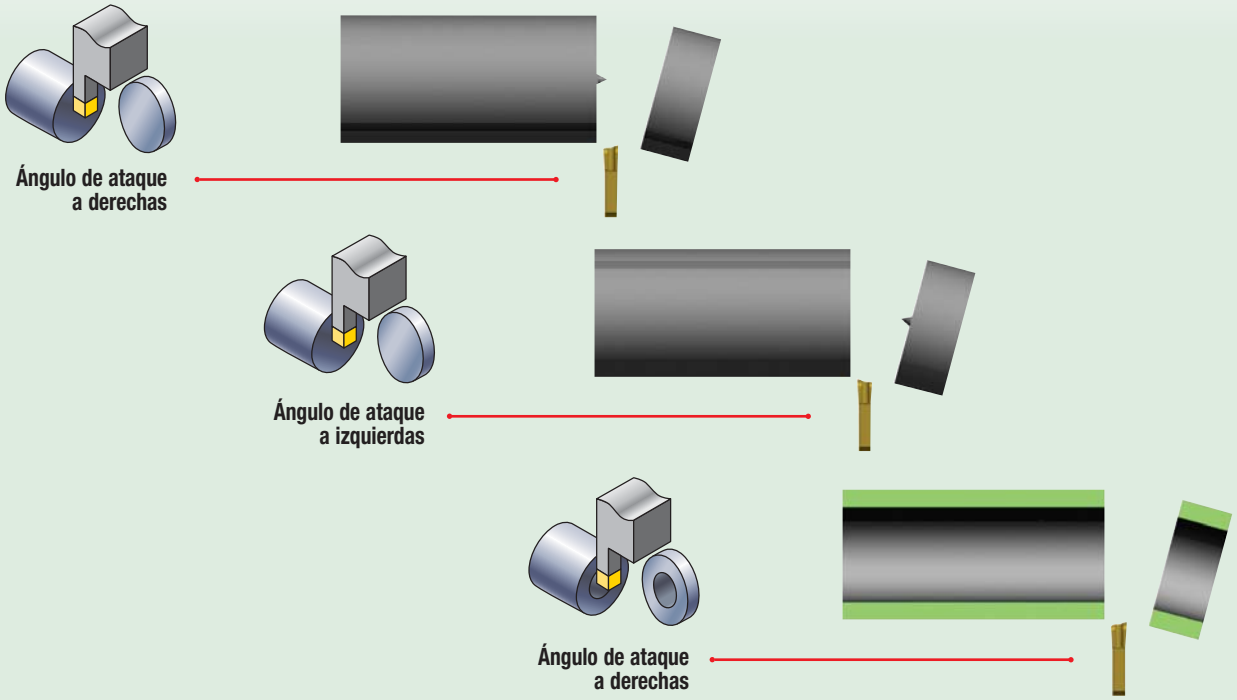
- Anchos de plaquita de 2,0 mm a 4,0 mm.
- Tamaños de mangos de portaherramientas de 10,0 mm a 31,75 mm.
- Tronzado de hasta 76,0 mm de capacidad de la barra.
- Indexado de plaquita rápido y fiable.
- Sujeción mecánica positiva.
- Mango cuadrado CNC, máquina de tornear y portaherramientas de tipo lama PL.

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

WIDIA™
Win with WIDIA™

**1 Elija la aplicación que se llevará a cabo:**

Elija el ángulo de ataque de la plaquita para la aplicación.




**2 Identifique el material que se va a mecanizar:**

cada herramienta cuenta con una presentación de materiales marcados con una letra que indica los materiales que se pueden mecanizar.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

**3 Seleccione su portaherramientas en función de la aplicación:**

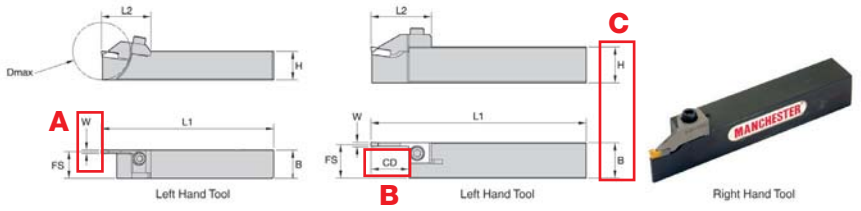
A Elija el ancho de plaquita apropiado que necesita la aplicación.

B Elija la dimensión de profundidad de corte "CD" más corta para una mayor rigidez de la herramienta.

C Seleccione las dimensiones de mango de portaherramientas "H" y "B" más grandes para la máxima rigidez.

**Separator™**
Toolholders

WIDIA MANCHESTER




■ Square Shank

| order number | catalogue number | A W | D max | B CD | C B | FS | C H | L2 | L1 | clamp | clamp screw |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right hand | | | | | | | | | | |
| 3614290 | 206445 | 2,00 | 20,00 | – | 9,86 | 9,00 | 10,00 | 21,55 | 75,00 | 435200 | MS318 |
| 3538751 | 206446 | 2,00 | 20,00 | – | 11,86 | 11,00 | 12,00 | 21,55 | 90,00 | 435200 | MS318 |
| 3538752 | 206447 | 2,00 | 26,00 | – | 9,86 | 9,00 | 10,00 | 24,83 | 150,00 | 435201 | MS318 |
| 3587590 | 206448 | 2,00 | 26,00 | – | 11,86 | 11,00 | 12,00 | 24,83 | 150,00 | 435201 | MS318 |
| 3615308 | 206449 | 2,00 | 38,00 | – | 15,86 | 15,00 | 16,00 | 32,83 | 100,00 | 435202 | MS412 |
| 3538753 | 206450 | 2,00 | 38,00 | – | 19,86 | 19,00 | 20,00 | 32,84 | 125,00 | 435202 | MS412 |
| 3538704 | 206263 | 2,50 | 20,00 | – | 9,75 | 8,80 | 10,00 | 21,51 | 74,96 | 435170 | MS318 |
| 3538706 | 206265 | 2,50 | 20,00 | – | 11,74 | 10,81 | 12,00 | 21,51 | 89,95 | 435170 | MS318 |
| 3538718 | 206279 | 2,50 | 26,00 | – | 9,75 | 8,81 | 10,00 | 24,80 | 150,00 | 435152 | MS318 |
| 3538719 | 206280 | 2,50 | 26,00 | – | 11,73 | 10,80 | 12,00 | 24,80 | 150,00 | 435152 | MS318 |
| 3538721 | 206282 | 2,50 | 38,00 | – | 15,75 | 14,81 | 16,00 | 32,80 | 100,00 | 435140 | MS412 |

**4 Seleccione el estilo de rompevirutas para la aplicación:**

Consulte la guía de aplicaciones de la página D93 para una lista completa de estilos de plaquita.

| tipo de plaquita | acero | acero inoxidable | fundición | metales no férreos | aleaciones de alta temperatura | materiales endurecidos |
|---|---|---|---|---|---|---|
| primera opción | **X²-Ultra** (X² incluye plaquitas "wiper") | **X²-Ultra** | **X²-Ultra** | **X²-Ultra** | **X²-Ultra** | — |
| segunda opción | **S²-Ultra** | **S²-Ultra** | **Clásico** | **S²-Ultra** | **S²-Ultra** | — |

**5 Seleccione la calidad:**

| | Calidades recomendadas | | | | |
|---|---|---|---|---|---|
| condición de mecanizado | acero | acero inoxidable | fundición | metales no férreos | aleaciones de alta temperatura |
| **alto rendimiento** para condiciones óptimas (cortes limpios, buen estado de la máquina, capacidad para mayores velocidades) | **M-93** | **M433B** | **M-93** | **M-93** | **M-433B** |
| | — | **M-93** | — | — | **M-93** |
| **uso general** (1.ª opción para el mecanizado general) | **M-43** | **M-43** | **M-43** | **M-43** | **M-43** |
| **condiciones desfavorables** (cortes interrumpidos, bajas velocidades, etc.) | **M-45** | **M-45** | **M-45** | **M-45** | **M-45** |
| | **M-40** | **M-40** | **M-40** | **M-40** | **M-40** |

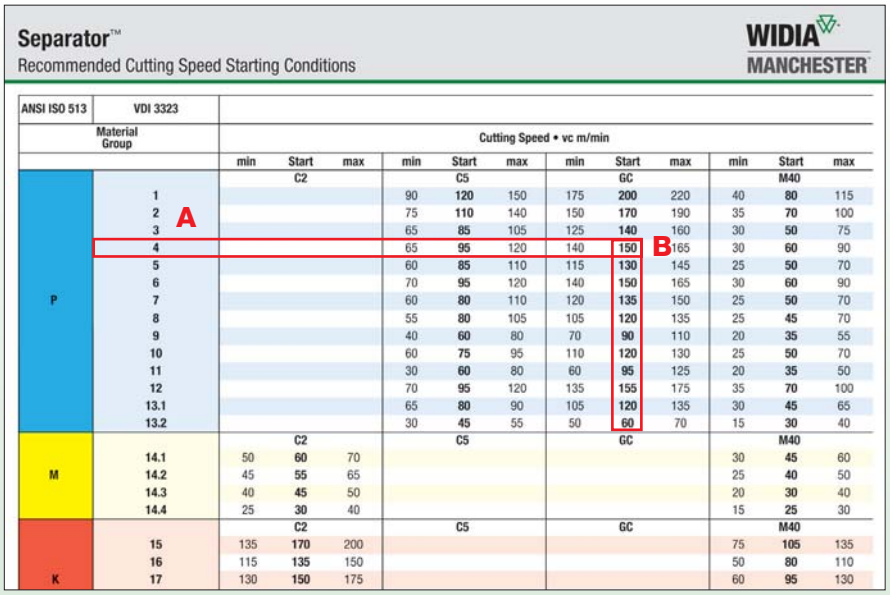
*Consulte en la página D92 las calidades y descripciones de calidades.*

**6 Determine los datos de corte:**

**A** Identifique la velocidad de arranque (vc), en función del grupo de materiales y la calidad.

**B** La primera opción en avances de arranque está en **negrita**.

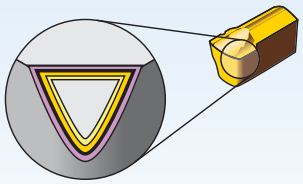
*Consulte la página D94 para datos de corte.*



Separator™
Recommended Cutting Speed Starting Conditions

WIDIA MANCHESTER

| ANSI ISO 513 | VDI 3323 | Cutting Speed • vc m/min | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material Group | | min | Start | max | min | Start | max | min | Start | max | min | Start | max |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| P | 1 | | | | 90 | **120** | 150 | 175 | **200** | 220 | 40 | **80** | 115 |
| | 2 | | | | 75 | **110** | 140 | 150 | **170** | 190 | 35 | **70** | 100 |
| | 3 | | | | 65 | **85** | 105 | 125 | **140** | 160 | 30 | **50** | 75 |
| | 4 | | | | 65 | **95** | 120 | 140 | **150** | 165 | 30 | **60** | 90 |
| | 5 | | | | 60 | **85** | 110 | 115 | **130** | 145 | 25 | **50** | 70 |
| | 6 | | | | 70 | **95** | 120 | 140 | **150** | 165 | 30 | **60** | 90 |
| | 7 | | | | 60 | **80** | 110 | 120 | **135** | 150 | 25 | **50** | 70 |
| | 8 | | | | 55 | **80** | 105 | 105 | **120** | 135 | 25 | **45** | 70 |
| | 9 | | | | 40 | **60** | 80 | 70 | **90** | 110 | 20 | **35** | 55 |
| | 10 | | | | 60 | **75** | 95 | 110 | **120** | 130 | 25 | **50** | 70 |
| | 11 | | | | 30 | **60** | 80 | 60 | **95** | 125 | 20 | **35** | 50 |
| | 12 | | | | 70 | **95** | 120 | 135 | **155** | 175 | 35 | **70** | 100 |
| | 13.1 | | | | 65 | **80** | 90 | 105 | **120** | 135 | 30 | **45** | 65 |
| | 13.2 | | | | 30 | **45** | 55 | 50 | **60** | 70 | 15 | **30** | 40 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| M | 14.1 | 50 | **60** | 70 | | | | | | | 30 | **45** | 60 |
| | 14.2 | 45 | **55** | 65 | | | | | | | 25 | **40** | 50 |
| | 14.3 | 40 | **45** | 50 | | | | | | | 20 | **30** | 40 |
| | 14.4 | 25 | **30** | 40 | | | | | | | 15 | **25** | 30 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| K | 15 | 135 | **170** | 200 | | | | | | | 75 | **105** | 135 |
| | 16 | 115 | **135** | 150 | | | | | | | 50 | **80** | 110 |
| | 17 | 130 | **150** | 175 | | | | | | | 60 | **95** | 130 |



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

- Reducen los ciclos de tiempo: velocidad y avance mayores.
- Vida más larga de la herramienta: un nuevo recubrimiento multicapa proporciona una mejor resistencia al desgaste.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|
| C2 / HW-K15 | Un metal duro de tungsteno de uso general para fundiciones, aleaciones no férreas y múltiples aleaciones de alta temperatura. | | | | | | | | | |
| C5 / HW-P35 | Un metal duro de tungsteno aleado de uso general para el corte de metales. | | | | | | | | | |
| GC / HC-P20 | Metal duro recubierto. CVD — TiC-TiCN-TiN. Un revestimiento de fase triple en una calidad de grano fino duro con bajo contenido en aglomerado. Calidad de uso general y alta velocidad para todo tipo de aceros. Color dorado. | | | | | | | | | |
| M40 / HC-P35 | Un excelente recubrimiento de PVD-TiN con una sola fase en un sustrato duro con una fórmula especial que actúa sin problemas en velocidades desde extremadamente bajas a moderadas, en máquinas de tornear. Ideal para aceros al carbono, aceros aleados, la mayoría de aceros inoxidables y múltiples aleaciones de alta temperatura. | | | | | | | | | |
| M43 / HC-P25 | Un recubrimiento PVD-TiAlN multicapa en un sustrato duro de metal duro y grano fino resistente a los choques con mayor resistencia a la oxidación. Recomendada en velocidades de corte baja y media cuando sean necesarias buenas propiedades de dureza. | | | | | | | | | |
| M433B / HC-M30 | Un recubrimiento PVD-TiAlN de capa única en un sustrato especialmente duro de metal duro y grano fino. Extraordinarias propiedades de temperatura con una resistencia excelente para evitar el recrecimiento de los filos. Velocidades y avances medias y altas. Para aceros inoxidables y aleaciones a altas temperaturas. | | | | | | | | | |
| M45 / HC-P30 | Un excelente metal duro con recubrimiento de PVD-TiCN y resistente a los choques, diseñado para velocidades bajas y moderadas. Una resistencia excelente al soldado y al recrecimiento del filo, junto con una mejor resistencia a la abrasión, convierten a esta calidad en la ideal para acero inoxidable austenítico, acero con bajo contenido en carbono y aleaciones de alta temperatura. | | | | | | | | | |
| M93 / HC-P20 | Un recubrimiento PVD-TiAlN multicapa en un sustrato duro de metal duro y grano fino con mayor resistencia al calor. Recomendado para velocidades de corte medias y más altas en condiciones moderadas. | | | | | | | | | |

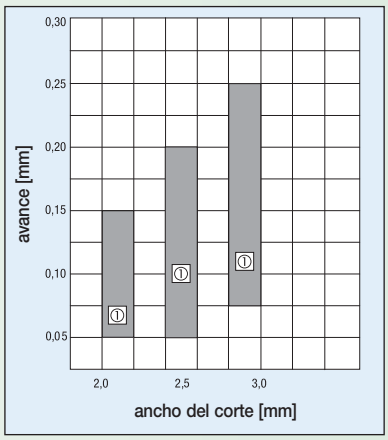
## Separator • X² y X²-Ultra

**X²**

Esta plaquita tiene la misma geometría que la WMT-SX™. Una geometría de control de virutas que ofrece la mayor variedad de velocidades y avances y que, además ofrece una uniformidad y un acabado superiores. Este rompevirutas corte con la menor cantidad de presión de la herramienta, aumentando la vida de la herramienta. La geometría también incluye plaquitas "wiper" y un radio de esquina. La geometría funciona bien con distintos materiales.

**X²-Ultra**

Esta plaquita tiene la misma geometría que la WMT-SX-Ultra. X²-Ultra es una versión mejorada de X², ideal para acero inoxidable, aleaciones con base de níquel, acero para herramientas, INOCNEL® y titanio.




① Avance recomendado

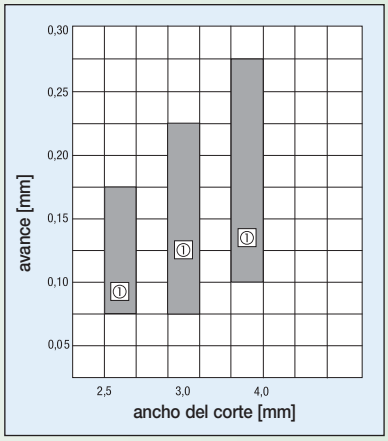
## Separator • S² y S²-Ultra

**S²**

Un desprendimiento positivo alto con un rompevirutas abierto que permite un aumento de las velocidades y los avances para aplicaciones de velocidad moderada a elevada. La geometría también incluye plaquitas "wiper" y un radio de esquina que proporciona una uniformidad y un acabado superiores. Esta plaquita también está disponible con esquinas afiladas. Destaca con los aceros inoxidables y los aceros gomosos suaves.

**S²-Ultra**

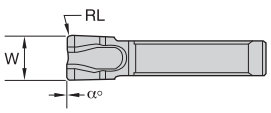
S2-Ultra es una versión mejorada de S², ideal para la serie 300 de acero inoxidable, aleaciones con base de níquel, acero para herramientas, INOCNEL® y titanio a velocidades y avances entre moderadas y elevadas.

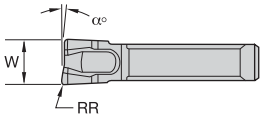


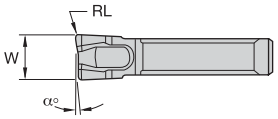

① Avance recomendado

| ANSI ISO 513 | VDI 3323 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| P | 1 | | | | 90 | **120** | 150 | 175 | **200** | 220 | 40 | **80** | 115 |
| | 2 | | | | 75 | **110** | 140 | 150 | **170** | 190 | 35 | **70** | 100 |
| | 3 | | | | 65 | **85** | 105 | 125 | **140** | 160 | 30 | **50** | 75 |
| | 4 | | | | 65 | **95** | 120 | 140 | **150** | 165 | 30 | **60** | 90 |
| | 5 | | | | 60 | **85** | 110 | 115 | **130** | 145 | 25 | **50** | 70 |
| | 6 | | | | 70 | **95** | 120 | 140 | **150** | 165 | 30 | **60** | 90 |
| | 7 | | | | 60 | **80** | 110 | 120 | **135** | 150 | 25 | **50** | 70 |
| | 8 | | | | 55 | **80** | 105 | 105 | **120** | 135 | 25 | **45** | 70 |
| | 9 | | | | 40 | **60** | 80 | 70 | **90** | 110 | 20 | **35** | 55 |
| | 10 | | | | 60 | **75** | 95 | 110 | **120** | 130 | 25 | **50** | 70 |
| | 11 | | | | 30 | **60** | 80 | 60 | **95** | 125 | 20 | **35** | 50 |
| | 12 | | | | 70 | **95** | 120 | 135 | **155** | 175 | 35 | **70** | 100 |
| | 13.1 | | | | 65 | **80** | 90 | 105 | **120** | 135 | 30 | **45** | 65 |
| | 13.2 | | | | 30 | **45** | 55 | 50 | **60** | 70 | 15 | **30** | 40 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| M | 14.1 | 50 | **60** | 70 | | | | | | | 30 | **45** | 60 |
| | 14.2 | 45 | **55** | 65 | | | | | | | 25 | **40** | 50 |
| | 14.3 | 40 | **45** | 50 | | | | | | | 20 | **30** | 40 |
| | 14.4 | 25 | **30** | 40 | | | | | | | 15 | **25** | 30 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| K | 15 | 135 | **170** | 200 | | | | | | | 75 | **105** | 135 |
| | 16 | 115 | **135** | 150 | | | | | | | 50 | **80** | 110 |
| | 17 | 130 | **150** | 175 | | | | | | | 60 | **95** | 130 |
| | 18 | 90 | **115** | 140 | | | | | | | 45 | **75** | 100 |
| | 19 | 150 | **185** | 215 | | | | | | | 85 | **115** | 145 |
| | 20 | 120 | **145** | 170 | | | | | | | 55 | **90** | 120 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| N | 21 | 305 | **410** | 520 | | | | | | | 210 | **370** | 520 |
| | 22 | 245 | **350** | 460 | | | | | | | 150 | **305** | 460 |
| | 23 | 305 | **410** | 520 | | | | | | | 210 | **365** | 520 |
| | 24 | 245 | **350** | 460 | | | | | | | 150 | **305** | 460 |
| | 25 | 210 | **245** | 275 | | | | | | | 135 | **205** | 275 |
| | 26 | 150 | **170** | 185 | | | | | | | 90 | **135** | 185 |
| | 27 | 150 | **170** | 185 | | | | | | | 90 | **135** | 185 |
| | 28 | 90 | **105** | 120 | | | | | | | 60 | **90** | 120 |
| | 29 | 60 | **75** | 90 | | | | | | | 45 | **70** | 90 |
| | 30 | 75 | **90** | 105 | | | | | | | 45 | **75** | 110 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| S | 31 | 35 | **45** | 50 | | | | | | | 25 | **40** | 50 |
| | 32 | 25 | **30** | 35 | | | | | | | 20 | **25** | 30 |
| | 33 | 20 | **25** | 30 | | | | | | | 15 | **20** | 25 |
| | 34 | 15 | **20** | 25 | | | | | | | 10 | **15** | 20 |
| | 35 | 15 | **20** | 25 | | | | | | | 10 | **15** | 20 |
| | 36 | 55 | **60** | 65 | | | | | | | 35 | **45** | 60 |
| | 37 | 25 | **30** | 35 | | | | | | | 15 | **25** | 30 |

| Velocidad de corte • vc m/min | | | | | | | | | | | | VDI 3323 | ANSI ISO 513 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Grupo de materiales | |
| mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | | |
| | **M43** | | | **M433B** | | | **M45** | | | **M93** | | | |
| 110 | **160** | 210 | — | — | — | 45 | **85** | 125 | 150 | **200** | 245 | **1** | |
| 85 | **140** | 190 | — | — | — | 40 | **75** | 110 | 130 | **170** | 215 | **2** | |
| 75 | **110** | 150 | — | — | — | 35 | **60** | 80 | 110 | **145** | 175 | **3** | |
| 80 | **125** | 170 | — | — | — | 40 | **70** | 100 | 120 | **150** | 185 | **4** | |
| 65 | **105** | 145 | — | — | — | 30 | **55** | 75 | 100 | **130** | 160 | **5** | |
| 80 | **125** | 170 | — | — | — | 40 | **70** | 100 | 120 | **150** | 185 | **6** | |
| 65 | **105** | 145 | — | — | — | 35 | **55** | 75 | 105 | **135** | 165 | **7** | **P** |
| 60 | **100** | 140 | — | — | — | 25 | **50** | 70 | 90 | **120** | 150 | **8** | |
| 45 | **80** | 115 | — | — | — | 20 | **40** | 60 | 60 | **90** | 120 | **9** | |
| 65 | **95** | 120 | — | — | — | 30 | **50** | 75 | 100 | **120** | 145 | **10** | |
| 35 | **75** | 115 | 30 | **70** | 115 | 20 | **40** | 60 | 55 | **100** | 135 | **11** | |
| 85 | **120** | 155 | 85 | **125** | 160 | 40 | **75** | 110 | 120 | **155** | 190 | **12** | |
| 80 | **100** | 120 | 80 | **105** | 130 | 35 | **55** | 75 | 90 | **120** | 150 | **13.1** | |
| 35 | **50** | 65 | 35 | **50** | 70 | 20 | **30** | 45 | 45 | **60** | 75 | **13.2** | |
| | **M43** | | | **M433B** | | | **M45** | | | **M93** | | | |
| 50 | **75** | 100 | 55 | **90** | 130 | 35 | **50** | 65 | 90 | **120** | 150 | **14.1** | |
| 45 | **60** | 80 | 45 | **75** | 105 | 30 | **50** | 60 | 75 | **100** | 120 | **14.2** | **M** |
| 35 | **50** | 65 | 35 | **60** | 80 | 25 | **35** | 50 | 55 | **75** | 95 | **14.3** | |
| 25 | **40** | 50 | 25 | **45** | 65 | 20 | **30** | 40 | 45 | **60** | 75 | **14.4** | |
| | **M43** | | | **M433B** | | | **M45** | | | **M93** | | | |
| 105 | **150** | 200 | 230 | **290** | 350 | 90 | **120** | 150 | 150 | **200** | 245 | **15** | |
| 75 | **115** | 150 | 170 | **230** | 290 | 60 | **100** | 135 | 105 | **150** | 200 | **16** | |
| 90 | **135** | 175 | 200 | **260** | 320 | 70 | **110** | 150 | 120 | **170** | 215 | **17** | **K** |
| 60 | **100** | 135 | 180 | **245** | 305 | 50 | **85** | 115 | 115 | **160** | 205 | **18** | |
| 120 | **170** | 215 | 245 | **305** | 365 | 100 | **130** | 160 | 165 | **180** | 260 | **19** | |
| 80 | **125** | 170 | 215 | **275** | 335 | 65 | **105** | 145 | 110 | **140** | 215 | **20** | |
| | **M43** | | | **M433B** | | | **M45** | | | **M93** | | | |
| 275 | **440** | 610 | | | | 245 | **400** | 550 | 305 | **490** | 670 | **21** | |
| 210 | **380** | 550 | | | | 180 | **335** | 490 | 245 | **430** | 610 | **22** | |
| 275 | **440** | 610 | | | | 245 | **395** | 550 | 305 | **490** | 670 | **23** | |
| 210 | **380** | 550 | | | | 180 | **335** | 490 | 245 | **430** | 610 | **24** | |
| 180 | **260** | 335 | | | | 150 | **230** | 305 | 210 | **305** | 400 | **25** | **N** |
| 120 | **170** | 215 | | | | 105 | **150** | 200 | 150 | **200** | 245 | **26** | |
| 120 | **170** | 215 | | | | 105 | **150** | 200 | 150 | **200** | 245 | **27** | |
| 75 | **105** | 135 | | | | 70 | **100** | 130 | 90 | **135** | 185 | **28** | |
| 55 | **80** | 110 | | | | 45 | **75** | 100 | 60 | **90** | 120 | **29** | |
| 60 | **90** | 120 | | | | 50 | **85** | 115 | 75 | **120** | 150 | **30** | |
| | **M43** | | | **M433B** | | | **M45** | | | **M93** | | | |
| 30 | **45** | 55 | 35 | **50** | 60 | 30 | **40** | 55 | 35 | **50** | 70 | **31** | |
| 20 | **30** | 40 | 25 | **35** | 40 | 25 | **30** | 35 | 30 | **35** | 45 | **32** | |
| 15 | **20** | 30 | 20 | **25** | 30 | 15 | **20** | 25 | 25 | **30** | 35 | **33** | |
| 15 | **20** | 25 | 15 | **20** | 25 | 10 | **15** | 20 | 20 | **25** | 30 | **34** | **S** |
| 15 | **20** | 25 | 15 | **20** | 25 | 10 | **15** | 20 | 20 | **25** | 30 | **35** | |
| 35 | **50** | 65 | 40 | **55** | 70 | 35 | **50** | 65 | 55 | **65** | 80 | **36** | |
| 25 | **30** | 35 | 25 | **30** | 40 | 20 | **25** | 35 | 30 | **35** | 45 | **37** | |




● primera elección
○ elección alternativa

| | | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | ● | ● | ● | ● | ● | ● |
| M | | ○ | | ● | ● | ● | ● | ● | ● |
| K | | ○ | | ○ | | | | | |
| N | | ○ | | | | ● | ● | | |
| S | | | | ○ | ● | ● | ● | ● | ○ |
| H | | ● | | | | | | | |

## X²

| Número de catálogo | W | RR | α° | mano |
|---|---|---|---|---|
| **507363** | 2,50 | 0,13 | — | N - Neutro |
| **507372** | 3,00 | 0,15 | — | N - Neutro |

| Número de catálogo | W | RR | α° | mano |
|---|---|---|---|---|
| **507365** | 2,50 | 0,13 | 5 | L - Izquierda |
| **507374** | 3,00 | 0,15 | 5 | L - Izquierda |

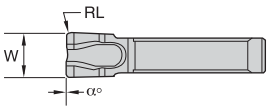
| Número de catálogo | W | RL | α° | mano |
|---|---|---|---|---|
| **507364** | 2,50 | 0,13 | 5 | R - Derecha |
| **507373** | 3,00 | 0,15 | 5 | R - Derecha |

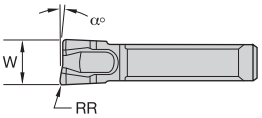
## X² Ultra

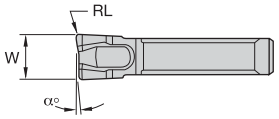
| Número de catálogo | W | RR | α° | mano |
|---|---|---|---|---|
| **507366** | 2,50 | 0,15 | — | N - Neutro |
| **507369** | 3,00 | 0,15 | — | N - Neutro |

| Número de catálogo | W | RR | α° | mano |
|---|---|---|---|---|
| **507368** | 2,50 | 0,13 | 5 | L - Izquierda |
| **507371** | 3,00 | 0,15 | 5 | L - Izquierda |

| Número de catálogo | W | RL | α° | mano |
|---|---|---|---|---|
| **507383** | 2,00 | — | 5 | R - Derecha |
| **507367** | 2,50 | 0,13 | 5 | R - Derecha |
| **507370** | 3,00 | 0,15 | 5 | R - Derecha |




● primera elección
○ elección alternativa

| | | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|
| P | | ○ | ○ | ● | ● | ● | ● | ● | |
| M | | ○ | | | ● | ● | ● | ● | ● |
| K | | ○ | | | ○ | | | | |
| N | | ○ | | | | ● | ● | | |
| S | | | | | ○ | ● | ● | ● | ○ |
| H | | ● | | | | | | | |

## ■ S²

| Número de catálogo | W | RR | α° | mano | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **507295** | 3,00 | 0,25 | — | N - Neutro | | | | | ● | | ● | ● |
| **507378** | 4,00 | 0,25 | — | N - Neutro | | | | | ● | | ● | ● |

| Número de catálogo | W | RR | α° | mano | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **507297** | 3,00 | 0,20 | 5 | L - Izquierda | | | | | ● | | ● | ● |
| **507380** | 4,00 | 0,25 | 5 | L - Izquierda | | | | | ● | | ● | ● |

| Número de catálogo | W | RL | α° | mano | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **507296** | 3,00 | 0,20 | 5 | R - Derecha | | | | | ● | | ● | ● |
| **507379** | 4,00 | 0,25 | 5 | R - Derecha | | | | | ● | | ● | ● |

## ■ S² Ultra

| Número de catálogo | W | RR | α° | mano | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **507348** | 2,50 | 0,15 | — | N - Neutro | | | | | | ● | | |
| **507351** | 3,00 | 0,15 | — | N - Neutro | | | | | | ● | | |

| Número de catálogo | W | RR | α° | mano | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **507350** | 2,50 | 0,15 | 5 | L - Izquierda | | | | | | ● | | |
| **507353** | 3,00 | 0,15 | 5 | L - Izquierda | | | | | | ● | | |

| Número de catálogo | W | RL | α° | mano | C2 | C5 | GC | M40 | M43 | M433B | M45 | M93 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **507349** | 2,50 | 0,15 | 5 | R - Derecha | | | | | | ● | | |
| **507352** | 3,00 | 0,15 | 5 | R - Derecha | | | | | | ● | | |

## Definiciones y líneas generales

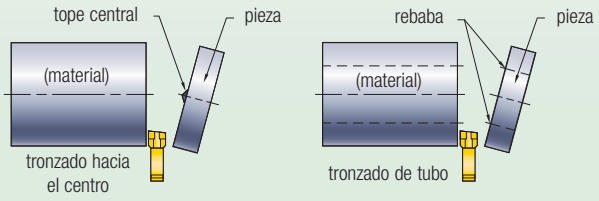
1. Ancho de corte (W) = ancho de la plaquita.

2. Ángulo de ataque = 0° (neutro); 4°, 5°, 12°, 18° (a derechas o a izquierdas).

## Reducir la rebaba de las caras de un tronzado:

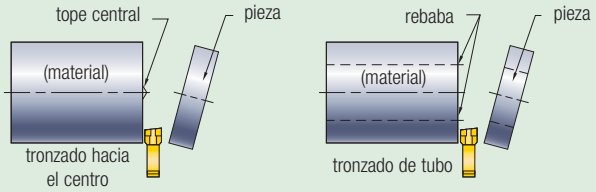
- Utilice plaquitas de tipo ángulo de ataque (figuras 1 y 2). El ángulo de ataque de una plaquita de tronzar reduce la rebaba que permanece en la pieza, pero no sólo disminuye la vida de la herramienta sino que aumenta la desviación de esta última; también puede aumentar el tiempo del ciclo.

**Figura 1**
Selección de plaquita con un **ataque a izquierdas**




La plaquita de ataque a izquierdas deja el tope central o la rebaba en la pieza y deja una superficie limpia en el material.

**Figura 2**
Selección de plaquita con un **ataque a derechas**

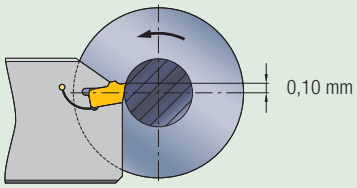



La plaquita de ataque a derechas deja el tope central o la rebaba en la pieza y proporciona una superficie limpia en el material.

- Compruebe la altura total y mantenga la plaquita en el centro del diámetro de la pieza.

- La altura del filo de corte debe estar a ±0,1 mm del centro; la posición de corte recomendada es de 0,05 mm por encima del centro.

**Figura 3**
Por encima del centro




- Si es obligatorio un ángulo de ataque de 0º, utilice la lama y la plaquita de tronzar más estrechas que sea posible. Esto minimizará la longitud de la rebaba del tronzado o el tope central. Disminuya la tasa de avance a un máximo de 0,05 mm o menos en el punto en el que el diámetro sea igual al ancho de la plaquita.

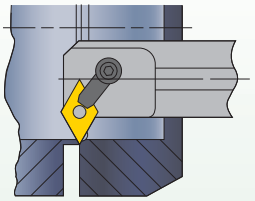


**Figura 4**
Alineado de biselado interior

- En las piezas de tipo tubo que requieran un biselado del diámetro interior, alinee la herramienta de biselado de diámetro interior con la superficie de tronzado. Esto permitirá a la operación de biselado separar la pieza de la barra (consulte la figura 4). Tenga en cuenta que la pieza puede caerse sobre la barra de biselado, que, en este caso, actuará como un receptor de la pieza.

## Mejora del acabado superficial de las caras de tronzado:

- Utilice una plaquita con un ángulo de 0º.

- Aumente el flujo de refrigerante o mejore la técnica de aplicación, tal y como se muestra en la figura 5.

- Disminuya la tasa de avance cerca del punto de ruptura del corte.

- Compruebe que la herramienta de ranurado esté fijada en el ángulo correcto.

- Utilice lamas con la mayor altura de cara posible y el menor ancho de corte.

- Aumente la velocidad.

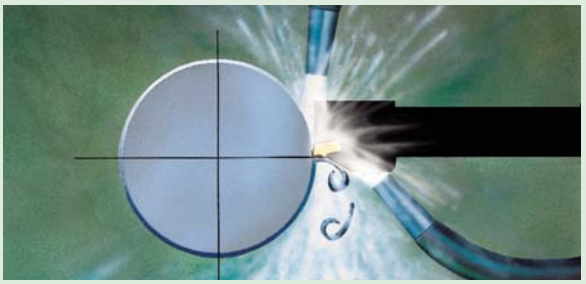


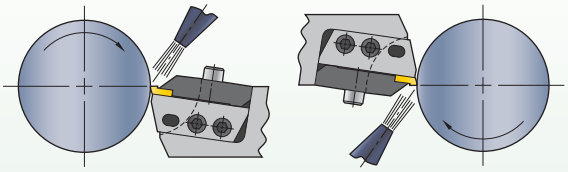
**Figura 5**
Método ideal para la aplicación de refrigerante

- Monte la herramienta de tronzado boca abajo. Así la gravedad retirará las virutas y se evitará cortarlas dos veces. Otra ventaja de montar la herramienta boca abajo es impedir que las virutas se interpongan entre la plaquita de la herramienta y las paredes del lado de la ranura, lo cual representaría un estorbo en las superficies de las paredes laterales.

## Mejorar del control de virutas:

- Aumente o disminuya la tasa de avance para acomodar la formación de virutas.
- Utilice un ataque de 0° o el más pequeño que sea posible.
- Utilice grandes cantidades de refrigerante bien dirigidos (consulte la figura A).
- Mantenga las esquinas y el filo de corte afilados.

**Figura A**



Refrigerante en la herramienta de tronzar

Método ideal de aplicación de refrigerante

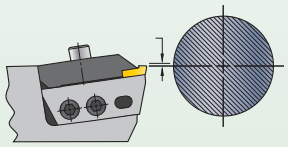
## Mejora de la uniformidad de las caras de tronzado:

- Mantenga una posición de 90° (alineamiento perpendicular) entre la herramienta de tronzar y la pieza de trabajo.
- Para un avance entre bajo y moderado (sfpm), utilice Separator F2.
- Para un avance entre moderado y alto (sfpm), utilice Separator S² o X².
- Utilice el sistema de portaherramientas más resistente que sea posible.
- Utilice plaquitas con ángulo de ataque de 0º siempre que sea posible. Si se necesitan plaquitas con ángulo de ataque, reduzca avance.
- Compruebe el voladizo mínimo del porta y la hoja.
- Configure un voladizo de pieza de trabajo mínimo (longitud sobrante del cono).
- Reduzca avance.
- Mantenga las esquinas y el filo de corte afilados en la plaquita de tronzar.
- Aumente la velocidad (RPM).
- Utilice grandes cantidades de refrigerante bien dirigidos (consulte la figura A).
- Mantenga en la herramienta una altura central adecuada de entre 0,0 mm y 0,0001 mm por encima del centro (consulte la figura B).

## Mejora del acabado superficial:

- Para un avance entre bajo y moderado (sfpm), utilice Separator F2.
- Para un avance entre moderado y alto (sfpm), utilice Separator S² o X².
- Evite un control de virutas excesivamente agresivo.
- Aumente la velocidad.
- Reduzca el ángulo de ataque y el avance.
- Determine si el radio de esquina es demasiado grande o pequeño.
- Utilice una calidad con recubrimiento.
- Utilice refrigerante (consulte la figura A).

**Figura B**



## Minimización del astillamiento de los filos:

- Compruebe si la herramienta está muy por encima o debajo del centro.
- Reduzca el avance antes de que la pieza se caiga.
- Utilice Separator S² o X².
- Elija el avance adecuado que corresponda a la calidad de la plaquita empleada.
- Llame al servicio de asistencia técnica para comprobar si es necesario un tamaño de agujero mayor.
- Elimine las vibraciones.
- Evite volver a cortar las virutas.
- Compruebe si se producen estos problemas en la pieza y la máquina:
  - La superficie está suelta.
  - El desplazamiento por la superficie es irregular.
  - El diámetro interior y/o exterior de la barra o el tubo no coinciden con lo programado.
  - La barra o el tubo están doblados.
  - Pared delgada que se deshace (se deforma) con el corte.
  - Pieza inestable.
  - Tronzado a través de material sin tornear.
  - Voladizo excesivo de la herramienta.
  - Anillo de rebaba doblado o fijado sólo parcialmente.

*(continuación)*

*(continuación)*

### Eliminación de vibraciones:

- Minimice el voladizo de la lama y el porta de la herramienta.
- Minimice el voladizo de la pieza.
- Utilice el sistema portaherramientas más resistente.
- Utilice una plaquita más estrecha.
- Puede que el rompevirutas sea demasiado agresivo. (Llame al servicio de asistencia técnica).
- Aumente o disminuye la velocidad y la tasa de avance.
- Sostenga con rigidez la pieza de trabajo.
- Con una pieza más larga, sostenga con un soporte o un punto fijos.
- Evite las paradas de la máquina.
- Utilice $S^2$ o $X^2$ para reducir las fuerzas de corte.

### Reducción de la punta de tronzado en una barra maciza o de la rebaba del diámetro interior en unos tubos:

- Compruebe la altura de la herramienta. El filo de corte de la plaquita debería estar en el centro a 0,05 mm por encima de la línea central de la pieza de trabajo.
- Para reducir la punta de la pieza, utilice una plaquita de tipo ángulo de ataque alto. El ángulo de ataque en una plaquita de tronzar reduce la punta, que permanece en la pieza de trabajo. PRECAUCIÓN: cuanto más alto el ataque, mayor el desvío de la herramienta.
- Utilice la plaquita de tronzar más estrecha para minimizar la longitud de las rebabas de tronzado.
- Reduzca la tasa de avance en el final del corte.
- En la mayoría de piezas de tipo tubo, bastará con un ángulo de ataque de 4° o 5°.
- Añada un soporte a una pieza larga y delgada.
- Mantenga una alineación adecuada para el subhusillo.
- Si la rebaba persiste, llame al servicio de asistencia técnica para consultar cómo reducir el tamaño de redondeo.
- Utilice un radio pequeño o sin esquinas.

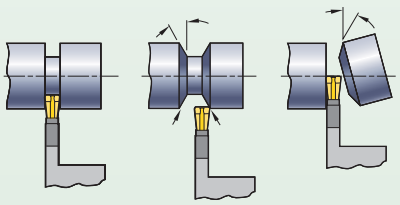
### Eliminación del recrecimiento del filo:

- Seleccione la calidad adecuada para la plaquita.
- Aumente la velocidad (RPM).
- Aumente el avance.
- Utilice grandes cantidades de refrigerante bien dirigidos (consulte la figura A de la página D99).

### Operaciones de biselado y tronzado:

- Utilice Separator $S^2$ o $X^2$.
- Realice una ranura en la superficie de la pieza de trabajo que se esté mecanizando.
- Realice el biselado.
- Para trabajos que requieran un biselado en ambos extremos de la pieza, empiece con un vaciado a una profundidad ligeramente mayor que la de los biseles. A continuación, vuelva con el diámetro exterior de la pieza y perfile cada bisel individualmente. Termine el tronzado tras finalizar el segundo biselado.
- Corte la pieza de trabajo (consulte la figura C).

**Figura C**



## Modificaciones para una mayor profundidad de corte

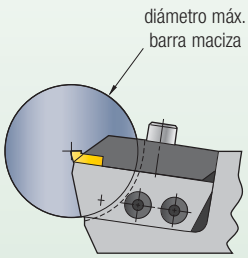



**Figura 1**
Capacidad de una barra estándar

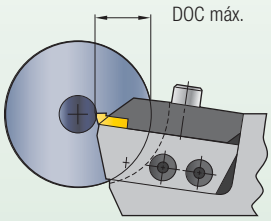



**Figura 2**
Diámetro de una barra más grande

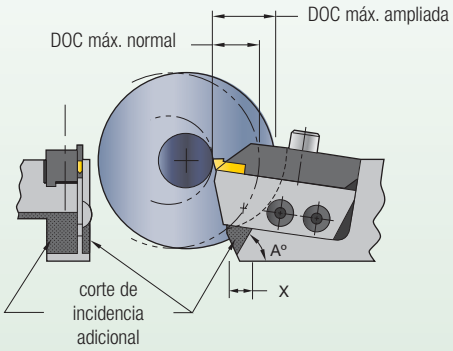



**Figura 3**
Portaherramientas modificado
con diámetro de barra más grande

| Tabla de capacidades para herramientas con capacidad de 57,15 mm de diámetro de barra | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **diámetro de barra** | 63,50 | 76,20 | 88,90 | 101,60 | 114,30 | 127,00 | 152,40 | **NOTA** |
| **máx. DOC** | 23,88 | 19,05 | 15,75 | 14,22 | 12,70 | 11,94 | 11,18 | **sin modificación en el portaherramientas** |
| | 28,45 | 26,16 | 24,64 | 24,64 | 22,10 | 21,34 | 19,81 | **sin modificación en el portaherramientas X = 10,16 mm A = 1270 mm** |

| Tabla de capacidades para herramientas con capacidad de 76,2 mm de diámetro de barra | | | | | | |
|---|---|---|---|---|---|---|
| **diámetro de barra** | 88,90 | 101,60 | 114,30 | 127,00 | 152,40 | **NOTA** |
| **máx. DOC** | 28,45 | 25,40 | 22,35 | 19,81 | 17,53 | **sin modificación en el portaherramientas** |
| | 36,58 | 34,80 | 33,27 | 31,75 | 28,45 | **sin modificación en el portaherramientas X = 10,16 mm A = 1270 mm** |

# Ranger™

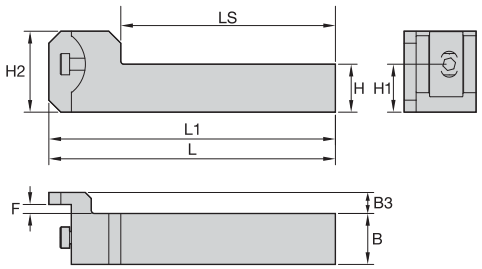
*Sistema de ranurado frontal ajustable Ranger™*

## Características:

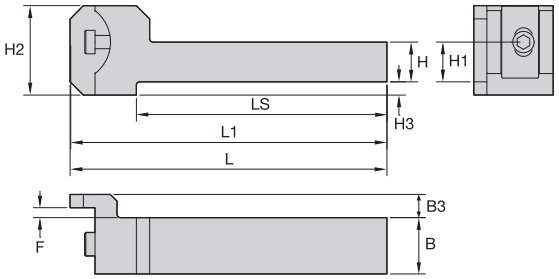
- Permite el ajuste de la lama de soporte con un diámetro de 57,0 mm a 406,0 mm para la penetración inicial.
- Anchos de plaquita de 3,2 mm, 4,9 mm y 6,4 mm.

## Ventajas:

- Disponible en rotación de CW y CCW y en estilos de mecanizado interior y exterior.
- Ranurado frontal de diámetro exterior de 57,0 mm a 406,0 mm con un único montaje ajustable.



Herramienta a derechas



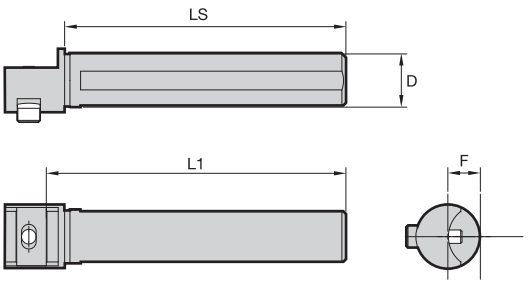
Herramienta a derechas

Conjunto a izquierdas

## Mango cuadrado

| Número de pedido | Número de catálogo | B | B3 | H | H1 | H2 | H3 | F | L | L1 | LS | tornillo de lama de soporte | tuerca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3538807** | **235204** | 27 | 11 | 20 | 20 | 43 | 5 | -5 | 152 | 151,46 | 113,665 | **606218** | **613137** |
| **3538808** | **235205** | 27 | 11 | 25 | 25 | 43 | — | -5 | 152 | 151,46 | 113,665 | **606218** | **613137** |
| **3538809** | **235206** | 27 | 11 | 32 | 32 | 49 | — | -5 | 152 | 151,46 | 113,665 | **606218** | **613137** |
| | **A izquierdas** | | | | | | | | | | | | |
| **3538810** | **235207** | 27 | 11 | 20 | 20 | 43 | 5 | -5 | 152 | 151,46 | 113,665 | **606218** | **613137** |
| **3538811** | **235208** | 27 | 11 | 25 | 25 | 43 | — | -5 | 152 | 151,46 | 113,665 | **606218** | **613137** |
| **3538812** | **235209** | 27 | 11 | 32 | 32 | 49 | — | -5 | 152 | 151,46 | 113,665 | **606218** | **613137** |

*NOTA: estos portas sólo pueden emplear un conjunto de cartucho con curva de salida.*
*Un porta a derechas emplea un conjunto de cartucho a izquierdas.*

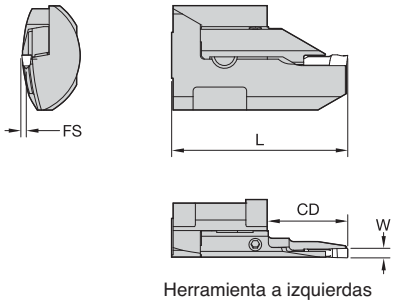


Conjunto a izquierdas

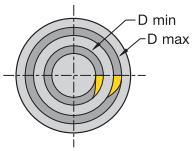
## Mango redondo

| Número de pedido | Número de catálogo | D | L1 | LS | F | tornillo de lama soporte | arandela |
|---|---|---|---|---|---|---|---|
| **3538804** | **235201** | 25 | 143,51 | 139,70 | 19 | **619155** | **613135** |
| **3538805** | **235202** | 30 | 143,51 | 139,70 | 19 | **619155** | **613135** |
| **3538806** | **235203** | 32 | 143,51 | 139,70 | 19 | **619155** | **613135** |

*NOTA: los portaherramientas pueden utilizarse tanto a izquierdas como a derechas.*
*Estos portas sólo pueden emplear un conjunto de cartucho con curva de entrada y salida.*




Herramienta a izquierdas



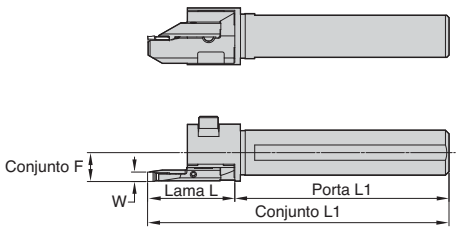

| Tipo lama | Forma de la pieza | A izquierdas | A derechas |
|---|---|---|---|
| Curva de entrada | | | |
| Curva de salida | | | |



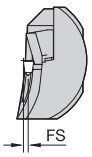
## Curva de entrada

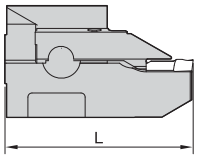
| Número de pedido | Número de catálogo | W | CD | D min | D max | FS | L | mano | amarre | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|
| **3539561** | **338223** | 3,18 | 19 | 57 | 400 | -1,80 | 58 | L - Izquierda | **440203** | **606219** |
| **3539562** | **338224** | 4,76 | 25 | 57 | 400 | -2,39 | 58 | L - Izquierda | **440204** | **606219** |
| **3539570** | **338232** | 6,35 | 25 | 57 | 400 | -3,18 | 58 | L - Izquierda | **4402122** | **606219** |
| **3539559** | **338221** | 3,17 | 19 | 57 | 400 | -1,80 | 58 | R - Derecha | **440201M** | **606219** |
| **3539560** | **338222** | 4,76 | 25 | 57 | 400 | -2,39 | 58 | R - Derecha | **440202** | **606219** |
| **3539569** | **338231** | 6,35 | 25 | 57 | 400 | -3,18 | 58 | R - Derecha | **440211** | **606219** |

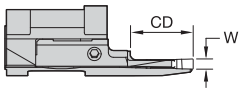
*NOTA: el cartucho a derechas se emplea con el portaherramientas a izquierdas.*
*El cartucho a izquierdas, con el portaherramientas a derechas.*



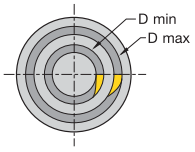

Para mango redondo
Conjunto F = W/2 + F (porta) + FS (lama)
Conjunto L1 = L1 (porta) + L (lama)

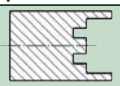
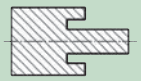



Herramienta a izquierdas

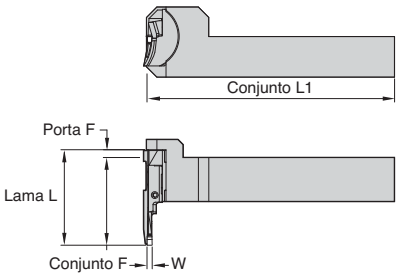



| Tipo lama | Forma de la pieza | A izquierdas | A derechas |
|---|---|---|---|
| Curva de entrada |  | | |
| Curva de salida |  | | |

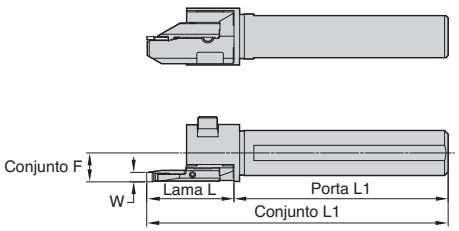
## Curva de salida

| Número de pedido | Número de catálogo | W | CD | D min | D max | FS | L | mano | amarre | tornillo de amarre |
|---|---|---|---|---|---|---|---|---|---|---|
| **3539563** | **338225** | 3,18 | 19 | 57 | 400 | -1,47 | 58 | L - Izquierda | **440205** | **606219** |
| **3539564** | **338226** | 4,76 | 25 | 57 | 400 | -2,39 | 58 | L - Izquierda | **440206** | **606219** |
| **3539565** | **338227** | 6,35 | 25 | 57 | 400 | -3,18 | 58 | L - Izquierda | **440207** | **606219** |
| **3539566** | **338228** | 3,18 | 19 | 57 | 400 | -1,47 | 58 | R - Derecha | **440208** | **606219** |
| **3539567** | **338229** | 4,76 | 25 | 57 | 400 | -2,39 | 58 | R - Derecha | **440209** | **606219** |
| **3539568** | **338230** | 6,35 | 25 | 57 | 400 | -3,18 | 58 | R - Derecha | **440210M** | **606219** |

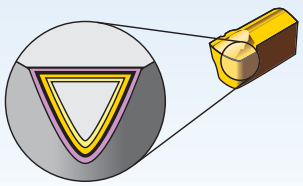
*NOTA: el cartucho a derechas se emplea con el portaherramientas a izquierdas.*
*El cartucho a izquierdas, con el portaherramientas a derechas.*




Para mango cuadrado
Conjunto F = F (porta) + L (lama)
Conjunto L1 = W/2 + L1 (porta) + FS (lama)



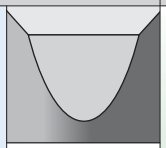
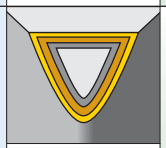
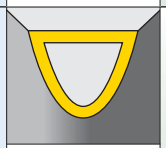
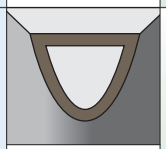

Para mango redondo
Conjunto F = W/2 + F (porta) + FS (lama)
Conjunto L1 = L1 (porta) + L (lama)



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

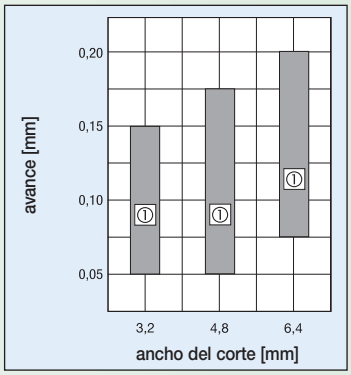
| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C2 |  HW-K15 | Un metal duro de tungsteno de uso general para fundiciones, aleaciones no ferrosas y múltiples aleaciones de alta temperatura. | M K N S | | | | | | | | |
| GC |  HC-P15 | Metal duro recubierto. CVD — TiC-TiCN-TiN. Un recubrimiento de fase triple en una calidad de grano fino duro con bajo contenido en aglomerado. Calidad de uso general y alta velocidad para todo tipo de aceros. Color dorado. | P | | | | | | | | |
| M40 |  HC-P35 | Un excelente recubrimiento de PVD-TiN con una sola fase en un sustrato duro con una fórmula especial que actúa sin problemas en velocidades desde extremadamente bajas a moderadas, en máquinas de tornear. Ideal para aceros al carbono, aceros aleados, la mayoría de aceros inoxidables y múltiples aleaciones de alta temperatura. | P M K N S | | | | | | | | |
| M43 |  HC-P30 | Un recubrimiento PVD-TiAlN multicapa en un sustrato duro de metal duro y grano fino resistente a los choques con mayor resistencia a la oxidación. Recomendada en velocidades de corte baja y media cuando sean necesarias buenas propiedades de dureza. | P M K S | | | | | | | | |

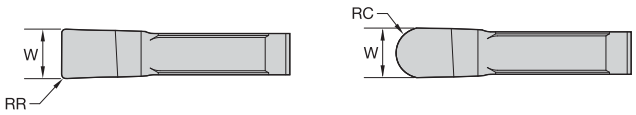
## Ranger • Ranurado frontal

- Plaquitas disponibles para penetración-ranurado y radios de nariz completa.
- Diseño de geometría que proporciona holgura para ranurado profundo.
- Superior control de virutas.




① Avance recomendado

| ANSI ISO 513 | VDI 3323 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | | C2 | | | GC | | | M40 | | | M43 | |
| P | 1 | | | | 175 | **200** | 220 | 40 | **80** | 115 | 110 | **160** | 210 |
| | 2 | | | | 150 | **170** | 190 | 35 | **70** | 100 | 85 | **140** | 190 |
| | 3 | | | | 125 | **140** | 160 | 30 | **50** | 75 | 75 | **110** | 150 |
| | 4 | | | | 140 | **150** | 165 | 30 | **60** | 90 | 80 | **125** | 170 |
| | 5 | | | | 115 | **130** | 145 | 25 | **50** | 70 | 65 | **105** | 145 |
| | 6 | | | | 140 | **150** | 165 | 30 | **60** | 90 | 80 | **125** | 170 |
| | 7 | | | | 120 | **135** | 150 | 25 | **50** | 70 | 65 | **105** | 145 |
| | 8 | | | | 105 | **120** | 135 | 25 | **45** | 70 | 60 | **100** | 140 |
| | 9 | | | | 70 | **90** | 110 | 20 | **35** | 55 | 45 | **80** | 115 |
| | 10 | | | | 110 | **120** | 130 | 25 | **50** | 70 | 65 | **95** | 120 |
| | 11 | | | | 60 | **95** | 125 | 20 | **35** | 50 | 35 | **75** | 115 |
| | 12 | | | | 135 | **155** | 175 | 35 | **70** | 100 | 85 | **120** | 155 |
| | 13.1 | | | | 105 | **120** | 135 | 30 | **45** | 65 | 80 | **100** | 120 |
| | 13.2 | | | | 50 | **60** | 70 | 15 | **30** | 40 | 35 | **50** | 65 |
| | | | C2 | | | GC | | | M40 | | | M43 | |
| M | 14.1 | 50 | **60** | 70 | | | | 30 | **45** | 60 | 50 | **75** | 100 |
| | 14.2 | 45 | **55** | 65 | | | | 25 | **40** | 50 | 45 | **60** | 80 |
| | 14.3 | 40 | **45** | 50 | | | | 20 | **30** | 40 | 35 | **50** | 65 |
| | 14.4 | 25 | **30** | 40 | | | | 15 | **25** | 30 | 25 | **40** | 50 |
| | | | C2 | | | GC | | | M40 | | | M43 | |
| K | 15 | 135 | **170** | 200 | | | | 75 | **105** | 135 | 105 | **150** | 200 |
| | 16 | 115 | **135** | 150 | | | | 50 | **80** | 110 | 75 | **115** | 150 |
| | 17 | 130 | **150** | 175 | | | | 60 | **95** | 130 | 90 | **135** | 175 |
| | 18 | 90 | **115** | 140 | | | | 45 | **75** | 100 | 60 | **100** | 135 |
| | 19 | 150 | **185** | 215 | | | | 85 | **115** | 145 | 120 | **170** | 215 |
| | 20 | 120 | **145** | 170 | | | | 55 | **90** | 120 | 80 | **125** | 170 |
| | | | C2 | | | GC | | | M40 | | | M43 | |
| N | 21 | 305 | **410** | 520 | | | | 210 | **370** | 520 | 275 | **440** | 610 |
| | 22 | 245 | **350** | 460 | | | | 150 | **305** | 460 | 210 | **380** | 550 |
| | 23 | 305 | **410** | 520 | | | | 210 | **365** | 520 | 275 | **440** | 610 |
| | 24 | 245 | **350** | 460 | | | | 150 | **305** | 460 | 210 | **380** | 550 |
| | 25 | 210 | **245** | 275 | | | | 135 | **205** | 275 | 180 | **260** | 335 |
| | 26 | 150 | **170** | 185 | | | | 90 | **135** | 185 | 120 | **170** | 215 |
| | 27 | 150 | **170** | 185 | | | | 90 | **135** | 185 | 120 | **170** | 215 |
| | 28 | 90 | **105** | 120 | | | | 60 | **90** | 120 | 75 | **105** | 135 |
| | 29 | 60 | **75** | 90 | | | | 45 | **70** | 90 | 55 | **80** | 110 |
| | 30 | 75 | **90** | 105 | | | | 45 | **75** | 110 | 60 | **90** | 120 |
| | | | C2 | | | GC | | | M40 | | | M43 | |
| S | 31 | 35 | **45** | 50 | | | | 25 | **40** | 50 | 30 | **45** | 55 |
| | 32 | 25 | **30** | 35 | | | | 20 | **25** | 30 | 20 | **30** | 40 |
| | 33 | 20 | **25** | 30 | | | | 15 | **20** | 25 | 15 | **20** | 30 |
| | 34 | 15 | **20** | 25 | | | | 10 | **15** | 20 | 15 | **20** | 25 |
| | 35 | 15 | **20** | 25 | | | | 10 | **15** | 20 | 15 | **20** | 25 |
| | 36 | 55 | **60** | 65 | | | | 35 | **45** | 60 | 35 | **50** | 65 |
| | 37 | 25 | **30** | 35 | | | | 15 | **25** | 30 | 25 | **30** | 35 |




● primera elección
○ elección alternativa

| | | | | | |
|---|---|---|---|---|---|
| P | | ○ | ● | ● | |
| M | | | ● | ● | |
| K | | | | | |
| N | ● | | ● | ● | |
| S | | | ○ | | |
| H | | | | | |

## Ranurado frontal

| Número de catálogo | W | RR | RC | C2 | GC | M40 | M43 |
|---|---|---|---|---|---|---|---|
| **506104** | 3,18 | — | 1,59 | ● | | ● | |
| **506101** | 3,18 | 0,25 | — | ● | ● | ● | ● |
| **506102** | 3,18 | 0,25 | — | ● | ● | ● | |
| **506105** | 3,18 | — | 1,59 | ● | | ● | |
| **506106** | 4,78 | — | 2,39 | | | ● | |
| **506103** | 4,78 | 0,25 | — | ● | ● | | ● |
| **506108** | 6,35 | — | 3,18 | | | ● | |
| **506107** | 6,35 | 0,25 | — | | | ● | |

*NOTA: las plaquitas 506101 y 506104 deben utilizarse sólo con rotación izquierda.*
*Las plaquitas 506102 y 506105 deben utilizarse sólo con rotación derecha.*

# Recomendaciones técnicas • Sistemas de herramientas Ranger

## Información sobre aplicaciones:

- Durante el cambio de plaquitas, asegúrese de ajustar la nueva plaquita con la parada positiva del amarre.
- Nunca apriete el tornillo de amarre de la plaquita sin una plaquita en el alojamiento. Podría producirse un daño permanente en el amarre.
- Toda proyección del portaherramientas que sobresalga del bloque de la herramienta debe ser lo más corta posible para mantener la rigidez.
- Se recomiendan unos avances y unas velocidades más lentas que el ranurado del diámetro exterior.

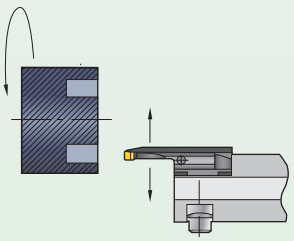
**Rangos de ranurado frontal por configuración**

| configuración de diámetro proporcionada | rango de vaciados según la configuración diámetro | |
|---|---|---|
| | diámetro exterior más pequeño | diámetro exterior más grande |
| 57,15 | 57,91 | 60,33 |
| 63,50 | 60,33 | 66,68 |
| 69,85 | 65,09 | 74,61 |
| 76,20 | 66,68 | 85,73 |
| 88,90 | 77,79 | 100,01 |
| 101,60 | 88,90 | 114,30 |
| 127,00 | 107,95 | 146,05 |
| 152,40 | 127,00 | 177,80 |
| 203,20 | 165,10 | 241,30 |
| 254,00 | 203,20 | 279,40 |
| 279,40–406,40 | 228,60 | 406,40 |

*NOTA: esta tabla es una guía general para la entrada de la ranura frontal con diámetros exteriores tanto más pequeños como más grandes que cada configuración de diámetro exterior en la herramienta. Ejemplo: si la herramienta está ajustada para un diámetro exterior de 101,6 mm, se pueden realizar cortes de vaciado con un diámetro exterior de 88,9 mm a 114,3 mm sin cambiar la configuración de diámetro exterior de 101,6 mm.*

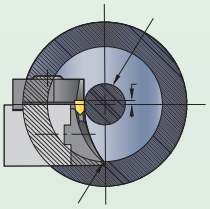
## Ensanche una ranura frontal

La incidencia adicional se genera en la pieza de trabajo tras el primer ranurado. La herramienta podrá utilizarse entonces sin más ajustes para ensanchar la ranura hacia el centro o el diámetro exterior de la pieza de trabajo.



## Holguras de ranurado frontal WMT™

El filo de corte del sistema de ranurado frontal de WMT debe estar a +0,762 mm por encima del centro para mejorar las holguras de corte. Esta herramienta no debe volver a colocarse en el centro. Cuando la trayectoria es hacia el centro, este sistema no posee suficiente incidencia para cortar en diámetros inferiores a 21,59 mm.



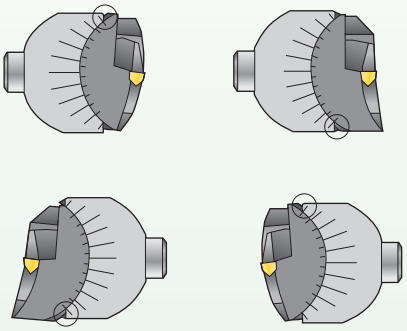
## Información de ajustes de herramientas Ranger

Las siguientes instrucciones son para las herramientas Ranger de tipo 1. Las instrucciones para las herramientas tipo 2 están en [corchetes].

- Se puede realizar la configuración del rango de diámetros de la siguiente manera:

**Paso 1** Afloje el tornillo de bloqueo de la lama de soporte y gire la lama para que la marca de 2,25 esté por encima de la línea superior del portaherramientas. [Por debajo de la línea del portaherramientas en el caso del tipo 2.]

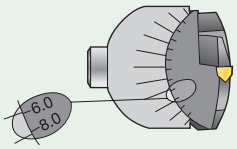
Configuraciones de diámetro de 2,25



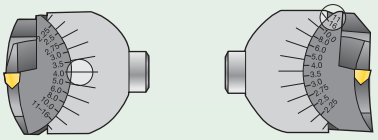
tipo 1 tipo 2

**Paso 2** Gire lentamente la lama de soporte hacia abajo hasta que la marca de 2,25 se alinee con la línea superior del portaherramientas. [Gire la lama de soporte hacia arriba hasta que la marca de 2,25 se alinee con la línea inferior del portaherramientas, en el caso del tipo 2.] En este punto, el conjunto de la lama de soporte estará alineada adecuadamente para cortar ranuras frontales con un diámetro exterior de 2,25".

Para diámetros superiores a 2,25", continúe girando la lama de soporte en la misma dirección hasta que se haya alineado el rango de diámetros deseado.




Configuración de diámetro de 7,0



Configuración de diámetro de 4,0 Configuración de diámetro de 11 a 16

Ejemplo: el diámetro de 7,0" se encuentra entre las configuraciones de diámetro de 6,0" y 8,0".

**Paso 3** Apriete el tornillo de la lama de soporte. Inspeccione la escala para asegurar que se alinee el rango de diámetros deseado.

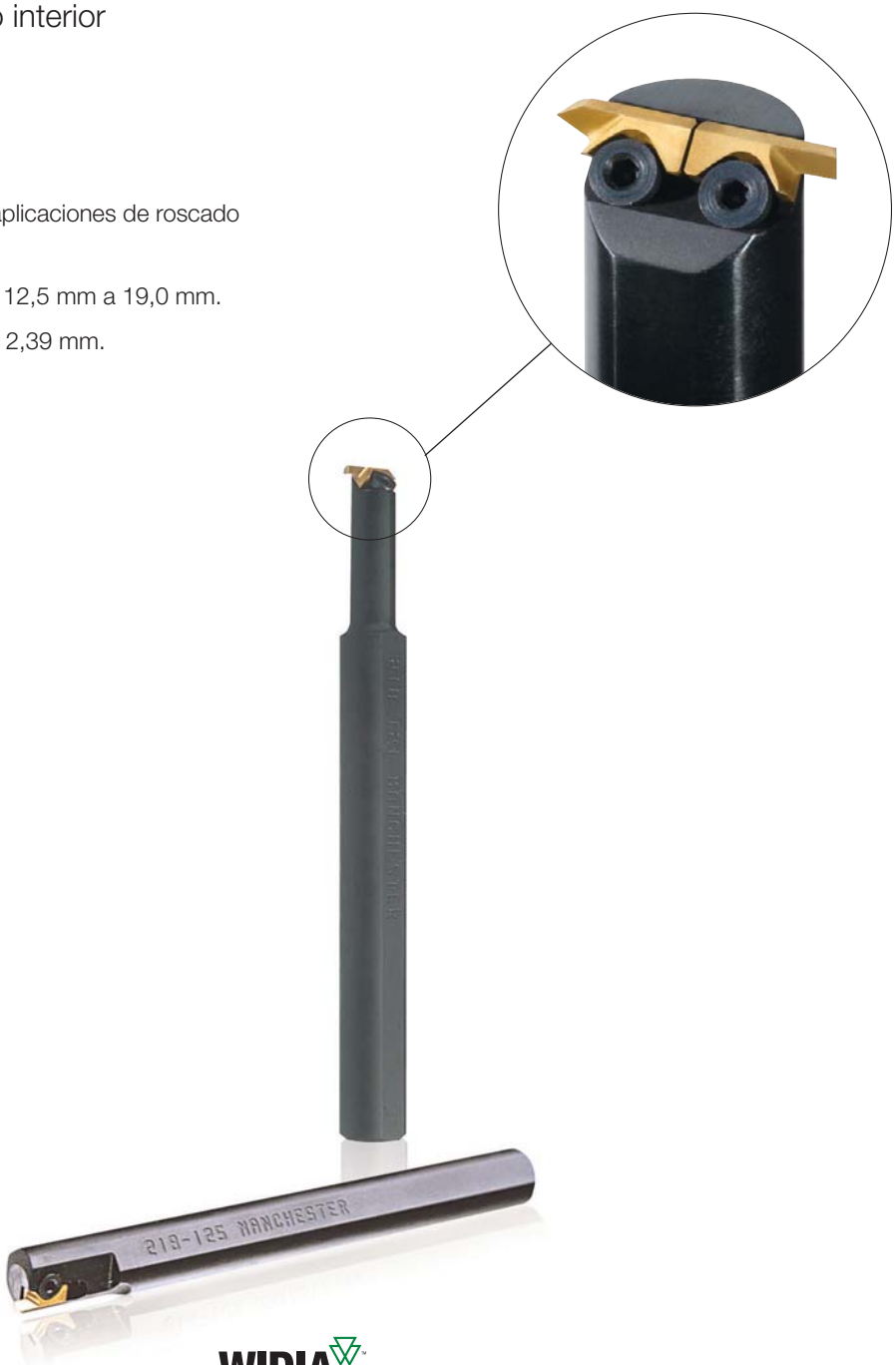
*NOTA: es importante seguir estas instrucciones. De lo contrario, tanto la herramienta como la pieza de trabajo podrían sufrir daños.*

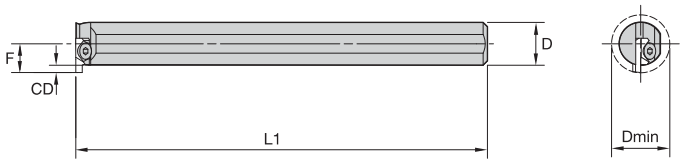
# S-LOC™

S-LOC • Roscado, ranurado frontal, ranurado y mandrinado de diámetro interior

## Características y ventajas:

- Específicamente para todas las aplicaciones de roscado y ranurado de diámetro interior.
- Rango de diámetros de barra de 12,5 mm a 19,0 mm.
- Profundidad máxima de corte de 2,39 mm.



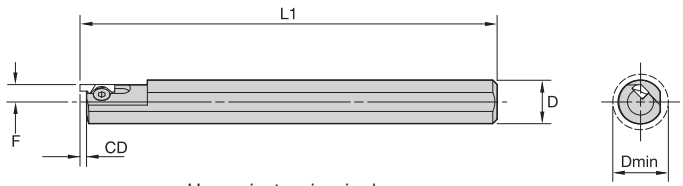



Conjunto a derechas

## Ranurado de diámetro interior

| Número de pedido | Número de catálogo | CD | L1 | D | F | D min | tornillo de amarre |
|---|---|---|---|---|---|---|---|
| **3538783** | **218134** | 2,40 | 152,50 | 12,00 | 8,00 | 14,20 | **606193** |
| **3538784** | **218142** | 2,40 | 150,00 | 16,00 | 8,00 | 14,20 | **606193** |
| **3538785** | **218143** | 2,40 | 200,00 | 20,00 | 13,00 | 24,00 | **606193** |

*NOTA: se puede utilizar con plaquitas a derechas e izquierdas.*
*Los conjuntos a derechas emplean plaquitas a izquierdas.*

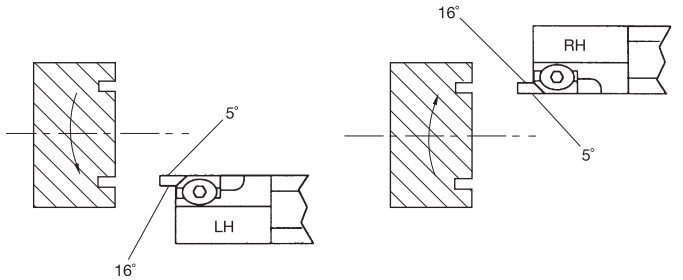



Herramienta a izquierdas

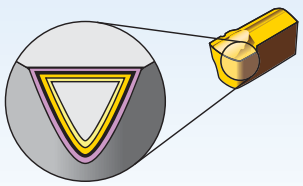
## Ranurado frontal

| Número de pedido | Número de catálogo | CD | L1 | D | F | D min | tornillo de amarre |
|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | |
| **3538779** | **218125** | 2,39 | 152,40 | 15,88 | 6,35 | 16,26 | **606190** |
| | **A izquierdas** | | | | | | |
| **3538780** | **218126** | 2,39 | 152,40 | 15,88 | 6,35 | 16,26 | **606190** |

*NOTA: diámetro exterior de 12,0 mm como mínimo.*



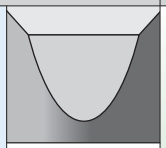
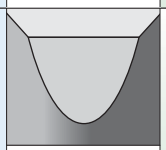
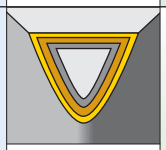
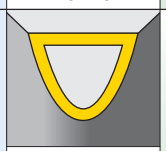

- Los ángulos de incidencia laterales son tal y como están descritos.
- Utilice herramientas a izquierdas sólo para rotación izquierda.
- Utilice herramientas a derechas sólo para rotación derecha.



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

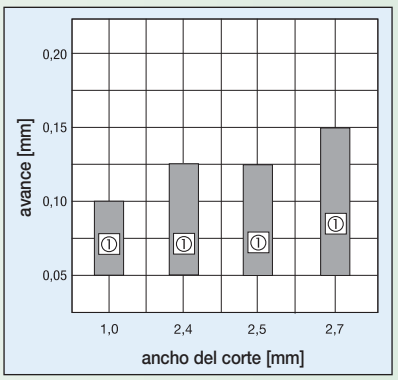
| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C2 |  HW-K15 | Un metal duro de tungsteno de uso general para fundiciones, aleaciones no ferrosas y múltiples aleaciones de alta temperatura. | | | | | | | | | |
| C5 |  HW-P30 | Un metal duro de tungsteno aleado de uso general para el corte de metales. | | | | | | | | | |
| GC |  HC-P15 | Metal duro recubierto. CVD — TiC-TiCN-TiN. Un revestimiento de fase triple en una calidad de grano fino duro con bajo contenido en aglomerado. Calidad de uso general y alta velocidad para todo tipo de aceros. Color oro. | | | | | | | | | |
| M40 |  HC-P35 | Un excelente recubrimiento de PVD-TiN con una sola fase en un sustrato duro con una fórmula especial que actúa sin problemas en velocidades desde extremadamente bajas a moderadas, en máquinas de tornear. Ideal para aceros al carbono, aceros aleados, la mayoría de aceros inoxidables y múltiples aleaciones de alta temperatura. | | | | | | | | | |

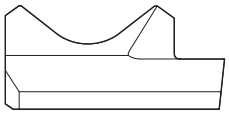
## S-LOC

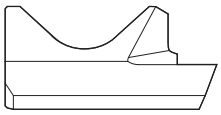
- Superficie de amarre única en las plaquitas.
- Para aplicaciones de ranurado y mandrinado de diámetro interior.
- Superior control de virutas.

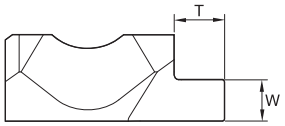



① Avance recomendado

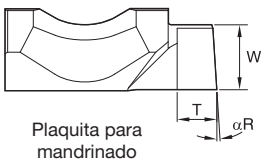
| ANSI ISO 513 | VDI 3323 | Velocidad de corte • vc m/min | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| P | 1 | | | | 90 | **120** | 150 | 175 | **200** | 220 | 40 | **80** | 115 |
| | 2 | | | | 75 | **110** | 140 | 150 | **170** | 190 | 35 | **70** | 100 |
| | 3 | | | | 65 | **85** | 105 | 125 | **140** | 160 | 30 | **50** | 75 |
| | 4 | | | | 65 | **95** | 120 | 140 | **150** | 165 | 30 | **60** | 90 |
| | 5 | | | | 60 | **85** | 110 | 115 | **130** | 145 | 25 | **50** | 70 |
| | 6 | | | | 70 | **95** | 120 | 140 | **150** | 165 | 30 | **60** | 90 |
| | 7 | | | | 60 | **80** | 110 | 120 | **135** | 150 | 25 | **50** | 70 |
| | 8 | | | | 55 | **80** | 105 | 105 | **120** | 135 | 25 | **45** | 70 |
| | 9 | | | | 40 | **60** | 80 | 70 | **90** | 110 | 20 | **35** | 55 |
| | 10 | | | | 60 | **75** | 95 | 110 | **120** | 130 | 25 | **50** | 70 |
| | 11 | | | | 30 | **60** | 80 | 60 | **95** | 125 | 20 | **35** | 50 |
| | 12 | | | | 70 | **95** | 120 | 135 | **155** | 175 | 35 | **70** | 100 |
| | 13.1 | | | | 65 | **80** | 90 | 105 | **120** | 135 | 30 | **45** | 65 |
| | 13.2 | | | | 30 | **45** | 55 | 50 | **60** | 70 | 15 | **30** | 40 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| M | 14.1 | 50 | **60** | 70 | | | | | | | 30 | **45** | 60 |
| | 14.2 | 45 | **55** | 65 | | | | | | | 25 | **40** | 50 |
| | 14.3 | 40 | **45** | 50 | | | | | | | 20 | **30** | 40 |
| | 14.4 | 25 | **30** | 40 | | | | | | | 15 | **25** | 30 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| K | 15 | 135 | **170** | 200 | | | | | | | 75 | **105** | 135 |
| | 16 | 115 | **135** | 150 | | | | | | | 50 | **80** | 110 |
| | 17 | 130 | **150** | 175 | | | | | | | 60 | **95** | 130 |
| | 18 | 90 | **115** | 140 | | | | | | | 45 | **75** | 100 |
| | 19 | 150 | **185** | 215 | | | | | | | 85 | **115** | 145 |
| | 20 | 120 | **145** | 170 | | | | | | | 55 | **90** | 120 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| N | 21 | 305 | **410** | 520 | | | | | | | 210 | **370** | 520 |
| | 22 | 245 | **350** | 460 | | | | | | | 150 | **305** | 460 |
| | 23 | 305 | **410** | 520 | | | | | | | 210 | **365** | 520 |
| | 24 | 245 | **350** | 460 | | | | | | | 150 | **305** | 460 |
| | 25 | 210 | **245** | 275 | | | | | | | 135 | **205** | 275 |
| | 26 | 150 | **170** | 185 | | | | | | | 90 | **135** | 185 |
| | 27 | 150 | **170** | 185 | | | | | | | 90 | **135** | 185 |
| | 28 | 90 | **105** | 120 | | | | | | | 60 | **90** | 120 |
| | 29 | 60 | **75** | 90 | | | | | | | 45 | **70** | 90 |
| | 30 | 75 | **90** | 105 | | | | | | | 45 | **75** | 110 |
| | | | C2 | | | C5 | | | GC | | | M40 | |
| S | 31 | 35 | **45** | 50 | | | | | | | 25 | **40** | 50 |
| | 32 | 25 | **30** | 35 | | | | | | | 20 | **25** | 30 |
| | 33 | 20 | **25** | 30 | | | | | | | 15 | **20** | 25 |
| | 34 | 15 | **20** | 25 | | | | | | | 10 | **15** | 20 |
| | 35 | 15 | **20** | 25 | | | | | | | 10 | **15** | 20 |
| | 36 | 55 | **60** | 65 | | | | | | | 35 | **45** | 60 |
| | 37 | 25 | **30** | 35 | | | | | | | 15 | **25** | 30 |








Plaquita a izquierdas




Plaquita para mandrinado

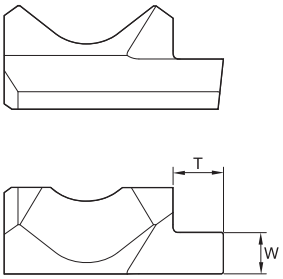
● primera elección
○ elección alternativa

| | |
|---|---|
| P | ● |
| M | ● |
| K | ○ |
| N | ● |
| S | ○ |
| H | |

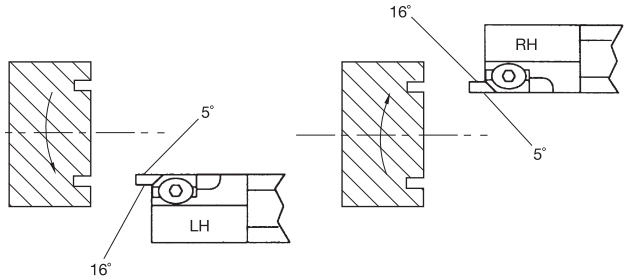
## Ranurado de diámetro interior

| Número de catálogo | W | T | αR | M40 |
|---|---|---|---|---|
| **A derechas** | | | | |
| **510124** | 1,04 | 2,08 | – | ● |
| **510128** | 1,63 | 2,92 | – | ● |
| **510104** | 2,39 | 2,92 | – | ● |
| **510132** | 2,50 | 2,92 | – | ● |
| **510134** | 2,71 | 2,92 | – | ● |
| **A izquierdas** | | | | |
| **510113** | 1,04 | 2,08 | – | ● |
| **510114** | 1,21 | 2,08 | – | ● |
| **510115** | 1,36 | 2,08 | – | ● |
| **510116** | 1,37 | 2,08 | – | ● |
| **510117** | 1,63 | 2,92 | – | ● |
| **510118** | 1,80 | 2,92 | – | ● |
| **510119** | 1,94 | 2,39 | – | ● |
| **510120** | 2,22 | 2,92 | – | ● |
| **510101** | 2,39 | 2,92 | – | ● |
| **510121** | 2,50 | 2,92 | – | ● |
| **510122** | 2,64 | 2,92 | – | ● |
| **510123** | 2,71 | 2,92 | – | ● |
| **510102** | 3,81 | 2,39 | 4.00 | ● |

*NOTA: la plaquita 510102 se utiliza para mandrinar.*




Plaquita a izquierdas



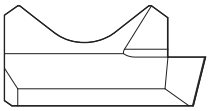

- Los ángulos de incidencia laterales son tal y como están descritos.
- Utilice herramientas a izquierdas sólo para rotación izquierda.
- Utilice herramientas a derechas sólo para rotación derecha.

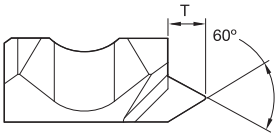
● primera elección
○ elección alternativa

| | | C2 | C5 | GC | M40 |
|---|---|---|---|---|---|
| P | | ● | ● | ● | ● |
| M | | ● | ● | ● | ● |
| K | | ○ | ○ | ○ | ○ |
| N | | ● | ● | ● | ● |
| S | | ○ | ○ | ○ | ○ |
| H | | | | | |

## Ranurado frontal

| Número de catálogo | W | T | C2 | C5 | GC | M40 |
|---|---|---|---|---|---|---|
| **A derechas** | | | | | | |
| **510136** | 1,98 | 2,39 | ● | ● | ● | ● |
| **510108** | 2,39 | 2,39 | ● | | | ● |
| **510138** | 2,59 | 2,39 | | | | ● |
| **A izquierdas** | | | | | | |
| **510135** | 1,98 | 2,39 | | ● | | ● |
| **510107** | 2,39 | 2,39 | | | | ● |
| **510137** | 2,59 | 2,39 | | | | ● |





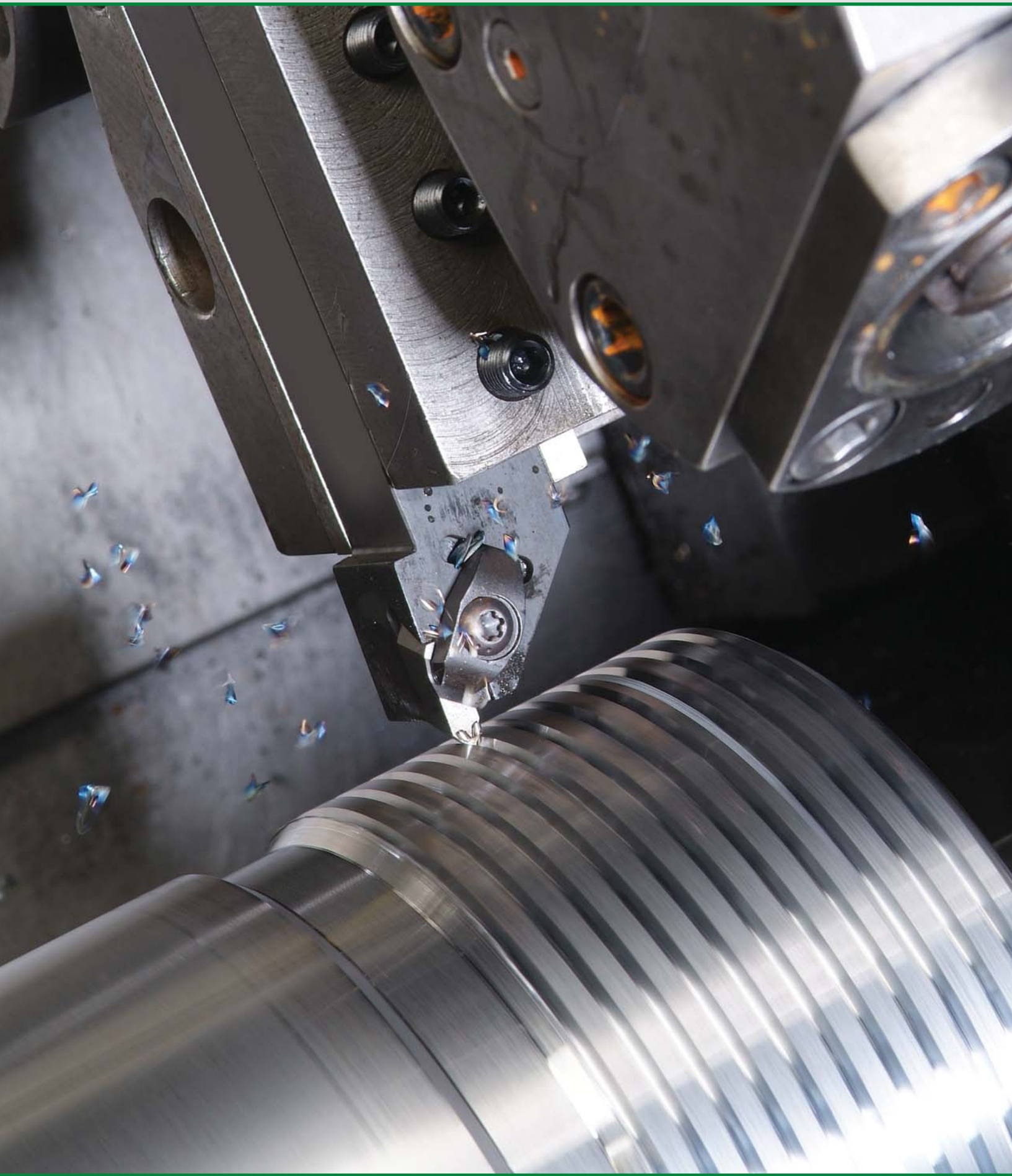

Plaquita a izquierdas

## Roscado

| Número de catálogo | T | C2 | C5 | GC | M40 |
|---|---|---|---|---|---|
| **A derechas** | | | | | |
| **510106** | 2,38 | ● | | | ● |
| **A izquierdas** | | | | | |
| **510103** | 2,38 | ● | ● | ● | ● |

*NOTA: 10 roscas por pulgada como mínimo.*

WIDIA



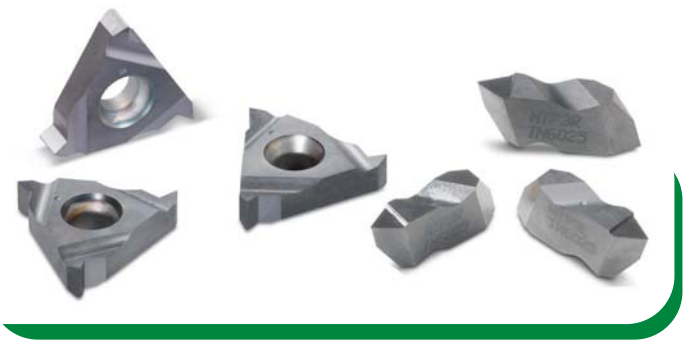
# Roscado

**Guía de aplicaciones de roscado** . . . . . **E4–E5**

**TopThread™** . . . . . **E6–E33**
- Guía para la selección de plaquitas . . . . . E8–E9
- Descripción general de las plaquitas . . . . . E10–E11
- Calidades y descripciones de calidades . . . . . E11
- Sistema de identificación de portaherramientas . . . . . E12
- Portaherramientas . . . . . E14–E16
- Sistema de identificación de barras de mandrinar . . . . . E18
- Barras de mandrinar . . . . . E19
- Sistema de identificación de plaquitas . . . . . E20
- Plaquitas . . . . . E21–E30
- Tabla de velocidades . . . . . E31
- Soluciones a medida . . . . . E32
- Hardware . . . . . E33

**Roscado Laydown** . . . . . **E34–E62**
- Guía para la selección de plaquitas . . . . . E36–E37
- Descripción general de las plaquitas . . . . . E38
- Calidades y descripciones de calidades . . . . . E39
- Sistema de identificación de portaherramientas . . . . . E40
- Portaherramientas . . . . . E41
- Sistema de identificación de barras de mandrinar . . . . . E42
- Barras de mandrinar . . . . . E44–E45
- Sistema de identificación de plaquitas . . . . . E46
- Plaquitas . . . . . E47–E60
- Hardware . . . . . E62

**Información técnica** . . . . . **E63–E86**
- Definición de rosca de tornillo . . . . . E63
- Formas de rosca comunes . . . . . E64
- Guía de fallos y soluciones . . . . . E66–E67



# Sistemas de roscado WIDIA™

La línea WIDIA ofrece dos sistemas estándar de herramientas, TopThread™ y roscado Laydown, para satisfacer todos los requisitos de sus operaciones de roscado más exigentes. Basta con elegir el sistema que más se adapte a sus necesidades y aplicaciones específicas.

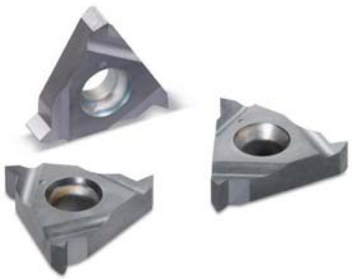
## TopThread

Con la mayor selección de geometrías de plaquitas y calidades de metal duro disponibles actualmente en el mercado, el sistema TopThread es la mejor opción para un paso ancho o fino y aplicaciones de roscado con uno o varios dientes.

- Un diseño de fijación rígida de la plaquita asegura que la vida de la herramienta, el acabado superficial y la calidad de la pieza de trabajo sean las mejores.
- Un diseño sencillo que no requiere una selección de placas de apoyo para los ángulos de hélice de la rosca.
- Una elección excelente para las aplicaciones muy resistentes como el mecanizado de roscas Acme, trapezoidal y redondeada.
- Utilice los mismos portaherramientas y barras de mandrinar para el roscado y ranurado de plaquitas.
- Ideal para portaherramientas y formas de plaquita especiales.

Reduzca su gasto por pieza añadiendo el tercer filo de corte con la plataforma de roscado Laydown.

Elimine la necesidad de placas de apoyo con el diseño de fijación superior rígida.

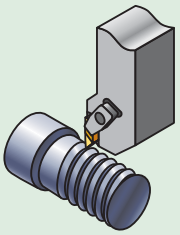


## Roscado Laydown

El diseño de roscado Laydiown está diseñado especialmente para permitir el roscado de un único punto en agujeros de diámetro pequeño.

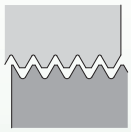
- Una amplia selección de formas de rosca comunes en Europa y métricas (ISO).
- Plaquitas disponibles en calidad de metal duro con recubrimiento de PVD para aplicaciones de alto rendimiento.
- Diseño de perfil bajo que permite un flujo de virutas sin restricciones.
- Tres filos de corte por plaquita para unos resultados superiores y consistentes.

## Roscado externo de TopThread



**Tamaños de portaherramientas con mango cuadrado:**
- 10,0 mm–32,0 mm

### Paso fino

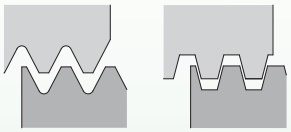


**Cresta (perfil completo):**
TPI máximo UN de 32
Paso mínimo ISO de 1,5 mm

**Perfil parcial — parte superior plana (NTF y NTK):**
TPI máximo UN de 44
Paso mínimo ISO de 0,6 mm

**Perfil parcial — control de virutas (NT-K):**
TPI máximo UN de 36
Paso mínimo ISO de 0,7 mm

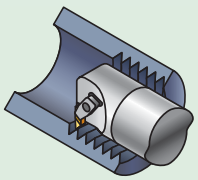
### Paso ancho/aplicaciones industriales



**Cresta (perfil completo):**
TPI máximo UN de 7
Paso máximo ISO de 3,0 mm

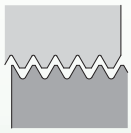
**Perfil parcial — parte superior plana y control de virutas (NT-C y NT-CK):**
TPI mínimo UN de 4,5
Paso máximo ISO de 5,5 mm

## Roscado interno de TopThread



**Diámetros de barra de mandrinar:**
- 10,0 mm–50,0 mm
- Mandrinado mínimo: 11,5 mm
- Acero

### Paso fino

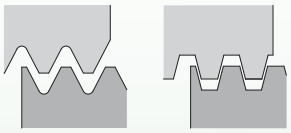


**Cresta (perfil completo):**
TPI máximo UN de 16
Paso mínimo ISO de 1,5 mm

**Perfil parcial — parte superior plana (NT-1L, NTF y NTK):**
TPI máximo UN de 24
Paso mínimo ISO de 1,0 mm

**Perfil parcial — control de virutas (NT-K):**
TPI máximo UN de 20
Paso mínimo ISO de 1,25 mm

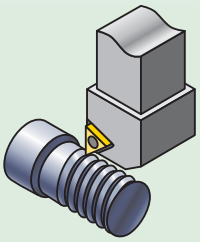
### Paso ancho/aplicaciones industriales



**Cresta (perfil completo):**
TPI máximo UN de 8
Paso máximo ISO de 3,0 mm

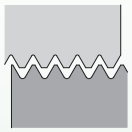
**Perfil parcial — parte superior plana y control de virutas (NT-C y NT-CK):**
TPI mínimo UN de 4,5
Paso máximo ISO de 5,5 mm

## Roscado exterior Laydown



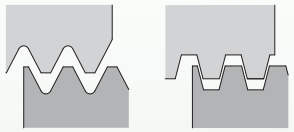
**Tamaños de portaherramientas con mango cuadrado:**
- 8,0 mm–40,0 mm

### Paso fino



**Cresta (perfil completo) y perfil parcial:**
TPI máximo UN de 48
Paso mínimo ISO de 0,5 mm

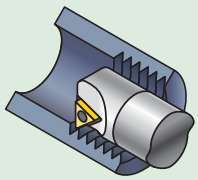
### Paso ancho/aplicaciones industriales



**Cresta (perfil completo):**
TPI mínimo UN de 8
Paso máximo ISO de 5,0 mm

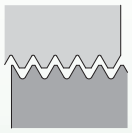
**Perfil parcial:**
TPI máximo UN de 5
Paso máximo ISO de 5,0 mm

## Roscado interior Laydown



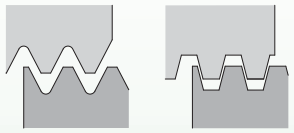
**Diámetros de barra de mandrinar:**
- 12,0 mm–50,0 mm
- Mandrinado mínimo: 13,0 mm
- Acero y metal duro

### Paso fino



**Cresta (perfil completo) y perfil parcial:**
TPI máximo UN de 48
Paso mínimo ISO de 0,5 mm

### Paso ancho/aplicaciones industriales



**Cresta (perfil completo):**
TPI mínimo UN de 8
Paso máximo ISO de 5,0 mm

**Perfil parcial:**
TPI máximo UN de 5
Paso máximo ISO de 5,0 mm

# WIDIA™ TopThread™

Las operaciones de roscado exigen un enorme esfuerzo por parte de las plaquitas de metal duro. Unas fuerzas tangenciales extremas convergen en el radio extremadamente pequeño de la nariz de la plaquita. Además, el paso de la rosca suele requerir una alta tasa de avance (en comparación con las operaciones de torneado corrientes), el filo de corte de la plaquita necesita holgura y se genera un calor excesivo en el corte. El sistema TopThread de WIDIA es la mejor forma de tratar estos problemas.

El sistema TopThread de WIDIA, una elección superior para aplicaciones pesadas como el mecanizado de roscas Acme, trapezoidales y API, es la mejor solución para aplicaciones de roscado de múltiples dientes y paso ancho.

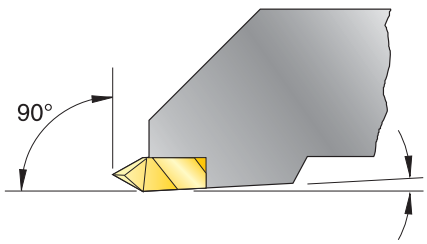
## Tecnología de plaquita de TopThread

La tecnología de plaquita de TopThread le ofrece un control de virutas superior a sus operaciones de roscado. A diferencia de los diseños de la competencia, la ranura de virutas empotrada de WIDIA, si se emplea según nuestras recomendaciones, romperá la viruta en la mayoría de aplicaciones, aportando una mayor vida a la herramienta y menores presiones de corte.

- Reducción de inconsistencias y mejor acabado de las piezas de trabajo.
- Un control de virutas superior que reduce el riesgo para los operarios.
- Mayor productividad en todas sus operaciones de roscado.
- Calidades de metal duro disponibles para un rendimiento excepcional.
- Una elección excelente para diseños de portaherramientas y formas de rosca especiales.

La versatilidad del acero TopThread le permite emplear plaquitas de roscado y ranurado.

Las plaquitas TopThread™ están disponibles en calidades TN6010 y TN6025 para resistir las presiones inusualmente duras impuestas al filo de corte de la plaquita de roscado.




*NOTA: Los portas están diseñados para colocar las plaquitas inclinadas a 3° y proporcionar así una holgura trasera en el lado abierto.*

## La solución sencilla

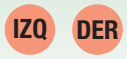
Con la solución TopThread de WIDIA™, no es necesario preocuparse por fallos de instalación costosos. La selección de plaquitas TopThread es fácil, rápida y permite un indexado preciso para mantener el husillo de su máquina trabajando.

- Diseño rígido para una mayor estabilidad de la plaquita durante las aplicaciones con altos avances.
- Roscas de buena calidad, rotura de plaquitas minimizada y mejora de la vida de la herramienta y los acabados superficiales.
- Fuerzas de bloqueo en tres direcciones para una resistencia superior al empuje y a la fuerza tangencial.
- Un ángulo exclusivo 3° de desahogo de plaquitas para holgura trasera.
- Disponible en plaquitas de perfil parcial para formas de rosca de 60°.

## Paso 1 • Seleccione el método de roscado y la dirección de la herramienta

**Información necesaria:**

- Operación externa/interna.
- Rotación del husillo/dirección de la rosca.
- Dirección del avance.

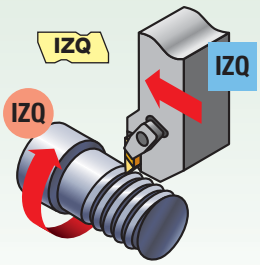


dirección de la rosca

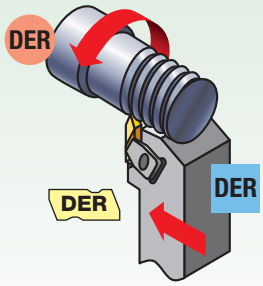
dirección del portaherramientas

dirección de la plaquita

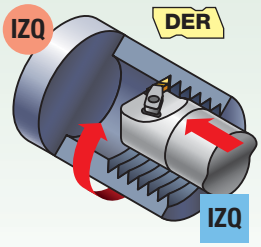
**Dirección del avance hacia el adaptador • hélice estándar**



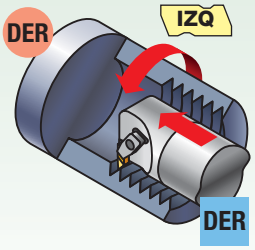
rosca exterior a izquierdas



rosca exterior a derechas

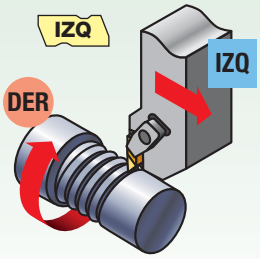


rosca interior a izquierdas

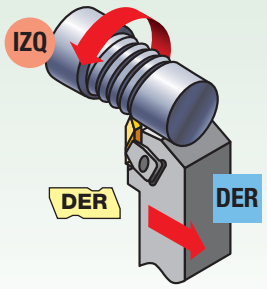


rosca interior a derechas

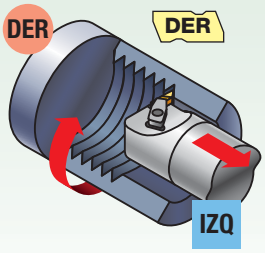
**Dirección del avance desde el adaptador • hélice inversa**



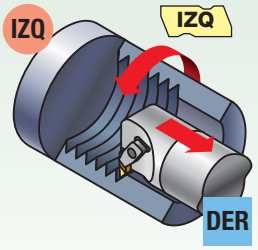
rosca exterior a derechas



rosca exterior a izquierdas



rosca interior a derechas



rosca interior a izquierdas

## Paso 2 • Seleccione el porta de la página del catálogo

**Información necesaria:**

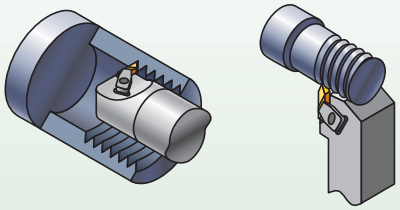
- Operación de exterior/interior.
- Diámetro de mandrinado mínimo (para operaciones de interior).
- Dirección de la herramienta.
- Tamaño de la plaquita (placa guía).

El tamaño de la plaquita debe coincidir con placa guía de la selección de portaherramientas:

| número de catálogo | placa guía |
|---|---|
| NSR2020K3 | N.3R |
| NSR2525M4 | N.4R |

*NOTA: las barras de mandrinar y los portaherramientas de TopThread están listados con placa guía para indicar el tamaño y la dirección necesarios. Son compatibles con las plaquitas de ranurado y roscado del mismo tamaño.*

**Seleccione el porta apropiado para el tamaño y la dirección de la plaquita:**



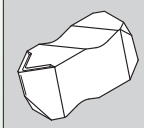
*NOTA: optimice su operación de roscado utilizando el ángulo de avance apropiado y los avances recomendados.*

*Consulte el apartado técnico en las páginas E71 a E76 de este catálogo.*

*Para roscado interior, el mandrinado mínimo varía dependiendo del tipo de rosca. Consulte la página E76 para más detalles.*

## Paso 3 • Elija la plaquita para la aplicación

- Consulte la información general sobre las plaquitas de roscado en la página E10.
- Seleccione plaquitas con cresta para una forma de rosca completamente controlada, incluyendo el control de diámetro. Las plaquitas con perfil de cresta eliminan la necesidad del desbarbado.
- Las plaquitas de perfil parcial sin cresta pueden cortar distintos tipos de pasos de rosca. El control de virutas sólo está disponible con plaquitas de perfil parcial.
- Tenga en cuenta el tamaño de la plaquita al seleccionar el portaherramientas.



| tamaño de la plaquita | número de catálogo | TN6025 | TN6010 |
|---|---|---|---|
| 2 | NT-2RK | ● | ● |
| 3 | NT-3RK | ● | ● |
| 4 | NT-4RK | ● | ● |

## Paso 4 • Selección de velocidades y calidades

**Recomendaciones para selección de calidades y velocidades: m/min**

| material de la pieza de trabajo | acero | acero inoxidable | fundición | metales no férreos | aleaciones de alta temperatura |
|---|---|---|---|---|---|
| estilo de plaquita | control de virutas o neutro | control de virutas o positivo | neutro | positivo | positivo |
| condiciones del corte óptimas | **TN6010** 50–230 | **TN6010** 50–185 | **TN6010** 70–210 | — | **TN6010** 20–120 |
| primera opción | **TN6025** 40–200 | **TN6025** 40–135 | **TN6025** 60–145 | **TN6025** 50–360 | **TN6025** 10–100 |

** NOTA: También disponible como óptima herramienta de corte para acero y acero inoxidable, o bien para el roscado de perfiles parciales. Aumente la velocidad en un 15% por encima de las recomendaciones anteriores.*

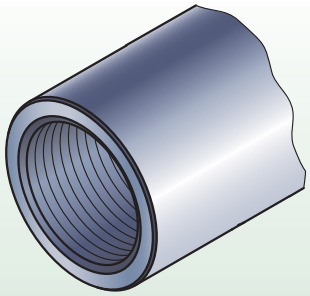
*Ejemplos:*
*Control de virutas: NT-K o NT-CK (sólo perfil parcial)*
*Neutro: NT, NT-C, NTF, NTC, NJ, NJF, NDC-V, NA, NDC, NTB-A/B*
*Positivo: NTP, NTK, NJP, NJK*

## Ejemplo de roscado TopThread:

aplicación: rosca interna a derechas 8 TPI Acme
material: acero aleado
diámetro de la pieza de trabajo: 114,3 mm buenas condiciones de corte avance hacia el adaptador

**Recomendación:**

placa: NA3L8
calidad: TN6010
tamaño de la plaquita: 3
barra de mandrinar: A40TNNTOR3
calibre de plaquita: N.3L
velocidad: 150 m/min
pasadas de alimentación*: 12 pasadas



** Recomendaciones de alimentación proporcionadas en el apartado de datos técnicos de las páginas E71 a E75.*

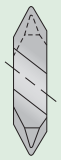
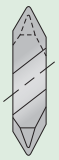
| tipo | | | perfil de rosca | estándar | clase de tolerancia | con cresta | aplicación | página (s) |
|---|---|---|---|---|---|---|---|---|
| control de virutas: K | neutro | positivo | | | | | | |
| NT-K | NT | NTP | 60º perfil parcial | — | — | N | Uso general para formas de rosca con 60º, como ISO y UN, cuando se desee emplear plaquitas sin cresta para cortar distintos tipos de paso. | **E21–E22** |
| NT-CK | | | 60º perfil parcial: paso ancho | — | — | N | Formas de rosca con 60º para paso ancho, como ISO y UN, cuando se desee emplear plaquitas sin perfil de cresta para cortar distintos tipos de paso. | **E23** |
| | NTF | NTK | 60º perfil parcial: paso fino | — | — | N | Formas de rosca con 60º para paso fino, como ISO y UN, cuando se desee emplear plaquitas sin perfil de cresta para cortar distintos tipos de paso, capaces de roscar cerca de las escuadras. | **E23–E24** |
| | NTU | | 60º perfil parcial: plaquita de cuatro filos | — | — | N | Plaquita de cuatro filos para roscado de perfil parcial de 60˚. Es necesario un portaherramientas estilo NSU para una plaquita de tamaño 4U. | **E24** |
| | NTC | | UN americano | ANSI B1.1:74 | 2A/2B | S | Forma en V de 60º basada en pulgadas y muy usada en todos los sectores. | **E25** |
| | | NJP | UNJ | SAEA588791 | 3A/3B | N | Radio de base controlado en roscas externas para la industria militar y aeroespacial. | **E26** |
| | | NJK | UNJ: paso fino | SAEA588790 | 3A/3B | N | Radio de base controlado en roscas externas para la industria militar y aeroespacial, capaz de roscar cerca de las escuadras. | **E26** |
| | NDC-V | | NPT | ANSI/ACME B1.201: 1983 | Estándar NPT | S | Formas del estándar americano National Pipe Thread para accesorios de tuberías. | **E27** |
| | NDC-V-M | | NPT: múltiples dientes | ANSI/ACME B1.201: 1983 | Estándar NPT | S | Plaquitas de roscado con múltiples dientes y alta productividad para roscas NPT. | **E27** |
| | NWC | | Whitworth, BSW, BSP | BS 84:1956, ISO 228/1: 1982, DIN 259 | Medio Clase A | S | Forma de 55° muy usada en conexiones de gas y agua. | **E28** |
| | NDC-RD | | API redondo | API STD. 5B:1979 | Estándar API RD | S | Forma en V de 60º con radio grande para carcasas, tuberías y conductos en la industria petrolífera, incluyendo las formas redondas 8 y 10. | **E28** |
| | NA | | Acme | ANSI B1.5:1988 | 3G | N | Forma de rosca troncada de 29º para aplicaciones de movimiento en una amplia gama de sectores. | **E29** |

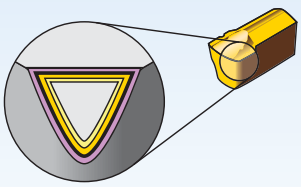
*(continuación)*

*(continuación)*

| tipo | | | perfil de rosca | estándar | clase de tolerancia | con cresta | aplicación | página (s) |
|---|---|---|---|---|---|---|---|---|
| control de virutas: K | neutro | positivo | | | | | | |
| | NAS | | Acme extracorto | ANSI B1.8:1988 | 2G | N | Forma de rosca truncada de 29º con poca profundidad para aplicaciones de movimiento en una amplia gama de sectores. | **E30** |
| | NTB-B | | Buttress americano: 45° de incidencia en el flanco delantero (tracción) | ANSI B1.9:1973 | Clase 2 | N | Forma de diente de sierra para aplicaciones con avance axial en distintos sectores: debe utilizarse el tipo "B" cuando el flanco de 45º de incidencia sea el filo de corte. | **E30** |

- Todas las plaquitas TopThread han sido rectificadas con precisión para proporcionar una ubicación precisa del filo y asegurar un bloqueo de la plaquita en el alojamiento del portaherramientas.
- Las plaquitas TopThread pueden utilizarse tanto en portaherramientas como en barras de mandrinar.
- Todas las plaquitas de roscado sin perfil de cresta pueden utilizarse tanto para aplicaciones exteriores como interiores. Todas las plaquitas con perfil de cresta están diseñadas específicamente para uso exterior o interior.
- Los portaherramientas TopThread a derechas emplean plaquitas a derechas. Los portaherramientas TopThread a izquierdas emplean plaquitas a izquierdas.
- Las barras de mandrinar TopThread a derechas emplean plaquitas a izquierdas. Las barras de mandrinar TopThread a izquierdas emplean plaquitas a derechas.
- Consulte la selección de calidades de metal duro y más información técnica en la página E11.

| plaquita a izquierdas | plaquita a derechas |
|---|---|
|  |  |



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

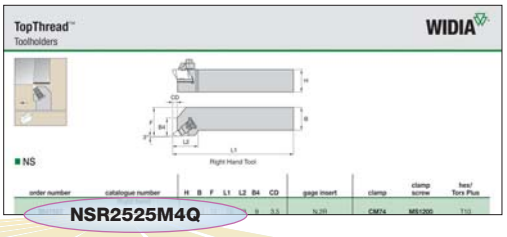
- Reducen los ciclos de tiempo: velocidad y avance mayores.
- Vida más larga de la herramienta: un nuevo recubrimiento multicapa proporciona una mejor resistencia al desgaste.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

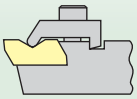
| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TN6010 | HC-P10 | Metal duro recubierto con multicapa de PVD-TiAlN. Para acabado y mecanizado general de aceros, aceros inoxidables, fundiciones, materiales no férreos y materiales difíciles de mecanizar. Recomendado a altas velocidades de corte en condiciones estables. | P | P | P | P | | | | | |
| | | | M | M | M | M | | | | | |
| | | | K | K | K | K | | | | | |
| | | | N | N | N | N | | | | | |
| | | | S | S | S | S | | | | | |
| TN6025 | HC-P25 | Metal duro recubierto con multicapa de PVD-TiAlN. Mecanizado general de aceros, aceros inoxidables, fundiciones, materiales no férreos y materiales difíciles de mecanizar. Recomendada en velocidades de corte baja y media cuando sean necesarias buenas propiedades de dureza. | | | | P | P | P | | | |
| | | | | | | M | M | M | | | |
| | | | | | | K | K | K | | | |
| | | | | | | N | N | N | | | |
| | | | | | | S | S | S | | | |
| THM | HW-K15 | Metal duro sin recubrir para mecanizado ligero y medio. Para fundición, todos los metales no férreos y materiales no metálicos. También apta para el mecanizado de materiales endurecidos a bajas velocidades de corte. | | | | | | | | | |
| | | | | | | | | | | | |
| | | | K | K | K | K | | | | | |
| | | | N | N | N | N | | | | | |
| | | | S | S | S | S | | | | | |
| | | | H | H | H | H | | | | | |

# TopThread
# Sistema de identificación del porta




## N
Método porta plaquita

N:
TopThread*

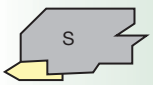


*Sólo estándar exclusivo.

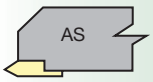
## S
Ubicación del montaje de plaquita

Montaje en extremo

Montaje lateral, salto

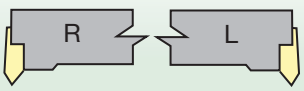



Montaje lateral, sin salto

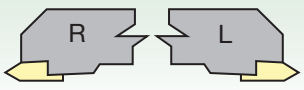



## R
Dirección de la herramienta

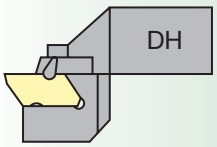
Montaje en extremo




Montaje lateral




## Cabeza abatible




## 2525
Tamaño del mango

Altura y ancho del mango en mm y porta.

## M
Longitud de la herramienta

| L1 | ISO |
|---|---|
| 32 | A |
| 40 | B |
| 50 | C |
| 60 | D |
| 70 | E |
| 80 | F |
| 90 | G |
| 100 | H |
| 110 | J |
| 125 | K |
| 140 | L |
| 150 | M |
| 160 | N |
| 170 | P |
| 180 | Q |
| 200 | R |
| 250 | S |
| 300 | T |
| 350 | U |
| 400 | V |
| 450 | W |
| 500 | Y |
| longitud especial | x |

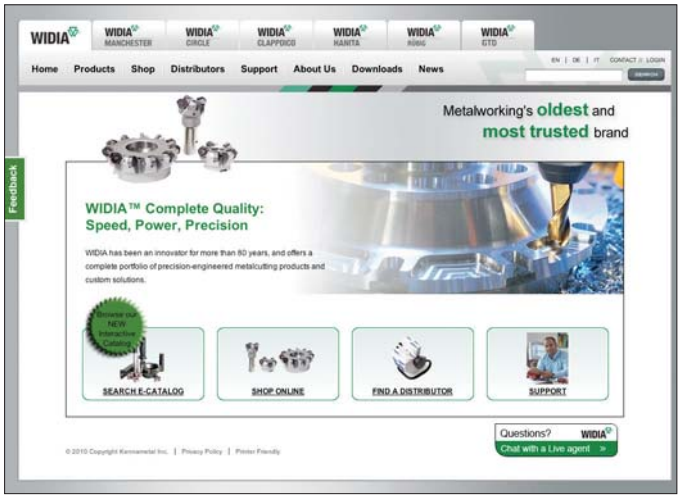
## 4
Tamaño de la plaquita

| tamaño de la plaquita | W1 |
|---|---|
| 2 | 3,81 |
| 3 | 4,95 |
| 4 | 6,98 |
| 5 | 9,65 |
| 6 | 9,73 |
| 8 | 11,13 |

## Q
Porta cualificado

Q:
porta cualificado

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

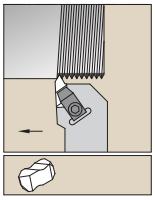
El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

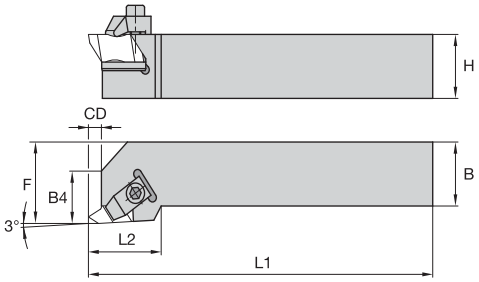
Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

## *Productos WIDIA*

Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.



Consulte las plaquitas de las páginas E10 y E11.

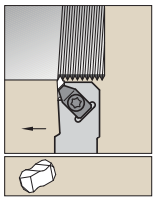



Herramienta a derechas

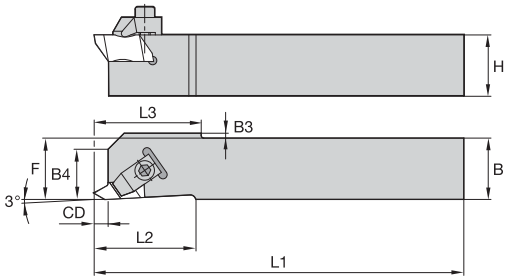
## ■ NS

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | B4 | CD | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **3641682** | **NSR1010E2** | 10 | 10 | 14 | 70 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3641660** | **NSR1212F2** | 12 | 12 | 16 | 80 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3636542** | **NSR1616H2** | 16 | 16 | 20 | 100 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3638589** | **NSR2020K2** | 20 | 20 | 25 | 125 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3638590** | **NSR2525M2** | 25 | 25 | 32 | 150 | 19 | 9 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3638588** | **NSR2020K3** | 20 | 20 | 25 | 125 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3636536** | **NSR2525M3** | 25 | 25 | 32 | 150 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641664** | **NSR3225P3** | 32 | 25 | 32 | 170 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641666** | **NSR3232P3** | 32 | 32 | 40 | 170 | 32 | 13 | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3636540** | **NSR2525M4** | 25 | 25 | 32 | 150 | 35 | 14 | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641675** | **NSR3225P4** | 32 | 25 | 32 | 170 | 35 | 14 | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641669** | **NSR3232P4** | 32 | 32 | 40 | 170 | 35 | 14 | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641673** | **NSR3232P5** | 32 | 32 | 40 | 170 | 51 | 16 | 10,5 | N.5R | **CM80** | **MS352** | 6mm |
| | **A izquierdas** | | | | | | | | | | | |
| **3641683** | **NSL1010E2** | 10 | 10 | 14 | 70 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3641681** | **NSL1212F2** | 12 | 12 | 16 | 80 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3636545** | **NSL1616H2** | 16 | 16 | 20 | 100 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3639045** | **NSL2020K2** | 20 | 20 | 25 | 125 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3639047** | **NSL2525M2** | 25 | 25 | 32 | 150 | 19 | 9 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3639046** | **NSL2020K3** | 20 | 20 | 32 | 125 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3636539** | **NSL2525M3** | 25 | 25 | 32 | 150 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641670** | **NSL3225P3** | 32 | 25 | 32 | 170 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641671** | **NSL3232P3** | 32 | 32 | 40 | 170 | 32 | 13 | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3636544** | **NSL2525M4** | 25 | 25 | 32 | 150 | 35 | 14 | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641678** | **NSL3225P4** | 32 | 25 | 32 | 170 | 35 | 14 | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641679** | **NSL3232P4** | 32 | 32 | 40 | 170 | 35 | 14 | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641688** | **NSL3232P5** | 32 | 32 | 40 | 170 | 51 | 16 | 10,5 | N.5L | **CM81** | **MS352** | 6mm |

*NOTA: se muestra la dimensión F en el calibre de plaquita de tipo N.*



Consulte las plaquitas de las páginas E10 y E11.

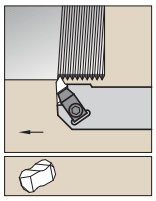



Herramienta a derechas

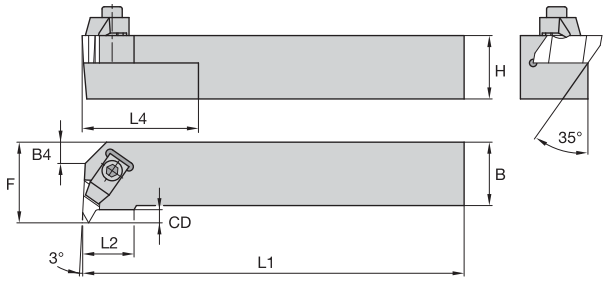
## NAS

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | B4 | CD | B3 | L3 | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | |
| **3641667** | **NASR1010M2Q** | 10 | 10 | 10 | 150 | 19 | 9 | 3,5 | 2,03 | 19 | N.2R | **CM182** | **MS1200** | T10 |
| **3641662** | **NASR1212M2Q** | 12 | 12 | 12 | 150 | 19 | 9 | 3,5 | — | — | N.2R | **CM182** | **MS1200** | T10 |
| **3639048** | **NASR1616K3Q** | 16 | 16 | 16 | 125 | 32 | 12 | 5,3 | — | — | N.3R | **CM184LP** | **MS2111** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | | | |
| **3641691** | **NASL1010M2Q** | 10 | 10 | 10 | 150 | 19 | 9 | 3,5 | 2,03 | 19 | N.2L | **CM183** | **MS1200** | T10 |
| **3641686** | **NASL1212M2Q** | 12 | 12 | 12 | 150 | 19 | 9 | 3,5 | — | — | N.2L | **CM183** | **MS1200** | T10 |
| **3641687** | **NASL1616K3Q** | 16 | 16 | 16 | 125 | 32 | 12 | 5,3 | — | — | N.3L | **CM185LP** | **MS2111** | 25 IP |

*NOTA: se muestra la dimensión F en el calibre de plaquita de tipo N.*



Consulte las plaquitas de las páginas E10 y E11.

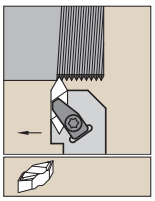



Herramienta a derechas

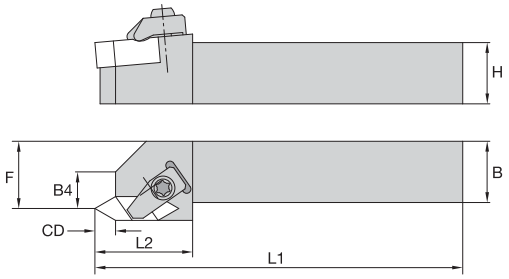
## NE

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | L4 | B4 | CD | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3641674** | **NER1616H2** | 16 | 16 | 20 | 100 | 15 | 25 | — | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3641658** | **NER2020K2** | 20 | 20 | 25 | 125 | 15 | 25 | 6 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3641665** | **NER2525M2** | 25 | 25 | 32 | 150 | 15 | 25 | 12 | 3,5 | N.2L | **CM75** | **MS1200** | T10 |
| **3636541** | **NER2525M3** | 25 | 25 | 32 | 150 | 22 | 51 | — | 5,3 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641680** | **NER3225P3** | 32 | 25 | 32 | 170 | 22 | 51 | — | 3,8 | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641672** | **NER2525M4** | 25 | 25 | 35 | 150 | 24 | 51 | — | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641689** | **NER3225P4** | 32 | 25 | 35 | 170 | 24 | 51 | — | 7,5 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641693** | **NER3232P4** | 32 | 32 | 40 | 170 | 24 | 51 | — | 6,4 | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641692** | **NER3232P5** | 32 | 32 | 50 | 170 | 35 | 51 | — | 10,5 | N.5L | **CM81** | **MS352** | 6mm |
| | **A izquierdas** | | | | | | | | | | | | |
| **3641684** | **NEL1616H2** | 16 | 16 | 20 | 100 | 15 | 25 | — | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3641677** | **NEL2020K2** | 20 | 20 | 25 | 125 | 15 | 25 | 6 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3641676** | **NEL2525M2** | 25 | 25 | 32 | 150 | 15 | 25 | 12 | 3,5 | N.2R | **CM74** | **MS1200** | T10 |
| **3636543** | **NEL2525M3** | 25 | 25 | 32 | 150 | 22 | 51 | — | 5,3 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641685** | **NEL3225P3** | 32 | 25 | 32 | 170 | 22 | 51 | — | 3,8 | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641668** | **NEL2525M4** | 25 | 25 | 35 | 150 | 24 | 51 | — | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641694** | **NEL3225P4** | 32 | 25 | 35 | 170 | 24 | 51 | — | 7,5 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641696** | **NEL3232P4** | 32 | 32 | 40 | 170 | 24 | 51 | — | 6,4 | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641695** | **NEL3232P5** | 32 | 32 | 50 | 170 | 35 | 51 | — | 10,5 | N.5R | **CM80** | **MS352** | 6mm |

*NOTA: se muestra la dimensión F en el calibre de plaquita de tipo N.*



Consulte las plaquitas de las páginas E10 y E11.




Herramienta a derechas

## NSU

| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | B4 | CD | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **3851386** | **NSUR2020K4Q** | 20 | 20 | 23 | 125 | 32 | 13 | 6,1 | NTU4R | **CM72LP** | **MS2111** | 25 IP |
| **3851387** | **NSUR2525M4Q** | 25 | 25 | 28 | 150 | 32 | 13 | 6,1 | NTU4R | **CM72LP** | **MS2111** | 25 IP |
| | **A izquierdas** | | | | | | | | | | | |
| **3851384** | **NSUL2020K4Q** | 20 | 20 | 23 | 125 | 32 | 13 | 6,1 | NTU4L | **CM73LP** | **MS2111** | 25 IP |
| **3851385** | **NSUL2525M4Q** | 25 | 25 | 28 | 150 | 32 | 13 | 6,1 | NTU4L | **CM73LP** | **MS2111** | 25 IP |

*NOTA: se muestra la dimensión F en el calibre de plaquita de tipo N.*
*Los portaherramientas NSU sólo deben emplearse con plaquitas de roscado NTU4.*

# WIN WITH WIDIA™

WIDIA™

## Sistema **TopThread**™

Una elección excelente para las aplicaciones pesadas como el mecanizado de roscas Acme, Buttress y API. El sistema TopThread de WIDIA™ es la mejor solución para aplicaciones de roscado de multi-dientes y paso ancho. Gracias a su tecnología de herramientas incomparable, puede estar seguro de que las herramientas TopThread de WIDIA proporcionarán todo lo que necesite para el roscado y ranurado.

- La mayor selección de geometrías y calidades de plaquitas del sector.
- Un diseño de fijación rígida de la plaquita asegura que la vida de la herramienta, el acabado superficial y la calidad de la pieza de trabajo sean las mejores.
- Minimiza los recrecimientos del filo, reduce las fuerzas de corte y corta con precisión los materiales más comunes.
- Asegura unas roscas precisas de gran calidad. Excelente para operaciones de roscado interior.

WIDIA™
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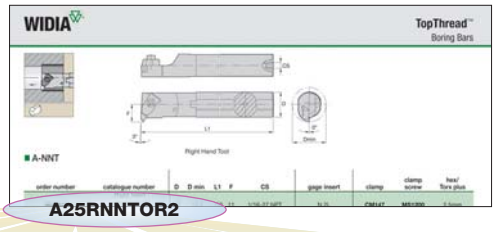
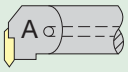
# Sistema de identificación de barras de mandrinar TopThread




| A | 25 | R | N | N | T | O | R | 2 |
|---|---|---|---|---|---|---|---|---|
| Tipo de barra | Diámetro de barra | Longitud de la barra | Método porta-plaquita | Forma de la plaquita | Ubicación de la plaquita | Ángulo de desprendimiento 0 = 0° | Dirección de la herramienta | Tamaño de la plaquita |

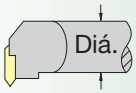
**A** — Tipo de barra

Acero con refrigeración




**25** — Diámetro de barra

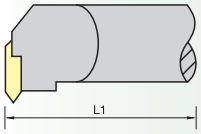
Diámetro de barra en milímetros




**R** — Longitud de la barra

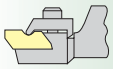
Barras

K = 125,0 mm
M = 150,0 mm
Q = 180,0 mm
R = 200,0 mm
S = 250,0 mm
T = 300,0 mm
U = 350,0 mm




**N** — Método porta-plaquita

N*: TopThread



**N** — Forma de la plaquita

**T** — Ubicación de la plaquita

Montaje en extremo

**O** — Ángulo de desprendimiento 0 = 0°

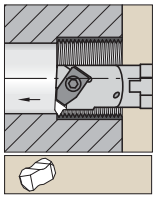
**R** — Dirección de la herramienta

A derechas

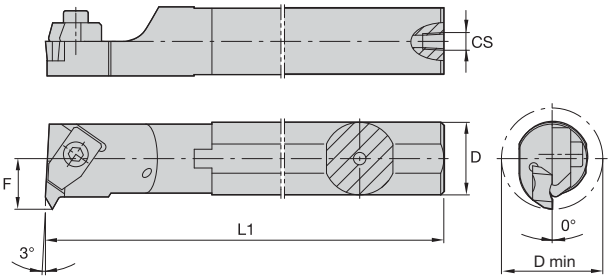
A izquierdas

**2** — Tamaño de la plaquita

| tamaño de la plaquita | W1 |
|---|---|
| 1 | 3,54 |
| 2 | 3,81 |
| 3 | 5,35 |
| 4 | 6,40 |
| 5 | 9,65 |
| 6 | 9,73 |
| 8 | 11,13 |



Mango de acero con refrigeración interna. Consulte las plaquitas de las páginas E10 y E11.

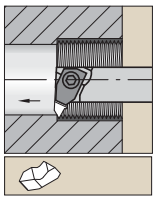



Herramienta a derechas

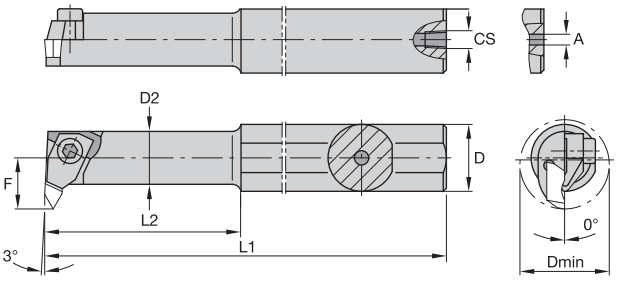
## A-NNT

| Número de pedido | Número de catálogo | D | D min | L1 | F | CS | placa guía | amarre | tornillo de amarre | hex./ Torx Plus |
|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | |
| **3641644** | **A12MNNTOR2** | 12 | 18,5 | 150 | 11 | 1/16-27 NPT | N.2L | **CM147** | **MS1200** | 2.5mm |
| **3641643** | **A16MNNTOR2** | 16 | 22,0 | 150 | 11 | 1/8-27 NPT | N.2L | **CM75** | **MS1200** | 2.5mm |
| **3641645** | **A20QNNTOR2** | 20 | 26,0 | 180 | 13 | 1/8-27 NPT | N.2L | **CM75** | **MS1200** | 2.5mm |
| **3641651** | **A25RNNTOR2** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.2L | **CM75** | **MS1200** | 2.5mm |
| **3641622** | **A25RNNTOR3** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641646** | **A32SNNTOR3** | 32 | 44,0 | 250 | 22 | 1/4-18 NPT | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641653** | **A40TNNTOR3** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.3L | **CM73LP** | **MS2111** | 25 IP |
| **3641654** | **A40TNNTOR4** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.4L | **CM73LP** | **MS2111** | 25 IP |
| **3641661** | **A50UNNTOR4** | 50 | 70,0 | 350 | 35 | 1/4-18 NPT | N.4L | **CM73LP** | **MS2111** | 25 IP |
| | **A izquierdas** | | | | | | | | | |
| **3641655** | **A12MNNTOL2** | 12 | 18,5 | 150 | 11 | 1/16-27 NPT | N.2R | **CM146** | **MS1200** | 2.5mm |
| **3641649** | **A16MNNTOL2** | 16 | 22,0 | 150 | 11 | 1/8-27 NPT | N.2R | **CM74** | **MS1200** | 2.5mm |
| **3641652** | **A20QNNTOL2** | 20 | 26,0 | 180 | 13 | 1/8-27 NPT | N.2R | **CM74** | **MS1200** | 2.5mm |
| **3641657** | **A25RNNTOL2** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.2R | **CM74** | **MS1200** | 2.5mm |
| **3641650** | **A25RNNTOL3** | 25 | 34,0 | 200 | 17 | 1/4-18 NPT | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641656** | **A32SNNTOL3** | 32 | 44,0 | 250 | 22 | 1/4-18 NPT | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641659** | **A40TNNTOL3** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.3R | **CM72LP** | **MS2111** | 25 IP |
| **3641663** | **A40TNNTOL4** | 40 | 54,0 | 300 | 27 | 1/4-18 NPT | N.4R | **CM72LP** | **MS2111** | 25 IP |
| **3641690** | **A50UNNTOL4** | 50 | 70,0 | 350 | 35 | 1/4-18 NPT | N.4R | **CM72LP** | **MS2111** | 25 IP |

*NOTA: se muestra la dimensión F en el calibre de plaquita de tipo N.*



Mango de acero con cuello reducido y refrigeración interna. Consulte las plaquitas de las páginas E10 y E11.



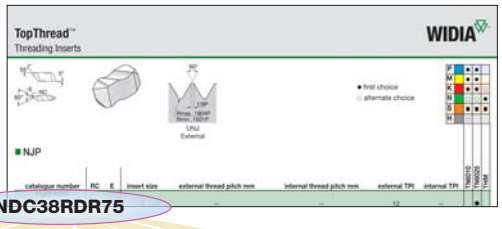

Herramienta a derechas

## A-NNT-1

| Número de pedido | Número de catálogo | D | D min | D2 | L1 | L2 | F | A | CS | placa guía | amarre | tornillo de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **3641648** | **A10KNNTOR1** | 10 | 11,5 | 8,7 | 125 | 31,75 | 7 | 3,2 | — | N.1L | **CM109** | **MS1034** | 1.5mm |
| **3641647** | **A12MNNTOR1** | 12 | 11,5 | 8,7 | 150 | 31,30 | 7 | 4,0 | 1/16-27 NPT | N.1L | **CM109** | **MS1034** | 1.5mm |

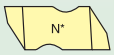
*NOTA: se muestra la dimensión F en el calibre de plaquita de tipo N.*

# TopThread
# Sistema de identificación de plaquita




| N | D | C | 3 | 8RD | R | 75 | |
|---|---|---|---|---|---|---|---|
| Tipo de plaquita | Estilo de plaquita | Información adicional | Tamaño de la plaquita | Identificación de rosca industrial | Dirección de la plaquita | Definición de plaquita | Información adicional |

**N:** TopThread*




*Sólo estándar exclusivo.

**B:** Trapezoidal

**F:** Paso fino

**S:** Acme extracorto

**C:** Cresta

**P:** Desprendimiento positivo

**K:** Paso fino, positivo

Indica la denominación de forma industrial de taladrado o API (p. ej., 10RD, 8RD, 0,038)
o
las plaquitas con roscado de radio de base controlado indican el radio de la base en aumentos de 0,025 (NJ, NJF, NJP, NJK)
o
M indica la rosca ISO (sistema métrico)

**R** = a derechas

**L** = a izquierdas

- Paso de la rosca (TP).
- Plaquita trapezoidal de tipo “A” o “B”.
- Cono por pie: roscas API.

**A:** Acme

**D:** API o NPT

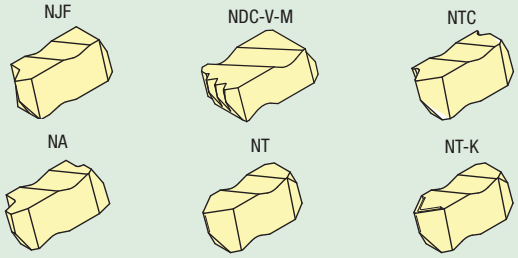
**J:** Rosca UNJ

**T:** Rosca V 60°

**W:** Whitworth V 55°

Dimensiones de la plaquita de TopThread

| tamaño de la plaquita | A mm | T mm |
|---|---|---|
| 1 | 2,54 | 2,54 |
| 2 | 5,56 | 3,81 |
| 3 | 8,74 | 4,95 |
| 4 | 11,51 | 6,48 |
| 5 | 17,48 | 9,65 |
| 6 | 11,51 | 9,73 |
| 8 | 7,93 | 11,13 |




**I:** Roscado interior

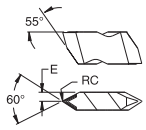
**E:** Roscado externo (sólo se utiliza si las formas de rosca interior y exterior son distintas)

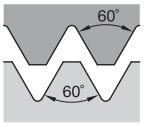
**M:** Múltiples dientes

**K:** Control de virutas estándar

**C:** Paso ancho

**D:** “Sellado en seco”





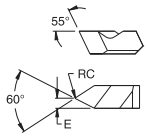
60º perfil parcial

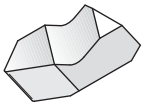
● primera elección
○ elección alternativa

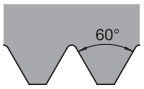
| | | | | |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## NT-K

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NT2RK** | 0,10 | 1,91 | 2 | 0,70–3,00 | 1,25–3,50 | 8–36 | 7–20 | ● | ● | |
| **NT3RK** | 0,17 | 2,49 | 3 | 1,25–4,00 | 2,00–5,00 | 6–20 | 5–12 | ● | ● | |
| **NT4RK** | 0,17 | 3,25 | 4 | 1,25–6,25 | 2,00–6,25 | 4–20 | 4–12 | | ● | |
| **A izquierdas** | | | | | | | | | | |
| **NT2LK** | 0,10 | 1,91 | 2 | 0,70–3,00 | 1,25–3,50 | 8–36 | 7–20 | ● | ● | |
| **NT3LK** | 0,17 | 2,49 | 3 | 1,25–4,00 | 2,00–5,00 | 6–20 | 5–12 | ● | ● | |



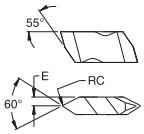



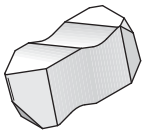


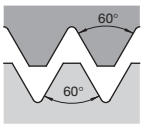
60º perfil parcial interior

## NT-1L

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | |
| **NT1L** | 0,08 | 1,09 | 1 | – | 1,00–2,00 | – | 12–24 | ● | ● | |





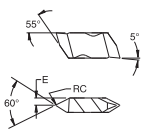
60º perfil parcial

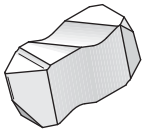
● primera elección
○ elección alternativa

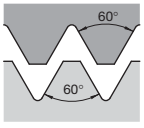
| | | TN6010 | TN6025 | THM |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## ■ NT

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NT2R** | 0,10 | 1,91 | 2 | 0,70–3,00 | 1,25–3,50 | 8–36 | 7–20 | ● | ● | |
| **NT3R** | 0,17 | 2,49 | 3 | 1,25–4,00 | 2,00–5,00 | 6–20 | 5–12 | ● | ● | |
| **NT4R** | 0,17 | 3,25 | 4 | 1,25–6,25 | 2,00–6,25 | 4–20 | 4–12 | ● | ● | |
| **A izquierdas** | | | | | | | | | | |
| **NT2L** | 0,10 | 1,91 | 2 | 0,70–3,00 | 1,25–3,50 | 8–36 | 7–20 | ● | ● | |
| **NT3L** | 0,17 | 2,49 | 3 | 1,25–4,00 | 2,00–5,00 | 6–20 | 5–12 | ● | ● | |
| **NT4L** | 0,17 | 3,25 | 4 | 1,25–6,25 | 2,00–6,25 | 4–20 | 4–12 | | ● | |



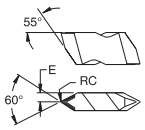



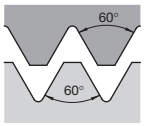


60º perfil parcial

## ■ NTP

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NTP2R** | 0,10 | 1,91 | 2 | 0,70–3,00 | 1,25–3,50 | 8–36 | 7–20 | ● | ● | |
| **NTP3R** | 0,17 | 2,49 | 3 | 1,25–4,00 | 2,00–5,00 | 6–20 | 5–12 | ● | ● | |
| **NTP4R** | 0,17 | 3,25 | 4 | 1,25–6,25 | 2,00–6,25 | 4–20 | 4–12 | | ● | |
| **A izquierdas** | | | | | | | | | | |
| **NTP2L** | 0,10 | 1,91 | 2 | 0,70–3,00 | 1,25–3,50 | 8–36 | 7–20 | ● | ● | |
| **NTP3L** | 0,17 | 2,49 | 3 | 1,25–4,00 | 2,00–5,00 | 6–20 | 5–12 | ● | ● | |





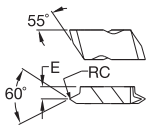
60º perfil parcial

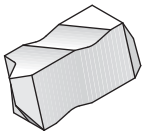
● primera elección
○ elección alternativa

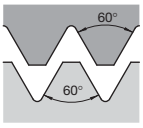
| | | | |
|---|---|---|---|
| P | ● | ● | |
| M | ● | ● | |
| K | ● | ● | ○ |
| N | ○ | ○ | ● |
| S | ● | ● | ● |
| H | ○ | | |

## NT-CK

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NT3RCK** | 0,34 | 2,46 | 3 | 2,50–4,00 | 4,00 | 6–11 | 6 | ● | ● | |



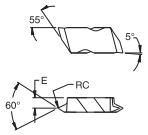



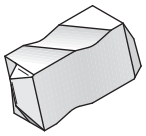


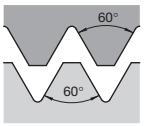
60º perfil parcial

## NTF

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NTF2R** | 0,08 | 2,79 | 2 | 0,60–1,75 | 1,00–2,00 | 14–44 | 12–24 | ● | ● | |
| **NTF3R** | 0,08 | 3,58 | 3 | 0,60–2,50 | 1,00–2,50 | 10–44 | 9–24 | ● | ● | |
| **A izquierdas** | | | | | | | | | | |
| **NTF3L** | 0,08 | 3,58 | 3 | 0,60–2,50 | 1,00–2,50 | 10–44 | 9–24 | ● | ● | |





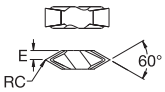
60º perfil parcial

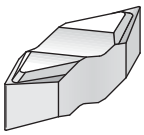
● primera elección
○ elección alternativa

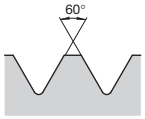
| | | TN6010 | TN6025 | THM |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## NTK

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas NTK2R** | 0,08 | 2,79 | 2 | 0,60–1,75 | 1,00–2,00 | 14–44 | 12–24 | ● | ● | |
| **NTK3R A izquierdas** | 0,08 | 3,58 | 3 | 0,60–2,50 | 1,00–2,50 | 10–44 | 9–24 | ● | ● | |
| **NTK3L** | 0,08 | 3,58 | 3 | 0,60–2,50 | 1,00–2,50 | 10–44 | 9–24 | | ● | |



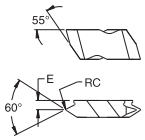



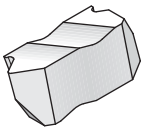


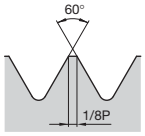
60º perfil parcial exterior

## NTU

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas NTU4R** | 0,11 | 3,18 | 4U | 1,25–6,25 | — | 4–20 | — | | ● | |
| **A izquierdas NTU4L** | 0,11 | 3,18 | 4U | 1,25–6,25 | — | 4–20 | — | | ● | |





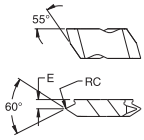

UN Americano - exterior

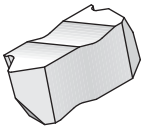
● primera elección
○ elección alternativa

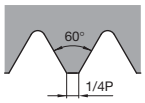
| | | TN6010 | TN6025 | THM |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## NTC-E

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NTC3R16E** | 0,19 | 3,76 | 3 | – | – | 16 | – | ● | ● | |
| **NTC3R14E** | 0,22 | 3,76 | 3 | – | – | 14 | – | ● | | |
| **NTC3R12E** | 0,25 | 3,76 | 3 | – | – | 12 | – | ● | ● | |



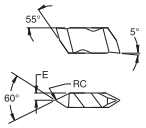



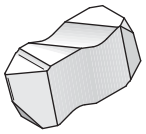


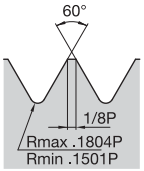

UN Americano - interior

## NTC-I

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | | | |
| **NTC3L12I** | 0,10 | 3,76 | 3 | – | – | – | 12 | | ● | |





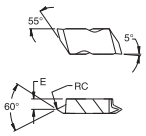
UNJ exterior

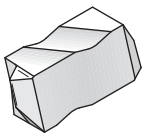
● primera elección
○ elección alternativa

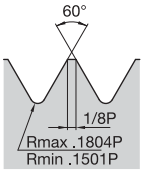
| | | | | |
|---|---|---|---|---|
| P | ● | ● | | |
| M | ● | ● | | |
| K | ● | ● | ○ | |
| N | ○ | ○ | ● | |
| S | ● | ● | ● | |
| H | ○ | | | |

## ■ NJP

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NJP3014R12** | 0,33 | 2,49 | 3 | – | – | 12 | – | | ● | |



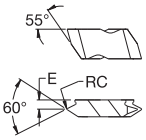



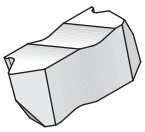


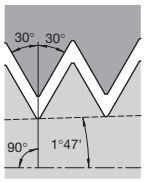
UNJ exterior

## ■ NJK

| Número de catálogo | RC | E | tamaño de la plaquita | paso de rosca exterior mm | paso de rosca interior mm | tpi externo | tpi interno | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | | |
| **NJK3008R20** | 0,20 | 3,58 | 3 | – | – | 20 | – | ● | | |





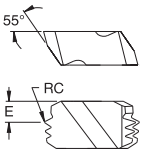

NPT

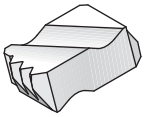
● primera elección
○ elección alternativa

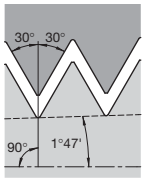
| | | TN6010 | TN6025 | THM |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## NDC-V

| Número de catálogo | RC | E | tamaño de la plaquita | tpi | TPF | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **NDC3115VR75** | 0,10 | 3,66 | 3 | 11,5 | .750 | ● | | |



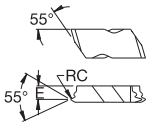



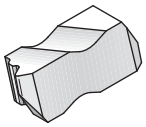


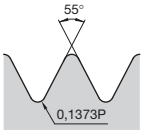

NPT

## NDC-V-M

| Número de catálogo | RC | E | tamaño de la plaquita | tpi | TPF | | | |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **NDC8115VR75M** | 0,10 | 2,59 | 8 | 11,5 | .750 | ● | | |
| **NDC88VR75M** | 0,13 | 2,41 | 8 | 8 | .750 | ● | | |





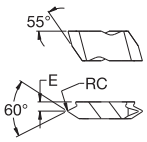
Whitworth BSW, BSP exterior

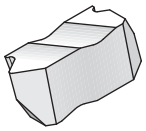
● primera elección
○ elección alternativa

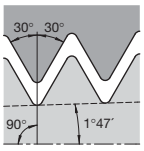
| | | | | |
|---|---|---|---|---|
| P | ● | ● | | |
| M | ● | ● | | |
| K | ● | ● | ○ | |
| N | ○ | ○ | ● | |
| S | ● | ● | ● | |
| H | ○ | | | |

## ■ NWC-E

| Número de catálogo | RC | E | tamaño de la plaquita | tpi | TPF | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **NWC3R14E** | 0,24 | 3,43 | 3 | 14 | – | | ● | |
| **NWC3R11E** | 0,30 | 3,43 | 3 | 11 | – | | ● | |



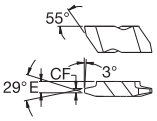



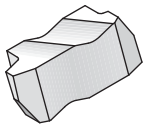


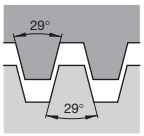
API redondo

## ■ NDC-RD

| Número de catálogo | RC | E | tamaño de la plaquita | tpi | TPF | | | |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **NDC38RDR75** | 0,43 | 3,18 | 3 | 8 | .750 | | ● | |
| **A izquierdas** | | | | | | | | |
| **NDC310RDL75** | 0,36 | 3,18 | 3 | 10 | .750 | | ● | |
| **NDC38RDL75** | 0,43 | 3,18 | 3 | 8 | .750 | | ● | |





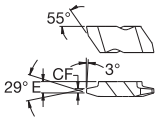
ACME

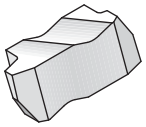
● primera elección
○ elección alternativa

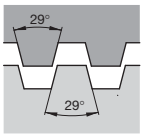
| | | | | |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## NA

| Número de catálogo | RC | CF | E | tamaño de la plaquita | tpi | TPF | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NA3R8** | – | 1,04 | 3,79 | 3 | 8 | – | | ● | |
| **NA3R6** | – | 1,44 | 3,79 | 3 | 6 | – | | ● | |
| **NA3R4** | – | 2,22 | 3,38 | 3 | 4 | – | | ● | |
| **NA4R4** | – | 2,22 | 5,13 | 4 | 4 | – | | ● | |
| **NA6R3** | – | 3,01 | 7,19 | 6 | 3 | – | | ● | |
| **NA6R2** | – | 4,58 | 7,19 | 6 | 2 | – | | ● | |
| **A izquierdas** | | | | | | | | | |
| **NA3L8** | – | 1,04 | 3,79 | 3 | 8 | – | | ● | |
| **NA3L6** | – | 1,44 | 3,79 | 3 | 6 | – | | ● | |
| **NA3L4** | – | 2,22 | 3,38 | 3 | 4 | – | | ● | |
| **NA4L4** | – | 2,22 | 5,13 | 4 | 4 | – | | ● | |
| **NA6L3** | – | 3,01 | 7,19 | 6 | 3 | – | | ● | |
| **NA6L2** | – | 4,58 | 7,19 | 6 | 2 | – | | ● | |





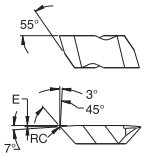

ACME
extracorto

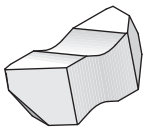
● primera elección
○ elección alternativa

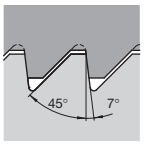
| | | TN6010 | TN6025 | THM |
|---|---|---|---|---|
| P | | ● | ● | |
| M | | ● | ● | |
| K | | ● | ● | ○ |
| N | | ○ | ○ | ● |
| S | | ● | ● | ● |
| H | | ○ | | |

## NAS

| Número de catálogo | RC | CF | E | tamaño de la plaquita | tpi | TPF | TN6010 | TN6025 | THM |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **NAS3R8** | — | 1,21 | 3,79 | 3 | 8 | — | | ● | |
| **A izquierdas** | | | | | | | | | |
| **NAS3L12** | — | 0,83 | 3,79 | 3 | 12 | — | | ● | |
| **NAS3L8** | — | 1,21 | 3,79 | 3 | 8 | — | | ● | |
| **NAS3L6** | — | 1,66 | 3,79 | 3 | 6 | — | | ● | |






Buttress
americano-tracción

## NTB-B

| Número de catálogo | RC | E | tamaño de la plaquita | tpi | TPF | | | |
|---|---|---|---|---|---|---|---|---|
| **A izquierdas** | | | | | | | | |
| **NTB3LB** | 0,17 | 0,31 | 3 | 8–16 | — | | ● | |

| ANSI ISO 513 | VDI 3323 | Velocidad de corte • vc m/min | | | | | |
|---|---|---|---|---|---|---|---|
| Grupo de materiales | | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | | | TN6010 | | | TN6025 | |
| P | 1 | 140 | **175** | 210 | 130 | **140** | 150 |
| | 2 | 130 | **160** | 190 | 120 | **160** | 200 |
| | 3 | 110 | **140** | 170 | 100 | **130** | 160 |
| | 4 | 120 | **150** | 180 | 120 | **150** | 180 |
| | 5 | 100 | **130** | 160 | 100 | **130** | 160 |
| | 6 | 120 | **150** | 180 | 120 | **150** | 180 |
| | 7 | 100 | **130** | 160 | 90 | **125** | 160 |
| | 8 | 90 | **120** | 150 | 80 | **110** | 140 |
| | 9 | 60 | **90** | 120 | 60 | **80** | 100 |
| | 10 | 90 | **105** | 120 | 80 | **95** | 110 |
| | 11 | 50 | **65** | 80 | 50 | **65** | 80 |
| | 12 | 120 | **155** | 190 | 120 | **140** | 160 |
| | 13.1 | 90 | **120** | 150 | 80 | **105** | 130 |
| | 13.2 | 45 | **60** | 75 | 40 | **55** | 65 |
| | | | TN6010 | | | TN6025 | |
| M | 14.1 | 90 | **115** | 140 | 60 | **75** | 90 |
| | 14.2 | 75 | **95** | 115 | 50 | **60** | 75 |
| | 14.3 | 55 | **70** | 90 | 40 | **50** | 55 |
| | 14.4 | 45 | **60** | 70 | 30 | **40** | 45 |
| | | | TN6010 | | | TN6025 | |
| K | 15 | 140 | **170** | 200 | 70 | **90** | 100 |
| | 16 | 100 | **130** | 160 | 50 | **65** | 80 |
| | 17 | 120 | **150** | 180 | 60 | **70** | 80 |
| | 18 | 90 | **120** | 150 | 40 | **55** | 70 |
| | 19 | 150 | **180** | 210 | 80 | **95** | 110 |
| | 20 | 110 | **140** | 170 | 60 | **75** | 90 |
| | | | TN6010 | | | TN6025 | |
| N | 21 | 600 | **750** | 900 | 600 | **750** | 900 |
| | 22 | 500 | **650** | 800 | 500 | **650** | 800 |
| | 23 | 600 | **750** | 900 | 600 | **750** | 900 |
| | 24 | 500 | **650** | 800 | 500 | **650** | 800 |
| | 25 | 230 | **300** | 370 | 230 | **300** | 370 |
| | 26 | 150 | **200** | 250 | 150 | **200** | 250 |
| | 27 | 150 | **200** | 250 | 150 | **200** | 250 |
| | 28 | 110 | **140** | 170 | 110 | **140** | 170 |
| | 29 | 60 | **80** | 100 | 60 | **80** | 100 |
| | 30 | 80 | **100** | 120 | 80 | **100** | 120 |
| | | | TN6010 | | | TN6025 | |
| S | 31 | 37 | **45** | 55 | 26 | **37** | 45 |
| | 32 | 30 | **36** | 45 | 21 | **30** | 36 |
| | 33 | 24 | **28** | 35 | 17 | **24** | 28 |
| | 34 | 15 | **18** | 25 | 11 | **15** | 18 |
| | 35 | 16 | **18** | 25 | 11 | **16** | 18 |
| | 36 | 60 | **72** | 80 | 42 | **60** | 72 |
| | 37 | 30 | **36** | 45 | 21 | **30** | 36 |

## Soluciones a medida de TopThread

Las calidades de metal duro WIDIA de alto rendimiento, acompañadas de nuestro rígido diseño de fijación TopThread, ofrecen la mejor productividad de roscado de la industria del metal.

Cuando el amplio inventario de productos estándar de WIDIA no satisfaga por completo sus requisitos de productividad, puede rectificar a medida las plaquitas TopThread para que estas cumplan las necesidades exclusivas de sus aplicaciones.

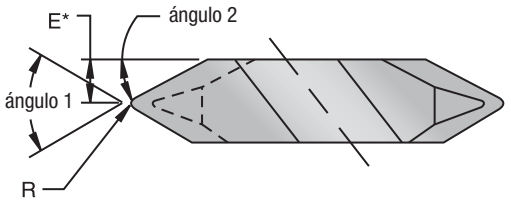
La gran variedad de tamaños en bruto de TopThread permite la mayor flexibilidad en el roscado de una forma final, especialmente para aplicaciones extraanchas o pertenecientes al sector petrolífero.

Aquí se muestran unos ejemplos comunes de formas especiales. Póngase en contacto con su representante local de Widia para recomendar formas de satisfacer sus necesidades de roscado especiales.

**Características y ventajas:**

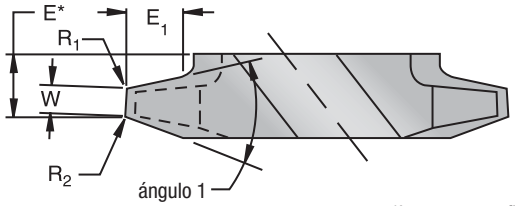
- Las peticiones se atienden con rapidez y eficiencia, mediante un ultramoderno software de diseño asistido por ordenador y un software de base de datos electrónica.
- Nuestro equipo de diseño de soluciones a medida de metal duro posee una de las bases de datos electrónicas más grandes del sector. Pueden resolver sus problemas de diseño más complicados.
- Siempre que sea necesario, podrá disponer de diseños conceptuales para facilitar el desarrollo de ingeniería.
- Dispone de una gran cantidad de calidades de metal duro para optimizar la productividad. La opción de producir estilos de plaquitas estándar en calidades de metal duro no estándar permite optimizar la vida de la herramienta.

**estilo C2** versión a derechas



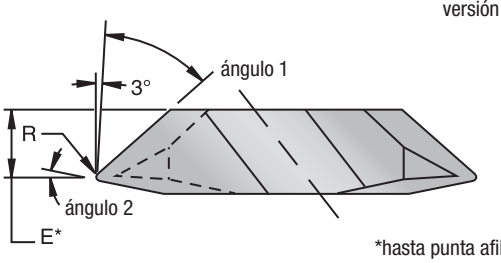

*hasta punta afilada teórica

**estilo C3** versión a derechas



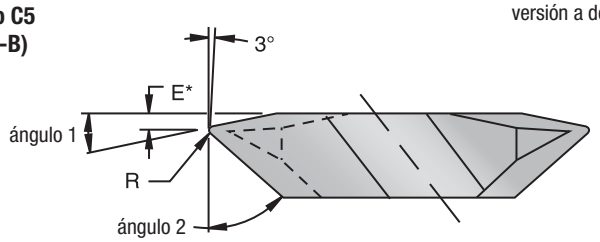

*hasta punta afilada teórica

**estilo C4 (NTB-A)** versión a derechas



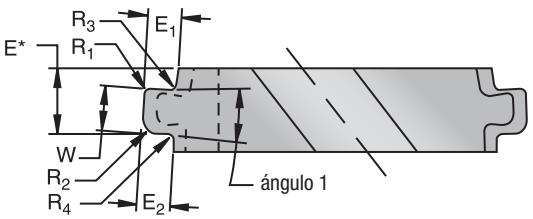

*hasta punta afilada teórica

**estilo C5 (NTB-B)** versión a derechas




*hasta punta afilada teórica

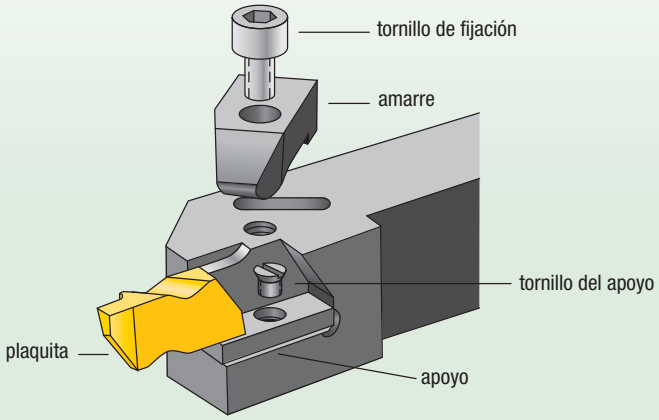
**estilo C6** versión a derechas




*hasta punta afilada teórica

*NOTA: Las plaquitas que se muestran son de tipo "a derechas"; también está disponible la versión "a izquierdas".*

## Portaherramientas y barras de mandrinar
## TopThread y TopGroove




| tamaño y tipo de plaquita | amarre | tornillo de fijación | apoyo | tornillo del apoyo |
|---|---|---|---|---|
| NG-1L | CM-109 | S-304 | – | – |
| NG-2R | CM-182 | S-310 | – | – |
| NG-2L | CM-183 | S-310 | – | – |
| NG-2R | CM-74 | S-310 | – | – |
| NG-2L | CM-75 | S-310 | – | – |
| NG-3R | CM-184 | S-412 | – | – |
| NG-3L | CM-185 | S-412 | – | – |
| NG-3R | CM-72 | S-412 | – | – |
| NG-3L | CM-73 | S-412 | – | – |
| NG-3R* | CM-78 | S-412 | – | – |
| NG-3L* | CM-70 | S-412 | – | – |
| NG-4R | CM-72 | S-412 | SM-420 | SL-344 |
| NG-4L | CM-73 | S-412 | SM-420 | SL-344 |
| NG-5R | CM-80 | S-352 | – | – |
| NG-5L | CM-81 | S-352 | – | – |
| NG-6R | CM-120 | S-412 | SM-416 | S-111 |
| NG-6L | CM-121 | S-412 | SM-416 | S-111 |
| NG-8R | CM-144 | S-422 | SM-419 | S-112 |
| NG-8L | CM-145 | S-422 | SM-419 | S-112 |
| NG-8R** | CM-144 | S-422 | SM-427 | S-111 |
| NG-8L** | CM-145 | S-422 | SM-427 | S-111 |
| Ranurado de desahogo TopGroove | | | | |
| NU-3125R | CM-72 | S-412 | – | – |
| NU-3125L | CM-73 | S-412 | – | – |
| NU-3125R** | CM-72 | S-618 | – | – |
| NU-3125L** | CM-73 | S-618 | – | – |
| Aplicación de roscado | | | | |
| NTU-4R | CM-72 | S-412 | – | – |
| NTU-4L | CM-73 | S-412 | – | – |

**Cabeza de mandrinar de 25,0 mm de diámetro.*

***Cabeza de mandrinar.*

# Roscado Laydown de WIDIA™

Para una mayor fiabilidad y productividad, no busque más y quédese con el sistema de roscado Laydown de WIDIA para todas sus operaciones de roscado de diámetro interior y exterior. Con ángulos de placa de apoyo variables y la geometría de corte adecuada, el sistema de roscado Laydown maximiza la vida de la herramienta y mejora la calidad de la rosca.

Este sistema diseñado especialmente cumple todos los estándares de producción modernos. Con una amplia gama de plaquitas y portaherramientas disponible, la plataforma de roscado triangular es ideal para todos sus requisitos de roscado.

## Tecnología de plaquita Laydown

La tecnología de plaquita Laydown, con su amplia gama de herramientas y plaquitas disponibles, garantiza una mayor vida de la herramienta, minimiza el recrecimiento de los filos y unos cortes precisos de los materiales más comunes.

- La calidad especial TN6025 con recubrimiento de PVD TiAlN supera a las calidades con PVD convencionales en hasta un 30%.
- Permite un control de virutas superior y una reducción de las fuerzas de corte.
- Opciones de plaquita de perfil parcial y completo disponibles para todas las formas de rosca comunes.

El bloqueo fiable TopClamp garantiza la precisión del posicionamiento de la plaquita.

Elija entre unas barras de mandrinar de acero o de metal duro para satisfacer todas las necesidades de aplicaciones de mecanizado.

Consiga más piezas por plaquita con la economía de los tres filos de corte de la plaquita de roscado Laydown.

## La solución de roscado Laydown

Con el sistema de roscado triangular de WIDIA™, experimentará un bloqueo fiable de los tornillos avellanados, logrando un flujo de virutas sin obstáculos y total precisión del posicionamiento de la plaquita.

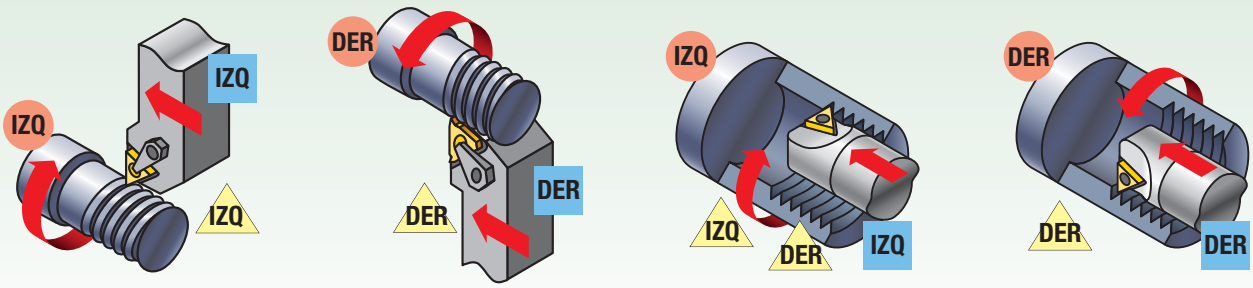
- Cuatro tamaños de plaquita disponibles para cubrir una amplia gama de aplicaciones de roscado.
- Ideal para roscas de paso fino, roscas de hélice elevada/entrada múltiple y roscado de un solo punto en mandrinados de diámetro pequeño.
- Vida de herramienta maximizada y diseño de perfil bajo para un flujo de virutas sin obstáculos y un rendimiento superior.

## Paso 1 • Selección del método de roscado y la dirección de la herramienta

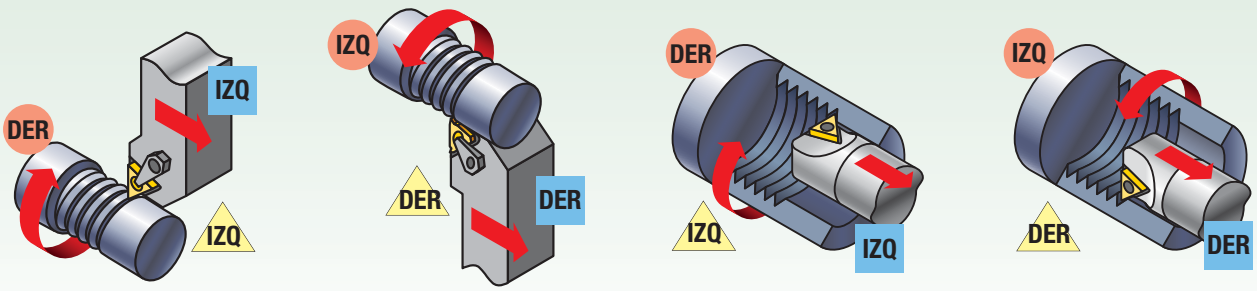
**Información necesaria:**

- Operación de exterior/interior.
- Rotación del husillo/mano de la rosca.
- Dirección del avance.

### Dirección del avance hacia el adaptador • hélice estándar




### Dirección del avance desde el adaptador • hélice inversa




## Paso 2 • Selección del soporte de la página del catálogo

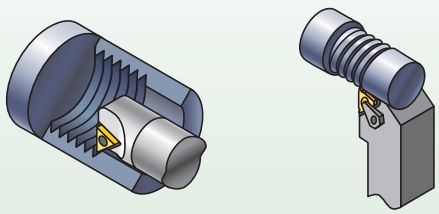
**Información necesaria:**

- Operación de exterior/interior.
- Diámetro de orificio mínimo (para operaciones de interior).
- Dirección de la herramienta.
- Tamaño de la plaquita (placa guía).

El tamaño de la plaquita debe coincidir con placa guía de la selección de portaherramientas:

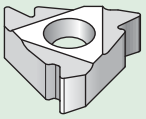
| número de catálogo | placa guía | diámetro de agujero mínimo (Dmin) | apoyo |
|---|---|---|---|
| S0812LSER2 | 2IRA60 | 16,5 mm | — |
| S2020LSER3 | 3IR... | 36,8 mm | SM-YI3 |

**Seleccione el porta apropiado para el tamaño y la mano de la plaquita:**



## Paso 3 • Elección de la plaquita para la aplicación

- Consulte la información general sobre las plaquitas de roscado en la página E38.
- Seleccione plaquitas con perfil de cresta para una forma de rosca completamente controlada, incluyendo el diámetro.
- Las plaquitas con perfil de cresta eliminan la necesidad de desbarbado y se optimizan para la mejor vida de herramienta posible en ese paso.
- Las plaquitas de perfil parcial sin cresta ofrecen la flexibilidad para cortar múltiples pasos de rosca con una sola plaquita.
- Tenga en cuenta el tamaño de la plaquita al seleccionar el portaherramientas.



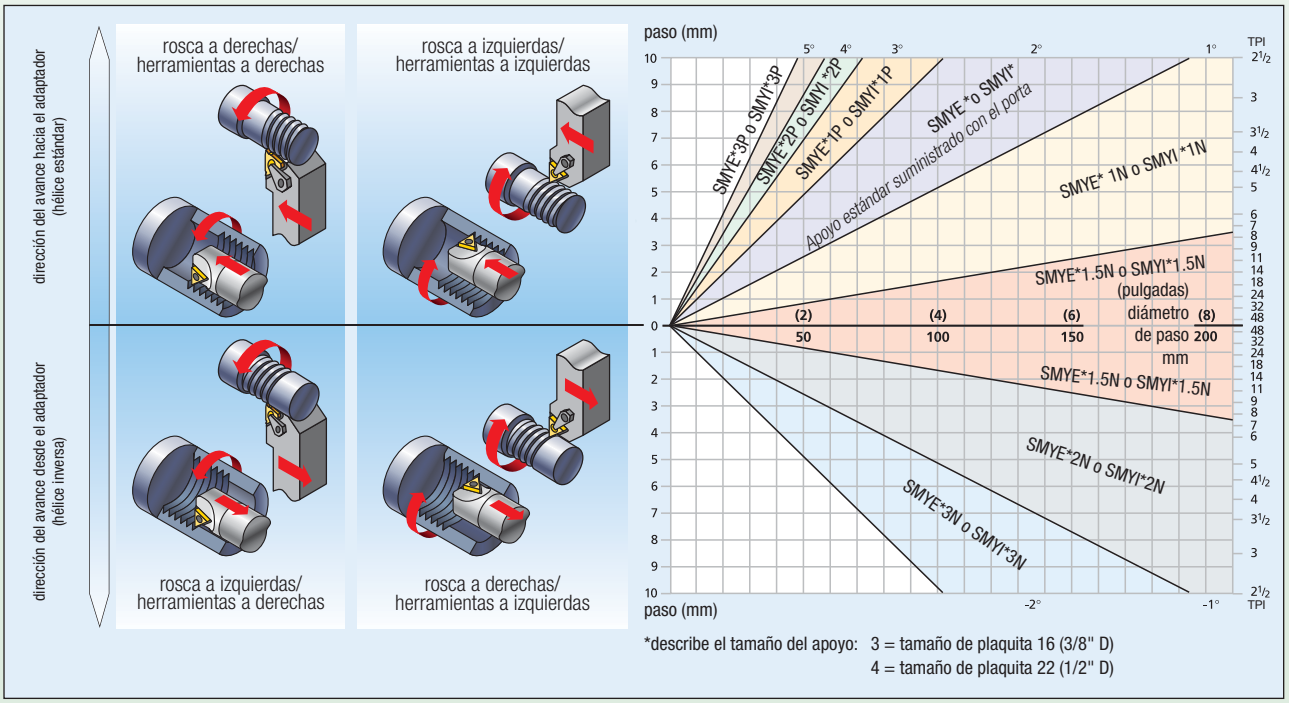
| tamaño de la plaquita | número de catálogo | TN6025 |
|---|---|---|
| 11 | 2IRA60 | ● |
| 16 | 3IRAG60 | ● |

## Paso 4 • Selección de apoyo apropiado

**Información necesaria:**

- Forma de rosca (TPI o paso).
- Diámetro de paso.
- Método de hélice (dirección de la herramienta, del avance y mano de la rosca).

Seleccione apoyo apropiado: SMYE... para dirección externa a derechas o interna a izquierdas
SMYI... para dirección interna a derechas o externa a izquierdas



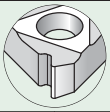

*describe el tamaño del apoyo: 3 = tamaño de plaquita 16 (3/8" D)
4 = tamaño de plaquita 22 (1/2" D)

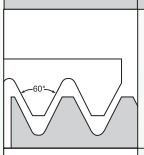
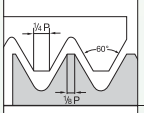
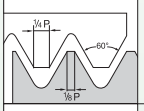
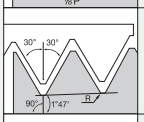
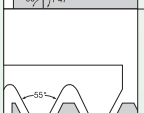
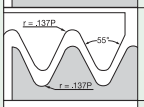
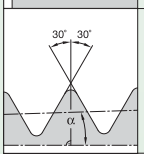
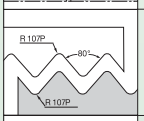
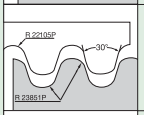
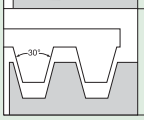
*Si el apoyo recomendado es distinto del suministrado con el portaherramientas, pida un apoyo por separado.*

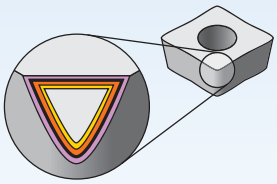
*NOTA: optimice su operación de roscado utilizando el ángulo de avance apropiado y los valores de avance recomendados. Consulte el apartado técnico anterior. Consulte también la información detallada para la selección del apoyo en el apartado anterior.*

## Paso 5 • Selección de velocidades y calidades

**Recomendaciones para selección de calidades y velocidades: m/min**

| material de la pieza de trabajo | acero | acero inoxidable | fundición | metales no férreos | aleaciones de alta temperatura |
|---|---|---|---|---|---|
| Estilo de plaquita |  Rectificado de precisión | | | | |
| Primera opción | **TN6025** 40–200 | **TN6025** 40–135 | **TN6025** 60–145 | **TN6025** 50–360 | **TN6025** 10–100 |

| tipo | | | perfil de rosca | estándar | clase de tolerancia | con cresta | aplicación | página (s) |
|---|---|---|---|---|---|---|---|---|
|  | 60 | | 60º perfil parcial | — | — | N | Uso general para formas de rosca con 60º, como ISO y UN, cuando se desee emplear plaquitas sin perfil de cresta para cortar distintos tipos de paso. | **E47–E48** |
|  | ISO | | ISO métrico | ISO R262, DIN 13 | 6g/6H | S | Forma en V métrica de 60° muy usada en todos los sectores. | **E49–E50** |
|  | UN | | UN americano | ANSI B1.1:74 | 2A/2B | S | Forma en V de 60° basada en pulgadas muy usada en todos los sectores. | **E51–E52** |
|  | NPT | | NPT | ANSI/ASME B1.20.1S1983 | Estándar NPT | N | Forma de rosca de 60º del estándar americano National Pipe Thread para accesorios de tubería. | **E53** |
|  | 55 | | 55º perfil parcial | — | — | N | Uso general para formas de rosca con 55º, como Whitworth, BSW y BSP, cuando se desee emplear plaquitas sin perfil de cresta para cortar distintos tipos de paso. | **E54** |
|  | W | | Whitworth, BSW, BSF, BSP | BS 84:1956, ISO 228/1:1982, DIN 259 | Medio clase A | S | Forma de 55° muy usada en conexiones de gas y agua. | **E55–E56** |
|  | APIRD | | API redondo | API STD. 5B:1979 | Estándar API RD | S | Forma en V de 60º con radio grande para carcasas, tuberías y conductos en la industria petrolífera, incluyendo las formas redondas 8 y 10. | **E56–E57** |
|  | PG | | PG | DIN 404B0 | — | S | Rosca de conductos de acero de 80º. | **E57–E58** |
|  | RD | | Redondo | DIN 405 | 7e/7H | S | Forma de rosca redonda para accesorios de tubería en la industria química y alimentaria. | **E58–E59** |
|  | TR | | Trapez | DIN 103 | 7e/7H | N | Forma de rosca truncada de 30º para aplicaciones de movimiento. | **E59–E60** |

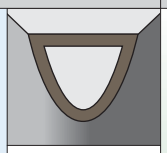


**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

- Reducen los ciclos de tiempo: velocidad y avance mayores.
- Vida más larga de la herramienta: un nuevo recubrimiento multicapa proporciona una mejor resistencia al desgaste.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

**Calidad**

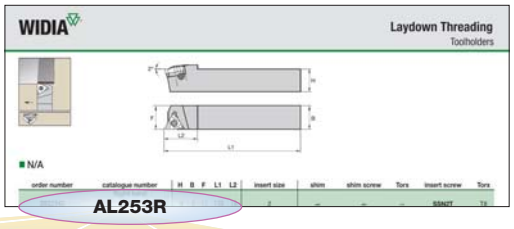
| Recubrimiento | Descripción de la calidad |
|---|---|
| TN6025  HC-P25 | Metal duro recubierto con multicapa de PVD-TiAlN. Mecanizado general de aceros, aceros inoxidables, fundiciones, materiales no ferrosos y materiales difíciles de mecanizar. Recomendada en velocidades de corte baja y media cuando sean necesarias buenas propiedades de dureza. |

| | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | |
| M | | | | | | | | | |
| K | | | | | | | | | |
| N | | | | | | | | | |
| S | | | | | | | | | |
| | | | | | | | | | |

## Guía de formas de rosca para roscado Laydown

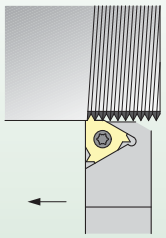
- Todas las plaquitas de roscado Laydown han sido rectificadas con precisión para proporcionar un indexado y unas formas de rosca precisas.
- Las plaquitas de perfil parcial con y sin cresta están diseñadas específicamente para operaciones de roscado tanto externas como internas.
- Las plaquitas con cresta proporcionan una forma de rosca completamente controlada, incluyendo el diámetro de un paso concreto. La necesidad de desbarbado se elimina y las plaquitas se optimizan para la mejor vida de herramienta posible en ese paso.
- Las plaquitas de perfil parcial sin cresta ofrecen la flexibilidad para cortar múltiples pasos de rosca con una sola plaquita.
- Los portaherramientas de roscado Laydown a derechas emplean plaquitas a derechas. Los portaherramientas de roscado Laydown a derechas emplean plaquitas a izquierdas.
- Las barras de mandrinar de roscado Laydown a derechas emplean plaquitas a derechas. Las barras de mandrinar de roscado Laydown a izquierdas emplean plaquitas a izquierdas.

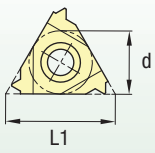
# Sistema de identificación de portaherramientas de roscado Laydown



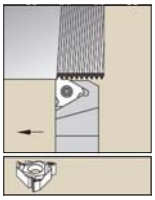

| A | L | 25 | 3 | R |
|---|---|---|---|---|
| Construcción de portaherramientas | Estilo de portaherramientas | Tamaño del mango | Características de la plaquita | Dirección de la herramienta |
| A: Con placa de apoyo<br><br>N: Sin apoyo | | Portaherramientas<br><br>• Los primeros dos números representan la altura del mango en mm. | | RH: Símbolo de rosca a derechas<br><br>LH: Símbolo de rosca a izquierdas |

L: Rosca externa

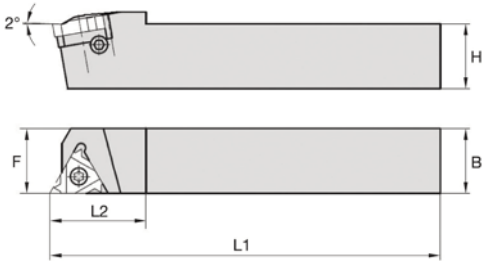





| símbolo | d | L1 |
|---|---|---|
| 2 | 6,35 | 11 |
| 3 | 9,52 | 16 |
| 4 | 12,7 | 22 |
| 5 | 15,88 | 27 |



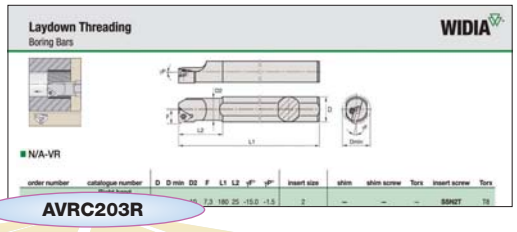
Consulte las plaquitas de la página E38.



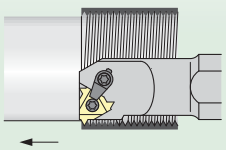

## N/A

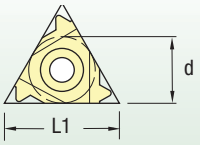
| Número de pedido | Número de catálogo | H | B | F | L1 | L2 | tamaño de la plaquita | apoyo | tornillo del apoyo | Torx | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | |
| **2022340** | **NL82R** | 8 | 8 | 11 | 136 | 18 | 2 | – | – | – | **SSN2T** | T8 |
| **2009587** | **AL163R** | 16 | 16 | 16 | 100 | 25 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009591** | **AL203R** | 20 | 20 | 20 | 128 | 30 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009594** | **AL253R** | 25 | 25 | 25 | 153 | 30 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009600** | **AL323R** | 32 | 32 | 32 | 173 | 30 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009597** | **AL254R** | 25 | 25 | 25 | 155 | 36 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2009603** | **AL324R** | 32 | 32 | 32 | 175 | 36 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2016118** | **AL404R** | 40 | 40 | 40 | 205 | 36 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2022589** | **AL325R** | 32 | 32 | 32 | 176 | 40 | 5 | **SMYE5** | **SSY5T** | T25 | **SSA5T** | T25 |
| **2016122** | **AL405R** | 40 | 40 | 40 | 206 | 40 | 5 | **SMYE5** | **SSY5T** | T25 | **SSA5T** | T25 |
| | **A izquierdas** | | | | | | | | | | | |
| **2071294** | **AL163L** | 16 | 16 | 16 | 100 | 25 | 3 | **SMYI3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2071295** | **AL203L** | 20 | 20 | 20 | 125 | 30 | 3 | **SMYI3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2065128** | **AL253L** | 25 | 25 | 25 | 150 | 30 | 3 | **SMYI3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2114772** | **AL254L** | 25 | 25 | 25 | 150 | 36 | 4 | **SMYI4** | **SSY4T** | T20 | **SSA4T** | T20 |

# Sistema de identificación de barras de mandrinar de roscado Laydown




| A | VR | C | 20 | 3 | R |
|---|---|---|---|---|---|
| Requisito del apoyo | Tipo de herramienta | Capacidad de refrigeración | Diámetro de la cabeza del mango | Tamaño de la plaquita | Dirección de la herramienta |
| A: Se requiere apoyo<br>N: No se requiere apoyo<br>O: Porta miniatura | VR: Mango redondo interior | C: Con refrigeración | 10, 12, 13, 16, 20, 25, 32, 40 ,50<br>6,2 (Miniajuste)<br>8,0 (Miniajuste) | | RH: Símbolo de rosca a derechas<br>LH: Símbolo de rosca a izquierdas |






| símbolo | d | L1 |
|---|---|---|
| 2 | 6,35 | 11 |
| 3 | 9,52 | 16 |
| 4 | 12,7 | 22 |
| 5 | 15,88 | 27 |

# WIN WITH WIDIA™

WIDIA™

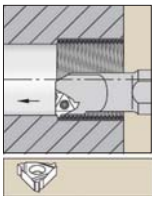
## Sistema de roscado **Laydown**

El sistema de roscado Laydown de WIDIA™ diseñado especialmente asegura la mayor precisión y calidad disponibles para satisfacer todos los estándares de producción modernos. Con una amplia gama de plaquitas y portaherramientas disponible, la plataforma de roscado Laydown es ideal para todos sus requisitos de roscado exterior.

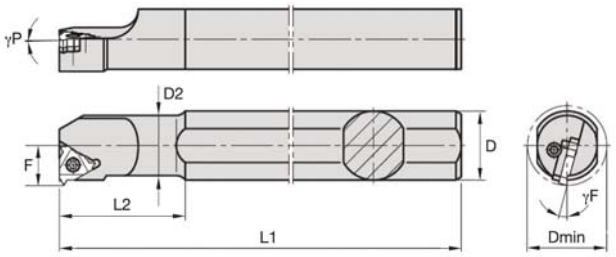
- Una amplia selección de formas de rosca comunes en Europa y métricas (ISO).
- Diseño de perfil bajo que permite un flujo de virutas sin restricciones.
- Formas de rosca rectificadas con precisión para cortes precisos.
- Ideal para roscas de paso fino, roscas de hélice elevada/entrada múltiple y roscado de un solo punto en mandrinados de diámetro pequeño.

WIDIA™
Win with WIDIA™

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.



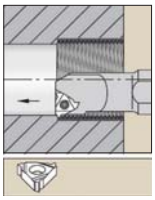
Mango de acero con refrigeración interna.
Consulte las plaquitas de la página E38.



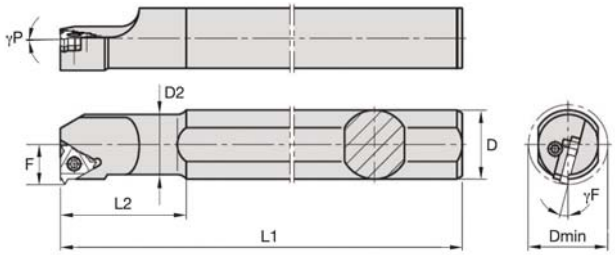

## N/A-VR

| Número de pedido | Número de catálogo | D | D min | D2 | F | L1 | L2 | γF° | γP° | tamaño de la plaquita | apoyo | tornillo del apoyo | Torx | tornillo de plaquita | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | | | |
| **2025828** | **NVR102R** | 20 | 13 | 10 | 7,3 | 180 | 25 | -15.0 | -1.5 | 2 | **–** | **–** | – | **SSN2T** | T8 |
| **2022342** | **NVR132R** | 20 | 16 | 13 | 8,9 | 180 | 32 | -15.0 | -1.5 | 2 | **–** | **–** | – | **SSN2T** | T8 |
| **2012307** | **NVR163R** | 20 | 20 | 16 | 11,5 | 180 | 40 | -15.0 | -1.5 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009609** | **AVR203R** | 20 | 24 | 20 | 13,4 | 180 | 50 | -15.0 | -1.5 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009628** | **AVR25D3R** | 25 | 29 | 25 | 16,1 | 200 | 45 | -15.0 | -1.5 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009612** | **AVR253R** | 32 | 29 | 25 | 16,3 | 250 | 60 | -15.0 | -1.5 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009640** | **AVR32D3R** | 32 | 36 | 32 | 19,6 | 250 | 60 | -15.0 | -1.5 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2009643** | **AVR403R** | 40 | 44 | 40 | 23,8 | 300 | 60 | -15.0 | -1.5 | 3 | **SMYE3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2022343** | **NVR204R** | 20 | 27 | 20 | 15,6 | 180 | 50 | -15.0 | -1.5 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2009631** | **AVR25D4R** | 25 | 32 | 25 | 17,2 | 200 | 45 | -15.0 | -1.5 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2009625** | **AVR254R** | 32 | 32 | 25 | 17,4 | 250 | 60 | -15.0 | -1.5 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2009634** | **AVR324R** | 32 | 39 | 32 | 21,5 | 250 | 60 | -15.0 | -1.5 | 4 | **SMYE4** | **SSY4T** | T20 | **SSA4T** | T20 |
| **2009637** | **AVR325R** | 32 | 40 | 32 | 22,4 | 250 | 60 | -15.0 | -1.5 | 5 | **SMYE5** | **SSY5T** | T25 | **SSA5T** | T25 |
| **2009646** | **AVR405R** | 40 | 48 | 40 | 26,4 | 300 | 60 | -15.0 | -1.5 | 5 | **SMYE5** | **SSY5T** | T25 | **SSA5T** | T25 |
| **2009649** | **AVR505R** | 50 | 58 | 50 | 31,4 | 350 | 75 | -15.0 | -1.5 | 5 | **SMYE5** | **SSY5T** | T25 | **SSA5T** | T25 |
| | **A izquierdas** | | | | | | | | | | | | | | |
| **2071313** | **NVR102L** | 20 | 13 | 10 | 7,3 | 180 | 25 | -15.0 | -1.5 | 2 | **–** | **–** | – | **SSN2T** | T8 |
| **2071317** | **NVR163L** | 20 | 20 | 16 | 11,5 | 180 | 40 | -15.0 | -1.5 | 3 | **SMYI3** | **SSY3T** | – | **SSA3T** | T10 |
| **2071318** | **AVR203L** | 20 | 24 | 20 | 13,4 | 180 | 40 | -15.0 | -1.5 | 3 | **SMYI3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2065134** | **AVR25D3L** | 25 | 29 | 25 | 16,1 | 200 | 45 | -15.0 | -1.5 | 3 | **SMYI3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2114832** | **AVR253L** | 32 | 29 | 25 | 16,3 | 250 | 60 | -15.0 | -1.5 | 3 | **SMYI3** | **SSY3T** | T10 | **SSA3T** | T10 |
| **2065135** | **AVR25D4L** | 25 | 32 | 25 | 17,2 | 200 | 45 | -15.0 | -1.5 | 4 | **SMYI4** | **SSY4T** | T20 | **SSA4T** | T20 |

*NOTA: los elementos sin apoyo de la lista están diseñados para un ángulo de inclinación de 1,5°.*



Consulte las plaquitas de la página E38.

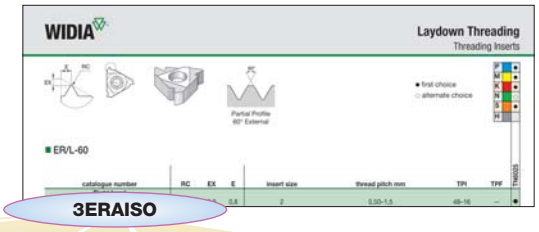



## OVR

| Número de pedido | Número de catálogo | D | D min | D2 | F | L1 | L2 | γF° | γP° | tamaño de la plaquita | tornillo | destornillador Torx | Torx |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A derechas** | | | | | | | | | | | | |
| **2012325** | **OVR122R** | 12 | 13 | 10 | 7 | 100 | 25 | -15.0 | -0.5 | 2 | **12147789100** | **12148001100** | T8 |
| **2022345** | **OVR152R** | 15 | 16 | 13 | 9 | 100 | 32 | -15.0 | -0.5 | 2 | **12147789100** | **12148001100** | T8 |

*NOTA: los portas en miniatura WIDIA deben utilizarse en máquinas automáticas tal y como se realiza en el sector óptico y el de mecánica de precisión. Las dimensiones del mango corresponden a los de herramientas convencionales de metal duro y HSS. Disponibles portas con mangos redondos o cuadrados. También se puede utilizar una herramienta interior a derechas para roscas exteriores a izquierdas. Igualmente, se puede utilizar una herramienta interior a izquierdas para roscas exteriores a derechas. Utilice las plaquitas correctas. El ángulo de inclinación de esta herramienta es de 0,5°. Las herramientas siempre se fijan con el mango paralelo a la pieza.*

# Sistema de identificación de plaquitas de roscado Laydown




| 3 | E | R | A | ISO | |
|---|---|---|---|---|---|
| Tamaño de la plaquita | Tipo de plaquita | Dirección de la plaquita | Paso de la rosca | Rosca Perfil | Número de dientes |

**Tipo de plaquita**

E: Rosca exterior

I: Rosca interior

UE: Rosca exterior

UI: Rosca interior

VE: Rosca exterior

VI: Rosca interior

**Dirección de la plaquita**

R:
Rosca a derechas

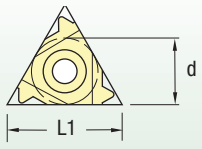
L:
Rosca a izquierdas

**Número de dientes**

Perfil de diente único: sin símbolo

Perfil de múltiples dientes:
número de dientes
(filo de corte y símbolo)

Perfil de múltiples dientes
con dos dientes: 2M




| símbolo | d | L1 |
|---|---|---|
| 2 | 6,35 | 11 |
| 3 | 9,52 | 16 |
| 4 | 12,7 | 22 |
| 5 | 15,88 | 27 |

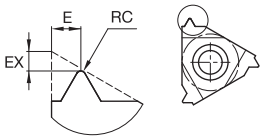
Plaquitas de perfil parcial

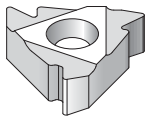
| símbolo | mm |
|---|---|
| A | 0,5–1,5 |
| AG | 0,5–3,0 |
| G | 1,7–3,0 |
| N | 3,5–5,0 |
| Q | 5,5–6,0 |

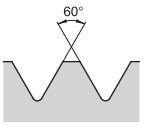
Plaquitas de perfil completo

| símbolo | mm |
|---|---|
| TP real | 0,5–0,4 |

| | |
|---|---|
| **55** | 55º Perfil parcial |
| **60** | 60º Perfil parcial |
| **ISO** | 60º ISO (sistema métrico) |
| **TR** | ISO Trapezoidal |
| **UN** | 60º UN americano/ISO (pulgadas) |
| **UNJ** | 60° Radio de base controlada |
| **ACME** | ACME americana |
| **W** | 55° Whitworth |
| **BSPT** | 55° Rosca según estándar británico |
| **NPT** | 60° Rosca según estándar americano |
| **BUT** | API tipo Buttress |
| **EL** | API tipo línea extrema |
| **RD** | Redonda |
| **PG** | Conducto de acero |
| **APIRD** | API redondo |
| **API** | American Petroleum Institute (Instituto americano del petróleo) |
| **H-90** | Oleoducto tipo Hughes |
| **VAM** | Oleoducto francés |





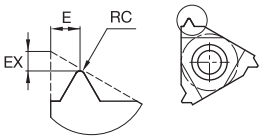

60º perfil parcial exterior

● primera elección
○ elección alternativa

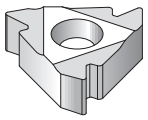
| | | |
|---|---|---|
| P | | ● |
| M | | ● |
| K | | ● |
| N | | ○ |
| S | | ● |
| H | | |

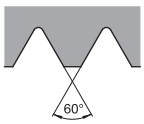
## ■ ER/L-60

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **2ERA60** | 0,05 | 0,9 | 0,8 | 2 | 0,50–1,5 | 48–16 | – | ● |
| **3ERAG60** | 0,08 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3ERA60** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3ERG60** | 0,28 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |
| **4ERN60** | 0,53 | 1,7 | 2,5 | 4 | 3,5–5,0 | 7–5 | – | ● |
| **5ERQ60** | 0,64 | 2,1 | 3,1 | 5 | 5,5–6,0 | 4,5–4 | – | ● |
| **A izquierdas** | | | | | | | | |
| **3ELAG60** | 0,08 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3ELA60** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3ELG60** | 0,28 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |
| **4ELN60** | 0,53 | 1,7 | 2,5 | 4 | 3,5–5,0 | 7–5 | – | ● |







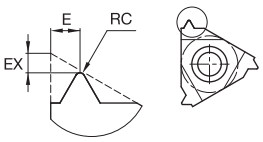

60º perfil parcial interior

● primera elección
○ elección alternativa

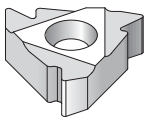
| | | |
|---|---|---|
| P | ● | |
| M | ● | |
| K | ● | |
| N | ○ | |
| S | ● | |
| H | | |

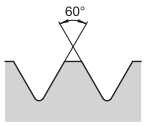
## ■ IR/L-60

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **2IRA60** | 0,05 | 0,8 | 0,9 | 2 | 0,50–1,5 | 48–16 | – | ● |
| **3IRAG60** | 0,05 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3IRA60** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3IRG60** | 0,15 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |
| **4IRN60** | 0,31 | 1,7 | 2,5 | 4 | 3,5–5,0 | 7–5 | – | ● |
| **5IRQ60** | 0,30 | 1,8 | 2,7 | 5 | 5,5–6,0 | 4,5–4 | – | ● |
| **A izquierdas** | | | | | | | | |
| **2ILA60** | 0,05 | 0,8 | 0,9 | 2 | 0,50–1,5 | 48–16 | – | ● |
| **3ILAG60** | 0,05 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3ILA60** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3ILG60** | 0,15 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |
| **4ILN60** | 0,31 | 1,7 | 2,5 | 4 | 3,5–5,0 | 7–5 | – | ● |







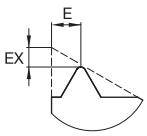

60º perfil parcial exterior

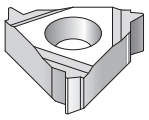
● primera elección
○ elección alternativa

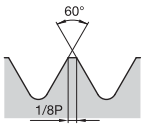
| | | |
|---|---|---|
| P | ● | ● |
| M | ● | ● |
| K | ● | ● |
| N | ○ | ○ |
| S | ● | ● |
| H | | |

## ■ ER/L-60

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | PN120 | TTS |
|---|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | | |
| **44315900** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–8 | – | ● | ● |
| **44315901** | 0,28 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● | ● |







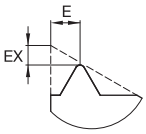

Sistema métrico
ISO-exterior

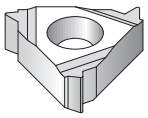
● primera elección
○ elección alternativa

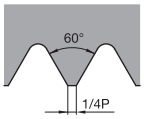
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## ■ ER/L-ISO

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **2ER175ISO** | 1,1 | 0,8 | 2 | 1,75 | – | – | ● |
| **2ER15ISO** | 1,0 | 0,8 | 2 | 1,5 | – | – | ● |
| **3ER30ISO** | 1,2 | 1,6 | 3 | 3,0 | – | – | ● |
| **3ER25ISO** | 1,1 | 1,5 | 3 | 2,5 | – | – | ● |
| **3ER20ISO** | 1,0 | 1,3 | 3 | 2,0 | – | – | ● |
| **3ER175ISO** | 0,9 | 1,2 | 3 | 1,75 | – | – | ● |
| **3ER15ISO** | 0,8 | 1,0 | 3 | 1,5 | – | – | ● |
| **3ER125ISO** | 0,8 | 0,9 | 3 | 1,25 | – | – | ● |
| **3ER10ISO** | 0,7 | 0,7 | 3 | 1,0 | – | – | ● |
| **3ER08ISO** | 0,6 | 0,6 | 3 | 0,80 | – | – | ● |
| **3ER075ISO** | 0,6 | 0,6 | 3 | 0,75 | – | – | ● |
| **3ER07ISO** | 0,6 | 0,6 | 3 | 0,70 | – | – | ● |
| **3ER05ISO** | 0,6 | 0,4 | 3 | 0,50 | – | – | ● |
| **3ER035ISO** | 0,4 | 0,8 | 3 | 0,35 | – | – | ● |
| **4ER50ISO** | 1,7 | 2,5 | 4 | 5,0 | – | – | ● |
| **4ER35ISO** | 1,6 | 2,3 | 4 | 4,5 | – | – | ● |
| **4ER45ISO** | 1,7 | 2,4 | 4 | 4,5 | – | – | ● |
| **4ER40ISO** | 1,6 | 2,3 | 4 | 4,0 | – | – | ● |
| **5ER60ISO** | 2,9 | 2,0 | 5 | 6,0 | – | – | ● |
| **5ER55ISO** | 2,7 | 1,9 | 5 | 5,5 | – | – | ● |
| **A izquierdas** | | | | | | | |
| **3EL30ISO** | 1,2 | 1,6 | 3 | 3,0 | – | – | ● |
| **3EL25ISO** | 1,1 | 1,5 | 3 | 2,5 | – | – | ● |
| **3EL20ISO** | 1,3 | 1,0 | 3 | 2,0 | – | – | ● |
| **3EL175ISO** | 0,9 | 1,2 | 3 | 1,75 | – | – | ● |
| **3EL15ISO** | 0,8 | 1,0 | 3 | 1,5 | – | – | ● |
| **3EL125ISO** | 0,8 | 0,9 | 3 | 1,25 | – | – | ● |
| **3EL10ISO** | 0,7 | 0,7 | 3 | 1,0 | – | – | ● |
| **3EL075ISO** | 0,6 | 0,6 | 3 | 0,75 | – | – | ● |
| **3EL05ISO** | 0,6 | 0,4 | 3 | 0,50 | – | – | ● |
| **4EL40ISO** | 1,6 | 2,3 | 4 | 4,0 | – | – | ● |
| **4EL35ISO** | 1,6 | 2,3 | 4 | 3,5 | – | – | ● |







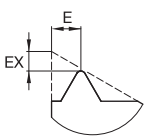

Sistema métrico
ISO-interior

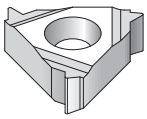
● primera elección
○ elección alternativa

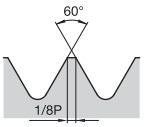
| | | |
|---|---|---|
| P | ● | |
| M | ● | |
| K | ● | |
| N | ○ | |
| S | ● | |
| H | | |

## ■ IR/L-ISO

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **2IR20ISO** | 0,9 | 1,1 | 2 | 2,0 | – | – | ● |
| **2IR175ISO** | 0,9 | 1,1 | 2 | 1,75 | – | – | ● |
| **2IR15ISO** | 0,8 | 1,0 | 2 | 1,5 | – | – | ● |
| **2IR125ISO** | 0,6 | 0,7 | 2 | 1,25 | – | – | ● |
| **2IR10ISO** | 0,6 | 0,7 | 2 | 1,0 | – | – | ● |
| **2IR08ISO** | 0,6 | 0,6 | 2 | 0,80 | – | – | ● |
| **2IR075ISO** | 0,6 | 0,3 | 2 | 0,75 | – | – | ● |
| **2IR05ISO** | 0,6 | 0,6 | 2 | 0,50 | – | – | ● |
| **3IR30ISO** | 1,1 | 1,5 | 3 | 3,0 | – | – | ● |
| **3IR25ISO** | 1,1 | 1,5 | 3 | 2,5 | – | – | ● |
| **3IR20ISO** | 1,0 | 1,3 | 3 | 2,0 | – | – | ● |
| **3IR175ISO** | 0,9 | 1,2 | 3 | 1,75 | – | – | ● |
| **3IR15ISO** | 0,8 | 1,0 | 3 | 1,5 | – | – | ● |
| **3IR125ISO** | 0,8 | 0,9 | 3 | 1,25 | – | – | ● |
| **3IR10ISO** | 0,6 | 0,7 | 3 | 1,0 | – | – | ● |
| **3IR08ISO** | 0,6 | 0,6 | 3 | 0,80 | – | – | ● |
| **3IR075ISO** | 0,6 | 0,6 | 3 | 0,75 | – | – | ● |
| **3IR05ISO** | 0,6 | 0,6 | 3 | 0,50 | – | – | ● |
| **4IR50ISO** | 1,6 | 2,3 | 4 | 5,0 | – | – | ● |
| **4IR45ISO** | 1,6 | 2,4 | 4 | 4,5 | – | – | ● |
| **4IR40ISO** | 1,6 | 2,3 | 4 | 4,0 | – | – | ● |
| **4IR35ISO** | 1,6 | 2,3 | 4 | 3,5 | – | – | ● |
| **5IR60ISO** | 1,8 | 2,5 | 5 | 6,0 | – | – | ● |
| **A izquierdas** | | | | | | | |
| **2IL20ISO** | 0,9 | 1,1 | 2 | 2,0 | – | – | ● |
| **2IL15ISO** | 0,8 | 1,0 | 2 | 1,5 | – | – | ● |
| **2IL125ISO** | 0,8 | 0,9 | 2 | 1,25 | – | – | ● |
| **2IL10ISO** | 0,6 | 0,7 | 2 | 1,0 | – | – | ● |
| **2IL075ISO** | 0,6 | 0,6 | 2 | 0,75 | – | – | ● |
| **2IL05ISO** | 0,6 | 0,4 | 2 | 0,50 | – | – | ● |
| **3IL30ISO** | 1,1 | 1,5 | 3 | 3,0 | – | – | ● |
| **3IL25ISO** | 1,1 | 1,5 | 3 | 2,5 | – | – | ● |
| **3IL20ISO** | 1,0 | 1,3 | 3 | 2,0 | – | – | ● |
| **3IL15ISO** | 0,8 | 1,0 | 3 | 1,5 | – | – | ● |
| **3IL10ISO** | 0,6 | 0,7 | 3 | 1,0 | – | – | ● |
| **3IL075ISO** | 0,6 | 0,6 | 3 | 0,75 | – | – | ● |
| **3IL05ISO** | 0,6 | 0,4 | 3 | 0,50 | – | – | ● |
| **4IL50ISO** | 1,6 | 2,3 | 4 | 5,0 | – | – | ● |
| **4IL40ISO** | 1,6 | 2,3 | 4 | 4,0 | – | – | ● |
| **4IL35ISO** | 1,6 | 2,3 | 4 | 3,5 | – | – | ● |
| **5IL60ISO** | 1,8 | 2,5 | 5 | 6,0 | – | – | ● |
| **5IL55ISO** | 1,6 | 2,3 | 5 | 5,5 | – | – | ● |







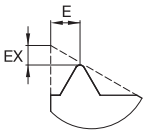

UN Americano - exterior

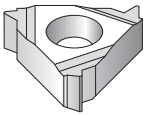
● primera elección
○ elección alternativa

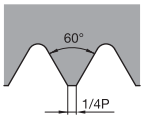
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## ■ ER/L-UN

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **3ER48UN** | 0,6 | 0,6 | 3 | – | 48 | – | ● |
| **3ER40UN** | 0,6 | 0,6 | 3 | – | 40 | – | ● |
| **3ER36UN** | 0,6 | 0,6 | 3 | – | 36 | – | ● |
| **3ER32UN** | 0,6 | 0,6 | 3 | – | 32 | – | ● |
| **3ER28UN** | 0,6 | 0,7 | 3 | – | 28 | – | ● |
| **3ER27UN** | 0,8 | 0,7 | 3 | – | 27 | – | ● |
| **3ER24UN** | 0,7 | 0,8 | 3 | – | 24 | – | ● |
| **3ER20UN** | 0,8 | 0,9 | 3 | – | 20 | – | ● |
| **3ER18UN** | 0,8 | 1,0 | 3 | – | 18 | – | ● |
| **3ER16UN** | 0,9 | 1,1 | 3 | – | 16 | – | ● |
| **3ER14UN** | 1,0 | 1,2 | 3 | – | 14 | – | ● |
| **3ER13UN** | 1,3 | 1,0 | 3 | – | 13 | – | ● |
| **3ER12UN** | 1,1 | 1,4 | 3 | – | 12 | – | ● |
| **3ER11UN** | 1,1 | 1,5 | 3 | – | 11 | – | ● |
| **3ER10UN** | 1,1 | 1,5 | 3 | – | 10 | – | ● |
| **3ER8UN** | 1,2 | 1,6 | 3 | – | 8 | – | ● |
| **A izquierdas** | | | | | | | |
| **3EL16UN** | 0,9 | 1,1 | 3 | – | 16 | – | ● |
| **3EL12UN** | 1,1 | 1,4 | 3 | – | 12 | – | ● |
| **3EL10UN** | 1,1 | 1,5 | 3 | – | 10 | – | ● |
| **3EL8UN** | 1,2 | 1,6 | 3 | – | 8 | – | ● |







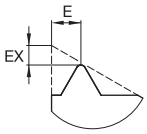

UN Americano - interior

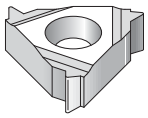
● primera elección
○ elección alternativa

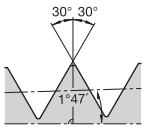
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## ■ IR/L-UN

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **2IR32UN** | 0,6 | 0,6 | 2 | — | 32 | — | ● |
| **2IR27UN** | 0,8 | 0,7 | 2 | — | 28 | — | ● |
| **2IR28UN** | 0,6 | 0,7 | 2 | — | 28 | — | ● |
| **2IR24UN** | 0,7 | 0,8 | 2 | — | 24 | — | ● |
| **2IR20UN** | 0,8 | 0,9 | 2 | — | 20 | — | ● |
| **2IR18UN** | 0,8 | 1,0 | 2 | — | 18 | — | ● |
| **2IR16UN** | 0,9 | 1,1 | 2 | — | 16 | — | ● |
| **3IR36UN** | 0,6 | 0,6 | 3 | — | 36 | — | ● |
| **3IR32UN** | 0,6 | 0,6 | 3 | — | 32 | — | ● |
| **3IR28UN** | 0,6 | 0,7 | 3 | — | 28 | — | ● |
| **3IR24UN** | 0,7 | 0,8 | 3 | — | 24 | — | ● |
| **3IR20UN** | 0,8 | 0,9 | 3 | — | 20 | — | ● |
| **3IR18UN** | 0,8 | 1,0 | 3 | — | 18 | — | ● |
| **3IR16UN** | 0,9 | 1,1 | 3 | — | 16 | — | ● |
| **3IR14UN** | 0,9 | 1,2 | 3 | — | 14 | — | ● |
| **3IR12UN** | 1,1 | 1,4 | 3 | — | 12 | — | ● |
| **3IR11UN** | 1,1 | 1,5 | 3 | — | 11 | — | ● |
| **3IR10UN** | 1,1 | 1,5 | 3 | — | 10 | — | ● |
| **3IR8UN** | 1,1 | 1,5 | 3 | — | 8 | — | ● |
| **A izquierdas** | | | | | | | |
| **2IL32UN** | 0,6 | 0,6 | 2 | — | 32 | — | ● |
| **3IL12UN** | 1,1 | 1,4 | 3 | — | 12 | — | ● |
| **3IL8UN** | 1,1 | 1,5 | 3 | — | 8 | — | ● |







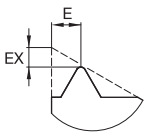
NPT-exterior

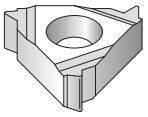
● primera elección
○ elección alternativa

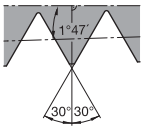
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## ■ ER/L-NPT

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **3ER27NPT** | 0,7 | 0,8 | 3 | — | 27 | .75 | ● |
| **3ER18NPT** | 0,8 | 1,0 | 3 | — | 18 | .75 | ● |
| **3ER14NPT** | 0,9 | 1,2 | 3 | — | 14 | .75 | ● |
| **3ER115NPT** | 1,1 | 1,5 | 3 | — | 11,5 | .75 | ● |
| **3ER8NPT** | 1,3 | 1,8 | 3 | — | 8 | .75 | ● |
| **A izquierdas** | | | | | | | |
| **3EL27NPT** | 0,7 | 0,8 | 3 | — | 27 | .75 | ● |
| **3EL18NPT** | 0,8 | 1,0 | 3 | — | 18 | .75 | ● |
| **3EL115NPT** | 1,1 | 1,5 | 3 | — | 11,5 | .75 | ● |
| **3EL8NPT** | 1,3 | 1,8 | 3 | — | 8 | .75 | ● |



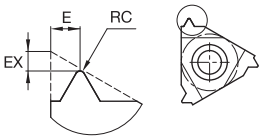




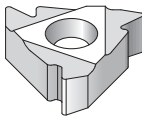
NPT-interior

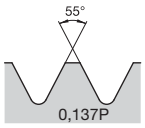
## ■ IR/L-NPT

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **3IR27NPT** | 0,7 | 0,8 | 3 | — | 27 | .75 | ● |
| **3IR18NPT** | 0,8 | 1,0 | 3 | — | 18 | .75 | ● |
| **3IR14NPT** | 0,9 | 1,2 | 3 | — | 14 | .75 | ● |
| **3IR115NPT** | 1,1 | 1,5 | 3 | — | 11,5 | .75 | ● |
| **3IR8NPT** | 1,3 | 1,8 | 3 | — | 8 | .75 | ● |
| **A izquierdas** | | | | | | | |
| **3IL14NPT** | 0,9 | 1,2 | 3 | — | 14 | .75 | ● |







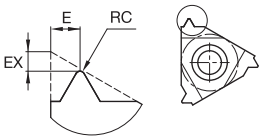

55º perfil parcial exterior

● primera elección
○ elección alternativa

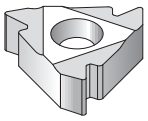
| | | |
|---|---|---|
| P | | ● |
| M | | ● |
| K | | ● |
| N | | ○ |
| S | | ● |
| H | | |

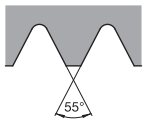
## ■ ER/L-55

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **3ERAG55** | 0,08 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3ERA55** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3ERG55** | 0,20 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |
| **4ERN55** | 0,43 | 1,7 | 2,5 | 4 | 3,5–5,0 | 7–5 | – | ● |
| **A izquierdas** | | | | | | | | |
| **3ELG55** | 0,20 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |





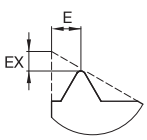



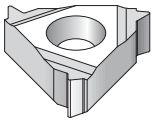


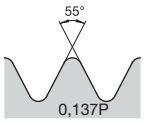

55º perfil parcial interior

## ■ IR/L-55

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **2IRA55** | 0,05 | 0,8 | 0,9 | 2 | 0,50–1,5 | 48–16 | – | ● |
| **3IRAG55** | 0,07 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3IRA55** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3IRG55** | 0,21 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |
| **4IRN55** | 0,43 | 1,7 | 2,5 | 4 | 3,5–5,0 | 7–5 | – | ● |
| **A izquierdas** | | | | | | | | |
| **3ILAG55** | 0,07 | 1,2 | 1,7 | 3 | 0,50–3,0 | 48–8 | – | ● |
| **3ILA55** | 0,05 | 0,8 | 0,9 | 3 | 0,50–1,5 | 48–16 | – | ● |
| **3ILG55** | 0,21 | 1,2 | 1,7 | 3 | 1,75–3,0 | 14–8 | – | ● |







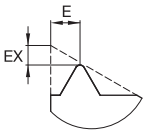

Whitworth BSW, BSF, BSP exterior

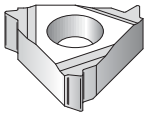
● primera elección
○ elección alternativa

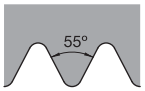
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## ■ ER/L-W

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **3ER36W** | 0,6 | 0,6 | 3 | – | 36 | – | ● |
| **3ER32W** | 0,6 | 0,6 | 3 | – | 32 | – | ● |
| **3ER28W** | 0,6 | 0,7 | 3 | – | 28 | – | ● |
| **3ER26W** | 0,8 | 0,7 | 3 | – | 26 | – | ● |
| **3ER24W** | 0,7 | 0,8 | 3 | – | 24 | – | ● |
| **3ER20W** | 0,8 | 0,9 | 3 | – | 20 | – | ● |
| **3ER19W** | 0,8 | 1,0 | 3 | – | 19 | – | ● |
| **3ER18W** | 0,8 | 1,0 | 3 | – | 18 | – | ● |
| **3ER16W** | 0,9 | 1,1 | 3 | – | 16 | – | ● |
| **3ER14W** | 1,0 | 1,2 | 3 | – | 14 | – | ● |
| **3ER12W** | 1,1 | 1,4 | 3 | – | 12 | – | ● |
| **3ER11W** | 1,1 | 1,5 | 3 | – | 11 | – | ● |
| **3ER10W** | 1,1 | 1,5 | 3 | – | 10 | – | ● |
| **3ER9W** | 1,2 | 1,7 | 3 | – | 9 | – | ● |
| **3ER8W** | 1,2 | 1,5 | 3 | – | 8 | – | ● |
| **4ER7W** | 1,6 | 2,3 | 4 | – | 7 | – | ● |
| **4ER6W** | 1,6 | 2,3 | 4 | – | 6 | – | ● |
| **A izquierdas** | | | | | | | |
| **3EL11W** | 1,1 | 1,5 | 3 | – | 11 | – | ● |
| **3EL8W** | 1,2 | 1,5 | 3 | – | 8 | – | ● |







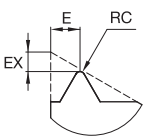

0,137P
Whitworth BSW, BSF,
BSP interior

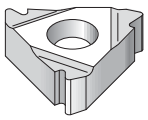
● primera elección
○ elección alternativa

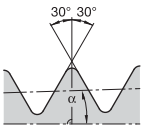
| | | |
|---|---|---|
| P | ● | |
| M | ● | |
| K | ● | |
| N | | ○ |
| S | ● | |
| H | | |

## ■ IR/L-W

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **2IR19W** | 0,8 | 1,0 | 2 | — | 19 | — | ● |
| **2IR18W** | 1,0 | 0,8 | 2 | — | 18 | — | ● |
| **2IR16W** | 1,1 | 0,9 | 2 | — | 16 | — | ● |
| **2IR14W** | 0,9 | 1,1 | 2 | — | 14 | — | ● |
| **3IR19W** | 0,8 | 0,9 | 3 | — | 19 | — | ● |
| **3IR18W** | 0,8 | 1,0 | 3 | — | 18 | — | ● |
| **3IR16W** | 0,9 | 1,1 | 3 | — | 16 | — | ● |
| **3IR14W** | 1,0 | 1,2 | 3 | — | 14 | — | ● |
| **3IR12W** | 1,1 | 1,4 | 3 | — | 12 | — | ● |
| **3IR11W** | 1,1 | 1,5 | 3 | — | 11 | — | ● |
| **3IR8W** | 1,2 | 1,5 | 3 | — | 8 | — | ● |
| **4IR7W** | 1,6 | 2,3 | 4 | — | 7 | — | ● |
| **4IR6W** | 1,6 | 2,3 | 4 | — | 6 | — | ● |
| **A izquierdas** | | | | | | | |
| **2IL19W** | 0,8 | 1,0 | 2 | — | 19 | — | ● |
| **2IL14W** | 0,9 | 1,1 | 2 | — | 14 | — | ● |
| **3IL14W** | 1,0 | 1,2 | 3 | — | 14 | — | ● |
| **3IL11W** | 1,1 | 1,5 | 3 | — | 11 | — | ● |





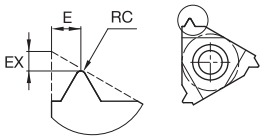


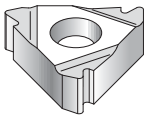

API redondo-exterior

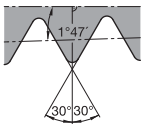
d=1/2 arcotangente (tpf/12)

## ■ ER/L-APIRD

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | |
|---|---|---|---|---|---|---|---|---|
| **3ER10APIRD** | 0,34 | 1,2 | 1,4 | 3 | — | 10 | .75 | ● |
| **3ER8APIRD** | 0,40 | 1,3 | 1,5 | 3 | — | 8 | .75 | ● |





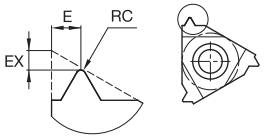

API redondo-interior

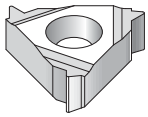
● primera elección
○ elección alternativa

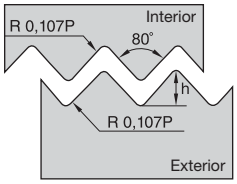
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## ■ IR/L-APIRD

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **3IR10APIRD** | 0,34 | 1,2 | 1,4 | 3 | – | 10 | .75 | ● |
| **3IR8APIRD** | 0,40 | 1,3 | 1,5 | 3 | – | 8 | .75 | ● |



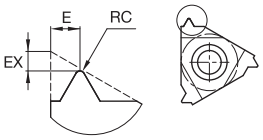





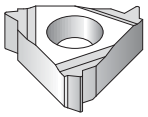

Definido por: DIN 40430

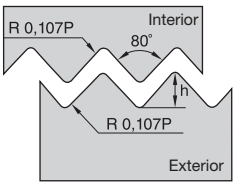
## ■ ER/L-PG

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **3ER20PG** | 0,07 | 0,9 | 0,8 | 3 | – | 20 | – | ● |
| **3ER18PG** | 0,09 | 1,0 | 0,8 | 3 | – | 18 | – | ● |
| **3ER16PG** | 0,11 | 1,1 | 0,9 | 3 | – | 16 | – | ● |







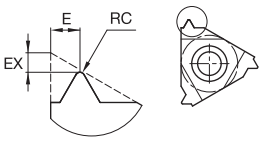

Definido por: DIN 40430

● primera elección
○ elección alternativa

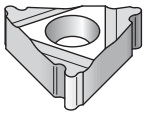
| | | |
|---|---|---|
| P | ● | |
| M | ● | |
| K | ● | |
| N | | ○ |
| S | ● | |
| H | | |

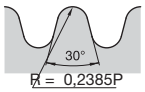
## ■ IR/L-PG

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **2IR18PG** | 0,09 | 1,0 | 0,8 | 2 | – | 18 | – | ● |
| **3IR18PG** | 0,09 | 0,1 | 0,8 | 3 | – | 18 | – | ● |
| **3IR16PG** | 0,11 | 1,1 | 0,8 | 3 | – | 16 | – | ● |





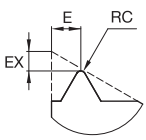



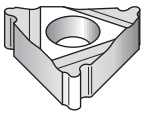


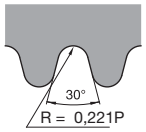

Redonda exterior

## ■ ER/L-RD

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **3ER10RD** | 0,61 | 1,1 | 1,2 | 3 | – | 10 | – | ● |
| **3ER8RD** | 0,76 | 1,4 | 1,3 | 3 | – | 8 | – | ● |
| **4ER6RD** | 1,01 | 1,5 | 1,7 | 4 | – | 6 | – | ● |
| **4ER4RD** | 1,52 | 2,3 | 2,2 | 4 | – | 4 | – | ● |
| **A izquierdas** | | | | | | | | |
| **3EL8RD** | 0,76 | 1,4 | 1,3 | 3 | – | 8 | – | ● |







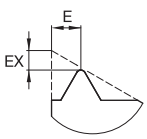
Redonda-interior

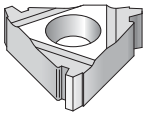
● primera elección
○ elección alternativa

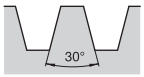
| | |
|---|---|
| P | ● |
| M | ● |
| K | ● |
| N | ○ |
| S | ● |
| H | |

## IR/L-RD

| Número de catálogo | RC | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | | |
| **3IR10RD** | 0,70 | 1,1 | 1,2 | 3 | – | 10 | – | ● |
| **3IR8RD** | 0,70 | 1,4 | 1,4 | 3 | – | 8 | – | ● |
| **3IR6RD** | 0,94 | 1,5 | 1,4 | 3 | – | 6 | – | ● |
| **4IR6RD** | 0,93 | 1,5 | 1,7 | 4 | – | 6 | – | ● |
| **4IR4RD** | 1,40 | 2,3 | 2,2 | 4 | – | 4 | – | ● |
| **A izquierdas** | | | | | | | | |
| **3IL8RD** | 0,06 | 1,4 | 1,4 | 3 | – | 8 | – | ● |



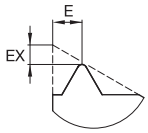


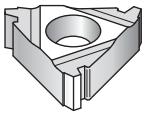


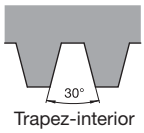
Trapez-exterior

## ER/L-TR

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **3ER3TR** | 1,3 | 1,5 | 3 | 3,0 | – | – | ● |
| **3ER2TR** | 1,1 | 1,3 | 3 | 2,0 | – | – | ● |
| **3ER15TR** | 1,0 | 1,1 | 3 | 1,5 | – | – | ● |
| **4ER5TR** | 2,1 | 2,5 | 4 | 5,0 | – | – | ● |
| **4ER4TR** | 1,7 | 1,9 | 4 | 4,0 | – | – | ● |
| **5ER6TR** | 2,3 | 2,7 | 5 | 6,0 | – | – | ● |
| **A izquierdas** | | | | | | | |
| **3EL3TR** | 1,3 | 1,5 | 3 | 3,0 | – | – | ● |
| **3EL2TR** | 1,1 | 1,3 | 3 | 2,0 | – | – | ● |
| **4EL4TR** | 1,7 | 1,9 | 4 | 4,0 | – | – | ● |
| **5EL6TR** | 2,3 | 2,7 | 5 | 6,0 | – | – | ● |







Trapez-interior

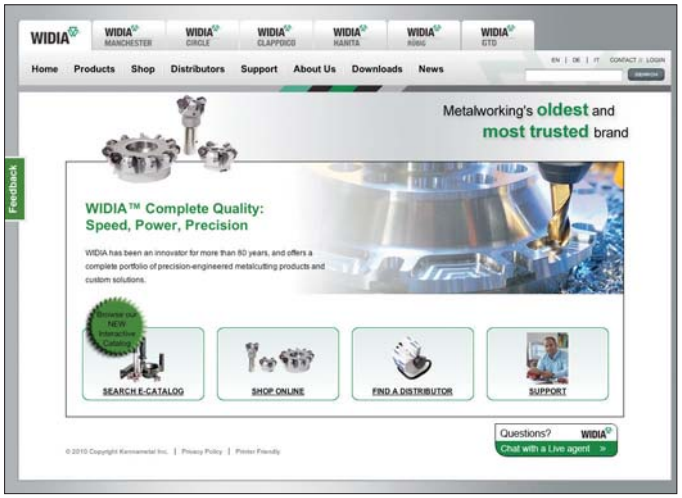
● primera elección
○ elección alternativa

| | | |
|---|---|---|
| P | | ● |
| M | | ● |
| K | | ● |
| N | | ○ |
| S | | ● |
| H | | |

## ■ IR/L-TR

| Número de catálogo | EX | E | tamaño de la plaquita | paso rosca mm | tpi | TPF | TN6025 |
|---|---|---|---|---|---|---|---|
| **A derechas** | | | | | | | |
| **3IR3TR** | 1,3 | 1,5 | 3 | 3,0 | – | – | ● |
| **3IR15TR** | 1,0 | 1,1 | 3 | 1,5 | – | – | ● |
| **4IR5TR** | 2,1 | 2,5 | 4 | 5,0 | – | – | ● |
| **4IR4TR** | 1,7 | 1,9 | 4 | 4,0 | – | – | ● |
| **5IR6TR** | 2,3 | 2,7 | 5 | 6,0 | – | – | ● |
| **A izquierdas** | | | | | | | |
| **3IL3TR** | 1,3 | 1,5 | 3 | 3,0 | – | – | ● |
| **4IL5TR** | 2,1 | 2,5 | 4 | 5,0 | – | – | ● |

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

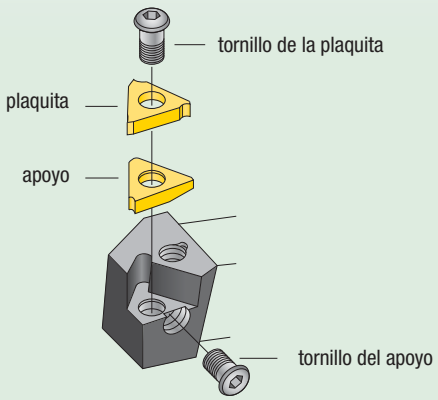
## *Productos WIDIA*

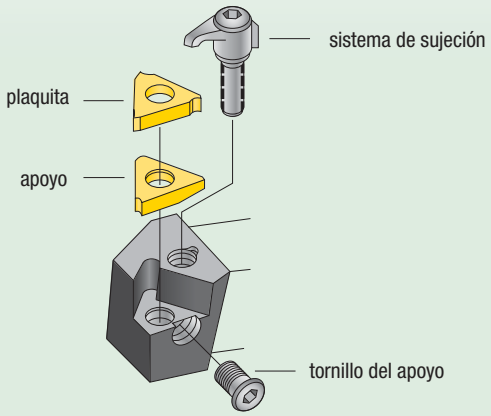
Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.

## Portaherramientas de roscado Laydown

En todos los casos es importante seleccionar el apoyo apropiado.

Los portaherramientas WIDIA™ cuenta con un apoyo para un ángulo de ataque de 1,5°. Cambie el apoyo si su rosca posee más de 1° de diferencia. Para obtener más detalles sobre las selecciones de apoyo apropiadas, consulte las páginas E84 a E86.




| tamaño y tipo de plaquita | tornillo de la plaquita | apoyo | tornillo del apoyo y arandela | sistema de sujeción |
|---|---|---|---|---|
| 3ER<br>3EL | S-SA3T<br>S-SA3T | SM-YE3<br>SM-YI3 | S-SY3T<br>S-SY3T | CK-C3<br>CK-C3 |
| 4ER<br>4EL | S-SA4T<br>S-SA4T | SM-YE4<br>SM-YI4 | S-SY4T<br>S-SY4T | CK-C4<br>CK-C4 |
| **Barras de mandrinar de roscado Laydown** | | | | |
| 2IR<br>2IL | S-SN2T<br>S-SN2T | –<br>– | –<br>– | –<br>– |
| 3IR<br>3IL | S-SA3T<br>S-SA3T | SM-YI3<br>SM-YE3 | S-SY3T<br>S-SY3T | CK-C3<br>CK-C3 |
| 4IR<br>4IL | S-SA4T<br>S-SA4T | SM-YI4<br>SM-YE4 | S-SY4T<br>S-SY4T | CK-C4<br>CK-C4 |

| SM | - | Y | E | 3 | - | 2P |
|---|---|---|---|---|---|---|
| apoyo | | Placa Y para plaquitas de roscado Laydown | E: exterior<br>I: interior | IC: 16,0 mm | | Ángulo de apoyo |

| | |
|---|---|
| 2P | 2º positivo |
| 1P | 1º positivo |
| — | 0º |
| 1N | 1º negativo |
| 2N | 2º negativo |
| 3N | 3º negativo |

| ángulo resultante | | 3.5° | 2.5° | 1.5° | 0.5° | -0.5° | -1.5° |
|---|---|---|---|---|---|---|---|
| tamaño de la plaquita (IC) | portaherramientas | código de pedido de apoyo | | | | | |
| 16,0 mm | ext. a derechas/int. a izquierdas<br>ext. a izquierdas/int. a derechas | SM-YE3-2P<br>SM-YI3-2P | SM-YE3-1P<br>SM-YI3-1P | SM-YE3<br>SM-YI3 | SM-YE3-1N<br>SM-YI3-1N | SM-YE3-2N<br>SM-YI3-2N | SM-YE3-3N<br>SM-YI3-3N |
| 22,0 mm | ext. a derechas/int. a izquierdas<br>ext. a izquierdas/int. a derechas | SM-YE4-2P<br>SM-YI4-2P | SM-YE4-1P<br>SM-YI4-1P | SM-YE4<br>SM-YI4 | SM-YE4-1N<br>SM-YI4-1N | SM-YE4-2N<br>SM-YI4-2N | SM-YE4-3N<br>SM-YI4-3N |

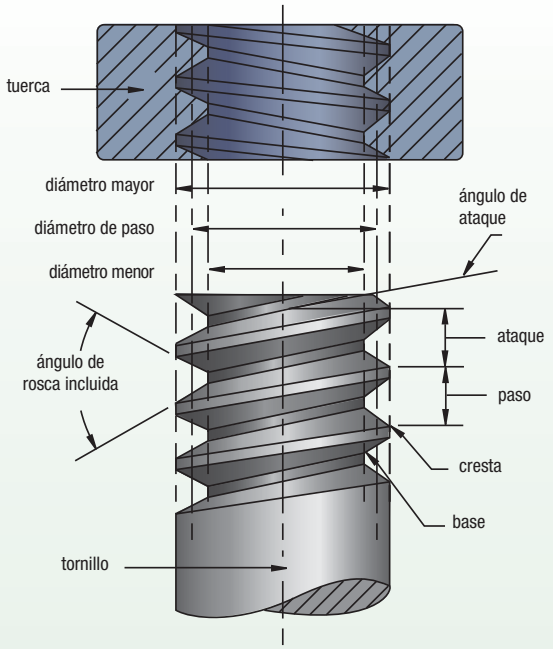
## Kit de placas de apoyo inclinadas

Puesto que puede que necesite de vez en cuando unos apoyos distintos de los que suministramos con nuestros portaherramientas estándar, recomendamos fervientemente que cada taller de herramientas tenga a su disposición un kit apoyos.

| tamaño de la plaquita | tamaño del apoyo (D) | tamaño del apoyo (D) código de pedido | contiene apoyos inclinados |
|---|---|---|---|
| 3x | 16,0 mm | ABY3 | SM-YE3-2P, 1P, 1N, 2N, 3N<br>SM-YI3-2P, 1P, 1N, 2N, 3N |
| 4x | 22,0 mm | ABY4 | SM-YE4-2P, 1P, 1N, 2N, 3N<br>SM-YI4-2P, 1P, 1N, 2N, 3N |

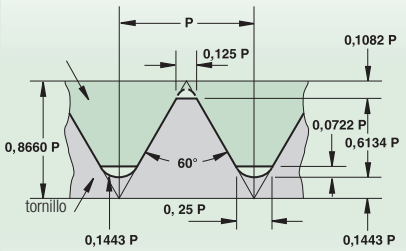
## Definiciones de rosca de tornillo

1. Diámetro mayor: el diámetro más grande de una rosca de tornillo recta. Esto se aplica tanto a roscas interiores como exteriores.
2. Diámetro de paso: en una rosca recta, es el diámetro que atraviesa los perfiles de rosca en unos puntos donde el ancho de rosca de la ranura equivale a la mitad del paso básico. En una “rosca perfecta”, esto se produce en el punto en el que los anchos de la rosca y la ranura son iguales.
3. Ángulo de rosca (incluido): el ángulo incluido entre los flancos individuales de la forma de la rosca.
4. Diámetro menor: el diámetro más pequeño de una rosca de tornillo recta. Esto se aplica tanto a roscas interiores como exteriores.
5. Ángulo de ataque: en una rosca recta, el ángulo de ataque es el ángulo creado por la hélice de la rosca en el diámetro de paso con un plano perpendicular al eje.
6. Ataque: la distancia que avanza una rosca de tornillo de forma axial en una revolución. En un solo arranque, el paso y el ataque son idénticos. El ataque es igual al número de pasos por el número de arranques.
7. Paso: la distancia desde un punto de una rosca de tornillo al punto correspondiente de la rosca siguiente medida paralelamente al eje de la rosca.
8. Cresta: la superficie más exterior de la forma de la rosca, que une los flancos.
9. Raíz: la superficie más interior de la forma de la rosca, que une los flancos.



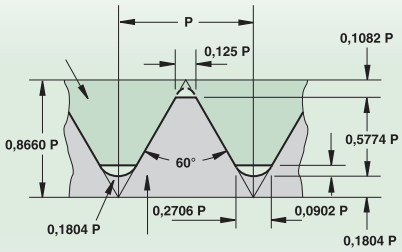

*NOTA: los roscados por pulgada (TPI) no se muestran: el número de roscas por pulgada se mide axialmente. A menudo se emplean los términos paso y TPI indistintamente. TPI = 1/paso.*

### ISO M (sistema métrico) y UN (estándar unificado de EE.UU. y Canadá)



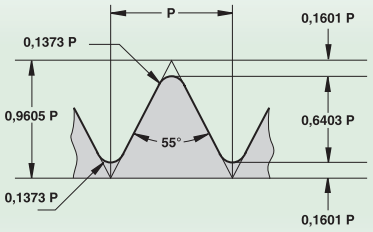

Uso: todas las ramas del sector mecánico.

### UNJ (radios de base controlada)



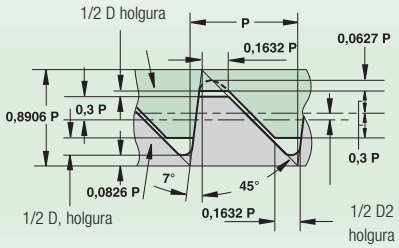

Uso: sector aeroespacial.

### Whitworth (BSW)



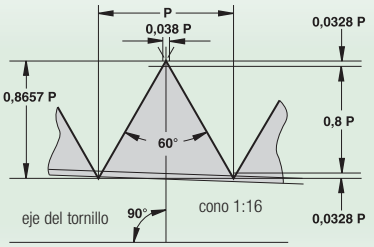

Uso: accesorios y acoplamientos de tuberías de gas, agua y residuos (sustituido por la ISO)

### Buttress americano



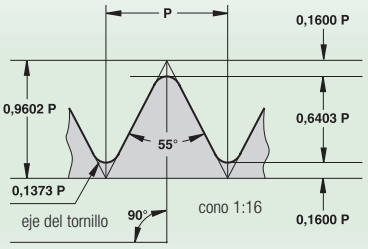

Uso: accesorios y acoplamientos de tuberías.

### NPT (estándar americano)



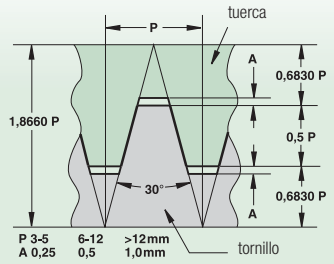

Uso: accesorios y acoplamientos de tuberías.

### BSPT (estándar británico)



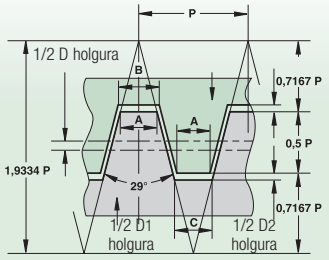

Uso: rosca de tubería de vapor, gas y agua.

### TR DIN 103




Uso: sector mecánico para tornillos de transmisión del movimiento.

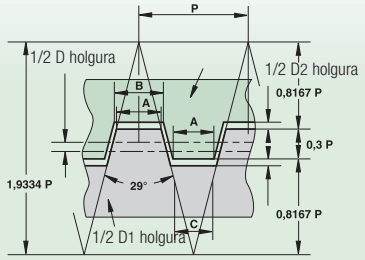
### Acme




A = 0,0307 P B = 0,3707 P—x D holgura
C = 0,3707 P—(D1 holgura—D2 holgura)

Uso: suele utilizarse Acme General en el sector mecánico para tornillos de transmisión del movimiento.

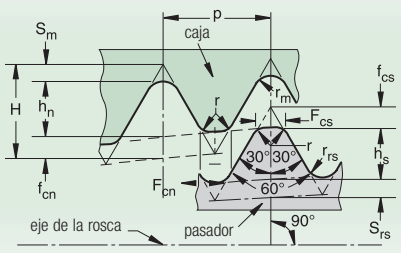
### Acme, truncado (longitud extracorta)




A = 0,4224 P B = 0,4224 P—x D holgura
C = 0,4224 P—(D1 holgura—D2 holgura)

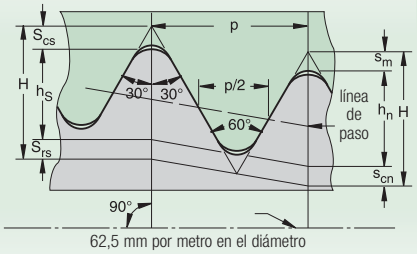
Uso: cuando el modelo Acme normal es demasiado profundo.

### Conexión de escuadras giratorias API




*NOTA: la representación del cono está exagerada.*

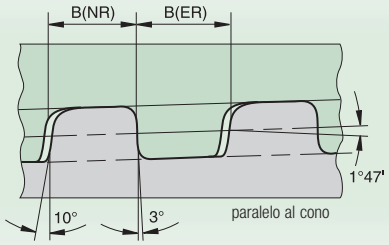
### Forma de roscas redondas de tuberías y carcasas API




62,5 mm por metro en el diámetro

*NOTA: la representación del cono está exagerada.*

### API Buttress

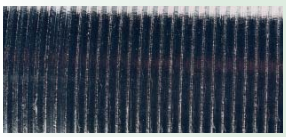


**Velocidades y calidades recomendadas para el roscado de varios materiales de piezas de trabajo**

| grupo de piezas de trabajo | material de pieza de trabajo | recomendaciones de velocidad superficial — m/min | | |
|---|---|---|---|---|
| | | sin recubrir | con recubrimiento de PVD | |
| | | THM | TN6010 | TN6025 |
| mecanizado libre<br>acero al carbono | 10L18, 10L45, 1213, 12L13, 12L14, 1140, 1141, 11L44, 1151, 10L50 | — | 91–198 | 45–198 |
| acero al carbono simple | 10063, 1008, 1010, 1015, 1018, 1020, 1025, 1026, 1108, 1117 | — | 76–198 | 45–175 |
| aceros aleados/aceros para herramientas<br>150–325 HB<br>hasta 35 HRC | 1042, 1045, 1070, 1080, 1085, 1090, 1095, 1541, 1561, 1572, 5140, 8620, W1, O1, S1, P20, H13, D2, A6, H13, L6 | — | 76–198 | 38–167 |
| aceros aleados/aceros para herramientas<br>330–450 HB<br>36–47 HRC | | — | 61–160 | — |
| martensítico/ferrítico<br>inoxidable/precipitación<br>endurecido | 416, 420F, 440F, 405, 409, 429, 430, 434, 436, 442, PH | — | 45–160 | 30–122 |
| acero inoxidable austenítico | 201, 202, 301, 302, 303, 304, 304, 305, 321, 347, 348, 310, 314, 316, 316L, 330 | 61–106 | 61–198 | 46–137 |
| fundición gris<br>135–270 HB | clase 20, 30, 35, 45 | 61–91 | 61–237 | 46–122 |
| fundición gris<br>275–450 HB | clase 50, 55, 60 | 45–76 | 45–175 | 15–76 |
| aleación/fundición dúctil | A536, J434C, 60-40-18, 80-55-06, 100-70-03 | 45–76 | 45–198 | 30–160 |
| mecanizado libre<br>aleaciones de aluminio | 2024-T4, 2014-T6, 6061-T6, 2011-T3, 3003-H18, A2, Alcan, Alcoa 510, duraluminio | 122–244 | 122–365 | — |
| aleaciones de aluminio<br>con alto contenido de silicio | A380, A390, A380-1, A390-1, A380-2 | — | — | — |
| cobre/cinc/bronce | | 76–183 | 76–304 | 46–236 |
| materiales no metálicos | grafito, nailon, materiales plásticos, cauchos, fenólicos, carbono | 122–457 | 122–396 | 46–305 |
| aleaciones de alta temperatura<br>125–269 HB<br>(hasta 27 HRC) | níquel 200, Monel, R405, Monel K500, INCONEL 600, INCONEL 625/901x750/718, Waspaloy, Hastelloy C | 24–37 | 24–122 | 13–76 |
| aleaciones de alta temperatura<br>260–450 HB<br>(26–47 HRC) | Rene 95, Waspaloy A286, Inconel 800, Haynes 188, Estelita F, Haynes 25 | 24–30 | 30–76 | 6–61 |
| aleaciones de titanio | Ti-6Al-4V, TI-5Al-2.5Sn | 34–55 | 34–99 | — |

*NOTA: cuando los niveles de dureza de la pieza de trabajo coincidan con el límite máximo de un rango, la proporción de m/min inicial debe coincidir con el nivel mínimo. Inspeccione con regularidad los amarres de plaquita en busca de partes planas desgastadas.*

*Preparación del filo:*
*sin recubrir: agudo*
*con recubrimiento de PVD: afilado ligero salvo desprendimiento superior positivo; desprendimiento positivo: afilado*

| problema | causa | posible solución |
|---|---|---|
| rosca con acabado rasgado  | • Rebabas.<br>• Acabado rasgado.<br>• Pasos. | • Utilizar un desprendimiento positivo o una plaquita de perfil completo.<br>• Aumentar la concentración de refrigerante.<br>• Alterar el avance.<br>• Aumento de m/min.<br>• Comprobar el eje del recorrido “Z” de la máquina.<br>• Comprobar la forma de la plaquita.<br>• Comprobar si el sistema LT cuenta con la placa de apoyo correcta. |
| vibración | • Rigidez insuficiente.<br>• Velocidad incorrecta.<br>• Movimiento de la plaquita.<br>• Avance inadecuado.<br>• Descentrado.<br>• Preparación del filo incorrecta. | • Minimizar el voladizo de la herramienta.<br>• Comprobar la posible desviación de la pieza de trabajo.<br>• Ajustar m/min.<br>• Comprobar la plaquita y el amarre.<br>• Utilizar un ángulo de avance modificado.<br>• Verificar que la posición de corte de la herramienta se encuentre en la línea central de la pieza de trabajo.<br>• Ajustar el nivel de afilado mediante una plaquita especial. |
| recrecimiento del filo | • Velocidad demasiado lenta.<br>• Refrigerante insuficiente.<br>• Carga de virutas.<br>• Preparación del filo incorrecta. | • Aumento de m/min.<br>• Aumentar la concentración o el flujo de refrigerante.<br>• Ajustar el ángulo de avance.<br>• Aumentar la profundidad de corte por pasada.<br>• Ajustar el nivel de afilado mediante una plaquita especial. |
| deformación | • Calidad errónea.<br>• Velocidad demasiado alta.<br>• Ángulo de avance inadecuado.<br>• Refrigerante insuficiente. | • Utilizar una calidad más resistente al desgaste (p. ej. TN6010).<br>• Reducir m/min.<br>• Alterar el ángulo/método de avance.<br>• Aumentar el flujo de refrigerante. |
| astillamiento | • Avance inadecuado.<br>• Carga de virutas.<br>• Calidad errónea.<br>• Velocidad incorrecta.<br>• Rigidez insuficiente.<br>• Preparación del filo incorrecta. | • Alterar el avance al flanco modificado.<br>• Ajustar la carga de virutas.<br>• Aumentar o disminuir el número de pasadas.<br>• Eliminar las pasadas en vacío.<br>• Utilizar una calidad más resistente (p. ej. TN6025).<br>• Aumentar m/min en caso de astillamiento en el filo posterior.<br>• Disminuir m/min en caso de astillamiento en el filo delantero.<br>• Minimizar el voladizo de la herramienta.<br>• Comprobar el movimiento de la plaquita/comprobar el amarre.<br>• Comprobar la posible desviación de la pieza.<br>• Ajustar el nivel de afilado mediante una plaquita especial. |
| nariz rota | • Carga de virutas pesada.<br>• Radio de nariz pequeño.<br>• Calidad errónea.<br>• Avance inadecuado.<br>• Preparación del filo incorrecta. | • Disminuir la carga de virutas.<br>• Utilizar un radio de nariz grande a ser posible.<br>• Utilizar una calidad más resistente (p. ej. TN6025).<br>• Alterar el avance al flanco modificado.<br>• Ajustar el nivel de afilado mediante una plaquita especial. |
| desgaste del flanco | • Calidad errónea.<br>• Refrigerante insuficiente.<br>• Descentrado. | • Utilizar una calidad más resistente al desgaste (p. ej. TN6025).<br>• Aumentar el flujo de refrigerante.<br>• Comprobar la altura de la línea central de la herramienta. (Cuanto más pequeño el diámetro, mayor la necesidad de precisión en la línea central.) |

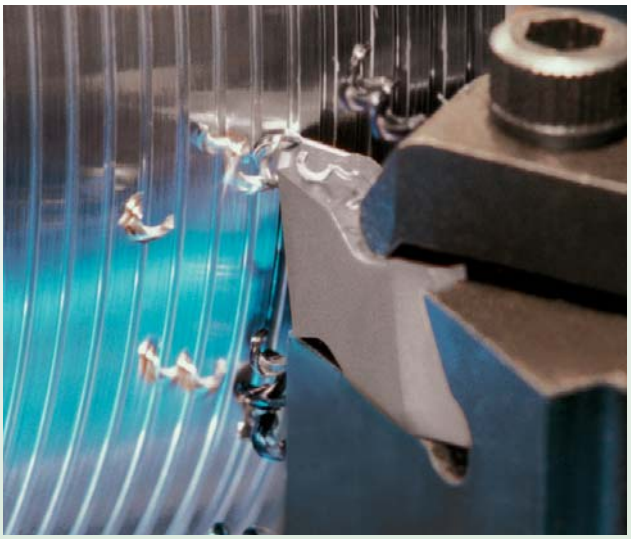
## Soluciones prácticas para problemas de roscado comunes

| problema | posible solución | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | aumentar m/min | reducir m/min | aumentar la carga de virutas | disminuir la carga de virutas en caso de fallo | utilizar una calidad de metal duro más resistente | utilizar una calidad de metal duro más dura | aplicar refrigerante | utilizar metal duro recubierto | utilizar plaquita superior | cambiar el ángulo de avance | comprobar el movimiento y la reubicación de la plaquita | reducir el voladizo de la herramienta | volver a seleccionar la placa de apoyo | aplicar el estilo de rompevirutas | reducir doc | ajustar la altura del centro | comenzar el corte de roscas 12,0 mm antes de la pieza de trabajo |
| vibración | ● | | | ● | | | | | | | ● | ● | | | | ● | |
| rebaba en cresta | ● | | | | | | | | ● | | | | | | | | |
| vida breve de la herramienta | | ● | ● | ● | | ● | | ● | | | | | | | | | |
| filo delantero astillado | | | ● | ● | ● | | | | | | | | | | | | |
| filo trasero astillado | | | | | ● | | | | | ● | | | | | | | |
| nariz rota (primera pasada) | ● | | | | | | | | | | | | | | ● | ● | |
| nariz rota (después de la primera pasada) | | | | ● | ● | | | | | ● | | | ● | | | | |
| recrecimiento del filo de corte | ● | | ● | | | | ● | ● | | | | | | | | | |
| cobertura prematura | | | | | | | | | | | | | ● | | | | |
| rotura de roscas | | | | | | | | | | | | | | | | | ● |
| evacuación de virutas insuficiente | | | | | | | | | | | | | | ● | | | |

La tecnología de plaquita de WIDIA™ le ofrece un control de virutas superior a sus operaciones de roscado con la plataforma TopThread™. La ranura de virutas empotrada de WIDIA, cuando se utiliza según nuestras recomendaciones, rompe la viruta en la mayoría de aplicaciones. Nuestro diseño de desprendimiento positivo reduce las presiones de corte, que lo cual a su vez reduce la generación de calor dañino, proporcionando así una mejor vida de la herramienta. Las virutas alargadas ya no estropearán el acabado superficial de la pieza de trabajo. Se elimina el peligro que corrían los operarios al evacuar virutas largas de la pieza de trabajo y el mandril. Todas esta ventajas se combinan para mejorar la productividad de sus operaciones de roscado.

## La última pasada

Algunos controles de CNC requiere que la última pasada sea con un ángulo de avance de 0°, debido a que la viruta no se rompe en la última pasada. En la mayoría de aceros aleados y al carbono, la última pasada puede tener una profundidad de corte de 0,127 mm y producir un acabado aceptable. En algunos materiales, puede utilizarse una pasada (en vacío) de 0,025 a 0,076 mm para mejorar el acabado superficial; sin embargo, puede ponerse en riesgo la rotura de virutas.

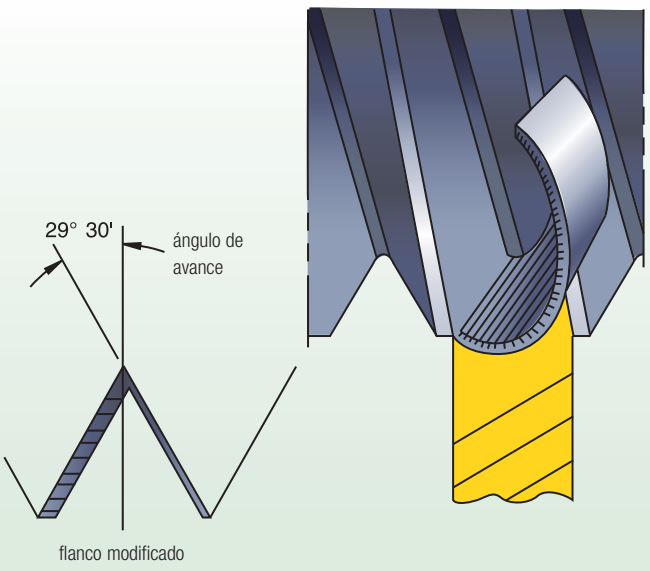


## Programación de máquinas

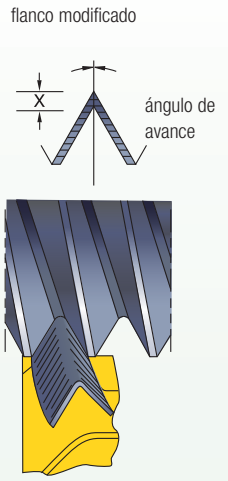
Los controles de CNC modernos permite al programador ajustar con facilidad el ángulo de avance, el número de pasadas y la profundidad de corte de cada pasada. La plaquita de roscado con control de virutas tiene mejores resultados con un ángulo de avance de 29° 30', aunque es aceptable cualquiera entre 15° y 30°. También es importante mantener un mínimo de 0,127 mm de profundidad de corte en cada pasada. En la mayoría de aplicaciones, el uso de ciclos CNC simplificados produce unos resultados sólo levemente satisfactorios. Los programas escritos a medida son mejores y más recomendables.

## Ángulo de avance

Para romper la viruta de forma eficaz y consistente, es importante utilizar un ángulo de avance entre 28° y 29° 30'. No aplique plaquitas con control de virutas en ángulos inferiores a 15°.



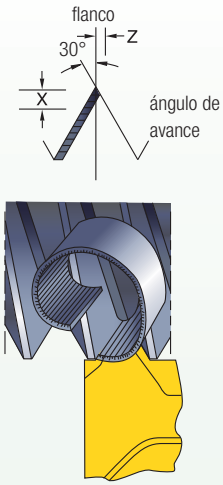
## Radial




Ventaja —
- Un corte en ambos lados de la forma de la rosca coloca el filo de corte entero en el corte y protege al filo del astillamiento.
- Desgaste equilibrado en la plaquita.

Desventaja —
- La herramienta desarrolla un canal de virutas que puede se difícil de manejar.
- El astillamiento de puntas se produce durante el corte de materiales de gran resistencia a la tracción.
- Aumenta la aparición de rebabas.
- Todo el filo de corte se acopla en el acabado del roscado, provocando una mayor tendencia a la vibración.

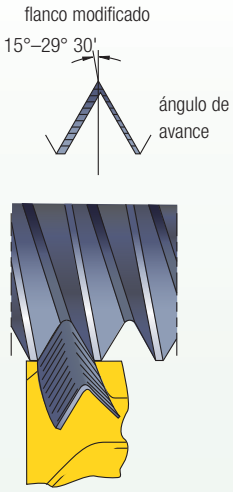
## Flanco




Ventaja —
- Un corte con el filo de corte de la herramienta de roscado proporciona una evacuación definitiva de virutas del área de la forma de la rosca. Esto reduce el problema de rebabas del filo posterior de la herramienta. Para evitar un mal acabado superficial, astillamiento o exceso de desgaste en los flancos debido al roce del filo de salida, el ángulo de avance debe ser de 3° a 5° más pequeño que el de la rosca. Este es un tipo de flanco modificado.

Desventaja —
- El filo posterior de la plaquita de roscado puede provocar un roce y tiende a astillarse.
- Las roscas pueden sufrir un acabado superficial raspado o inadecuado o raspado durante el corte de materiales blandos y gomosos como aceros con bajo contenido de carbono, aluminio y aceros inoxidables.

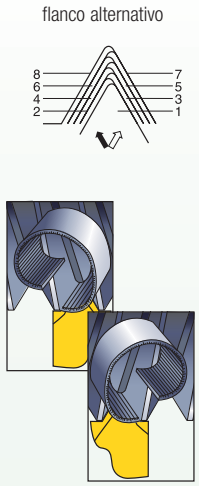
## Flanco modificado




Ventaja —
- La herramienta corta ambos lados de la forma de rosca, así que está protegida de un astillamiento similar al avance de 0°. Se desarrolla un astillamiento de tipo de canal, pero el grosor desigual de las virutas ayuda a evacuar la viruta de forma similar al avance del flanco.
- Este es el método preferido, especialmente cuando se utiliza con una plaquita de control de virutas.
- Avance de flanco alternativo y/o radial combinado.
- El resultado es una larga vida de la herramienta, con un desgaste distribuido de forma equitativa en ambos flancos.

Desventaja —
- Desventajas similares a las del avance de 0°, aunque reducidas en magnitud, ya que las fuerzas de corte están mejor equilibradas y el flujo de virutas es mucho menos problemático.

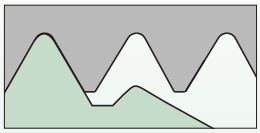
## Flanco alternativo




Ventaja —
- Mayor vida de la herramienta debido a que se utilizan ambos filos de igual forma. NOTA: algunas máquinas herramienta necesitan técnicas de programación especiales para poder llevar a cabo este método de avance.

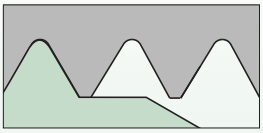
Desventaja —
- Difícil de cortar con maquinaria convencional.

## Perfil parcial



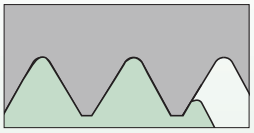
**Perfil de dientes con forma de perfil universal:**
- 55° o 60° sin filo de corte para los dientes cónicos.
- Inventario reducido.
- Para varios pasos en un rango limitado.
- Producción única a ser posible.
- Los diámetros exteriores/centrales deben estar pretorneados adecuadamente.

## Perfil completo



**Perfil de dientes con forma de perfil completo, incluyendo la altura de los dientes:**
- Para eliminar la posibilidad de rebabas, unas roscas precisas en el paso especificado.
- Aplicación general.
- Tolerancia de mecanizado para diámetro exterior/central en torno a 0,1–0,15 mm.

## Perfil de múltiples dientes



**Perfil de múltiples dientes con dos o tres dientes generalmente:**
- Roscado altamente productivo con menos pasadas y una mayor vida de la herramienta.
- Requiere una instalación rígida y un salto de rosca largo.
- Ancho de incidencia mínimo de aproximadamente 1,25 x E según la tabla de dimensiones de las plaquitas intercambiables.

## Fórmulas

| fórmula métrica | | |
|---|---|---|
| **hallar** | **dado** | **fórmula** |
| m/min | D (mm)<br>RPM | $m/min = \frac{\pi \times D}{1000} \times RPM$ |
| RPM | D (mm)<br>m/min | $RPM = \frac{m/min \times 1000}{D \times \pi}$ |

### Leyenda

m/min = metros por minuto
RPM = revoluciones por minuto
D = diámetro de la pieza
π = 3,1416

## Velocidades de corte máximas

A menudo la velocidad de corte máxima se ve limitada por la velocidad de desplazamiento máxima (mm/min) de la herramienta permitida por la máquina.

Compruebe la velocidad máxima con la siguiente fórmula:

velocidad de corte máxima (m/min) =
diámetro de la pieza (mm) x 3,14 x (1/paso) x $\frac{\text{máx mm/min}}{1000,0 \text{ mm}}$

## Recomendación para pasadas de avance de roscado

| TPI | 48–32 | 28–24 | 20–16 | 14–12 | 11.5–9 | 8–6 | 5–4 | 3–2 |
|---|---|---|---|---|---|---|---|---|
| paso métrico (mm) | 0,50–0,75 | 0,80–1,0 | 1,25–1,5 | 1,75–2,0 | 2,5–3,0 | 3,5–4,0 | 4,5–6,0 | 8,0 |
| **Tipo de roscado** | **cantidad recomendada de pasadas** | | | | | | | |
| Formas de rosca en V comunes ISO, UN, UNJ, NPT, Whitworth, BSPT, escuadras giratorias API | 4–5 | 5–6 | 6–8 | 8–10 | 9–12 | 12–15 | 14–16 | 15–25 |
| Acme, Trapez, redonda, API redondeada | — | — | 5–6 | 7–8 | 10–11 | 12–13 | 13–15 | 18–20 |
| Acme extracorta, API tipo Buttress | — | — | 5 | 5–6 | 7–8 | 8–10 | 10–12 | 14–16 |
| Buttress americano | — | — | 7–8 | 9–10 | 11–12 | 13–15 | 17–19 | 22–24 |

Mantenga un avance mínimo de 0,05 mm en las últimas pasadas para evitar un endurecimiento por deformación y una abrasión excesiva de la herramienta de roscado.

## Valores de avance de volumen constantes para operaciones de roscado

En la mayoría de aplicaciones, el uso de CNC simplificados produce unos resultados sólo levemente satisfactorios. En este caso estos programas no satisfacen la especificación de una profundidad de corte mínima recomendada de 0,05 mm.

Ejemplo:
fórmula de avance por pasada: profundidad acumulada = profundidad de corte inicial x √ nº pasada
Por ejemplo, una rosca exterior de 8 pasos tiene una profundidad de 2,0 mm.
25% de 2,0 mm = aproximadamente 0,50 mm
(Este es el avance/la profundidad de corte de la primera pasada.)

0,500 mm x √ (2) = 0,708 mm
0,708 mm - 0,500 mm = 0,207 mm (Este es el avance/la profundidad de corte de la segunda pasada.)

0,500 mm x √ (3) = 0,867 mm
0,867 mm - 0,708 mm = 0,159 mm (Este es el avance/la profundidad de corte de la tercera pasada.)

0,500 mm x √ (4) = 1,001 mm
1,001 mm - 0,867 mm = 0,134 mm (Este es el avance/la profundidad de corte de la cuarta pasada.)

## Uso de avance radial

Tensión de curvado sobre el filo de corte provocada por las virutas con forma de V de materiales de viruta larga en piezas de trabajo metálicas.

Las fuerzas de corte elevadas con pequeños grosores de corte requieren filos de corte afilados con alta resistencia.

Se recomienda su aplicación en metales duros de gran tenacidad, resistentes al desgaste y a choques térmicos y mecánicos.

## Uso de avance de flanco

Una menor tensión de curvado y unos filos de corte estabilizados producen formas de viruta más favorables y mayores grosores de corte.

Son óptimos los metales duros con buena resistencia al desgaste y gran dureza, así como estabilidad de temperatura.

Durante el torneado de roscas cortas con tiempos de implicación cortos, se produce una buena resistencia a los choques térmicos y mecánicos.

## Guías generales de avances
## Cómo determinar la cantidad y el tamaño de las pasadas

La cantidad de pasadas “s” por rosca es decisiva para un roscado y un torneado en cresta correctos. Las siguientes tablas proporcionan valores estándar para aplicar durante el mecanizado de acero. La cantidad correcta de pasadas debe determinarse basándose en la experiencia.

En caso de producirse una rotura de la plaquita, debe aumentarse la cantidad de pasadas. Ante un mayor desgaste, recomendamos disminuir la cantidad de pasadas. El grosor de las virutas no debe ser inferior a 0,05 mm. La tolerancia del diámetro no debe sobrepasar de 0,2 mm.

## ISO métrico, corte de rosca exterior

| paso (mm) | 6,0 | 5,5 | 5,0 | 4,5 | 4,0 | 3,5 | 3,0 | 2,5 | 2,0 | 1,8 | 1,5 | 1,3 | 1,0 | 0,8 | 0,5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| profundidad total | 3,84 | 3,53 | 3,20 | 2,87 | 2,54 | 2,24 | 1,93 | 1,60 | 1,24 | 1,12 | 0,94 | 0,81 | 0,66 | 0,48 | 0,36 |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,46 | 0,43 | 0,41 | 0,38 | 0,08 | 0,33 | 0,28 | 0,28 | 0,23 | 0,20 | 0,20 | 0,20 | 0,20 | 0,15 | 0,13 |
| 2 | 0,43 | 0,41 | 0,38 | 0,33 | 0,33 | 0,30 | 0,25 | 0,23 | 0,23 | 0,20 | 0,20 | 0,18 | 0,15 | 0,15 | 0,10 |
| 3 | 0,36 | 0,33 | 0,33 | 0,28 | 0,25 | 0,25 | 0,20 | 0,20 | 0,18 | 0,18 | 0,18 | 0,15 | 0,13 | 0,10 | 0,08 |
| 4 | 0,30 | 0,28 | 0,28 | 0,23 | 0,23 | 0,20 | 0,18 | 0,18 | 0,15 | 0,15 | 0,15 | 0,10 | 0,10 | 0,08 | 0,05 |
| 5 | 0,28 | 0,25 | 0,25 | 0,23 | 0,20 | 0,20 | 0,18 | 0,15 | 0,15 | 0,13 | 0,13 | 0,10 | 0,08 | | |
| 6 | 0,25 | 0,23 | 0,23 | 0,20 | 0,18 | 0,18 | 0,15 | 0,15 | 0,13 | 0,10 | 0,08 | 0,08 | | | |
| 7 | 0,23 | 0,20 | 0,23 | 0,20 | 0,18 | 0,15 | 0,15 | 0,13 | 0,10 | 0,08 | | | | | |
| 8 | 0,23 | 0,20 | 0,20 | 0,18 | 0,15 | 0,15 | 0,13 | 0,10 | 0,08 | 0,08 | | | | | |
| 9 | 0,23 | 0,18 | 0,18 | 0,18 | 0,15 | 0,15 | 0,13 | 0,10 | | | | | | | |
| 10 | 0,20 | 0,18 | 0,18 | 0,15 | 0,13 | 0,13 | 0,10 | 0,08 | | | | | | | |
| 11 | 0,18 | 0,18 | 0,15 | 0,15 | 0,13 | 0,10 | 0,10 | | | | | | | | |
| 12 | 0,15 | 0,15 | 0,15 | 0,13 | 0,10 | 0,08 | 0,08 | | | | | | | | |
| 13 | 0,15 | 0,15 | 0,13 | 0,13 | 0,10 | | | | | | | | | | |
| 14 | 0,15 | 0,13 | 0,10 | 0,10 | 0,08 | | | | | | | | | | |
| 15 | 0,13 | 0,13 | | | | | | | | | | | | | |
| 16 | 0,10 | 0,10 | | | | | | | | | | | | | |

## ISO métrico, corte de rosca interior

| paso P de rosca (mm) | 0,50 | 0,75 | 1,00 | 1,25 | 1,50 | 1,75 | 2,00 | 2,50 | 3,00 | 3,50 | 4,00 | 4,50 | 5,00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| profundidad h1 | 0,271 | 0,406 | 0,541 | 0,677 | 0,812 | 0,947 | 1,083 | 1,353 | 1,624 | 1,894 | 2,165 | 2,436 | 2,706 |
| número de pasadas | 4 | 4 | 5 | 6 | 6 | 8 | 8 | 10 | 11 | 12 | 14 | 15 | 16 |
| | valores de avance de flanco (X/Z) | | | | | | | | | | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,108/- | 0,162/- | 0,182/- | 0,196/- | 0,235/- | 0,212/- | 0,243/- | 0,243/- | 0,263/- | 0,277/- | 0,261/- | 0,269/- | 0,277/- |
| 2 | 0,067/0,039 | 0,102/0,058 | 0,120/0,069 | 0,137/0,079 | 0,165/0,095 | 0,166/0,096 | 0,190/0,110 | 0,213/0,123 | 0,243/0,140 | 0,272/0,157 | 0,288/0,166 | 0,313/0,180 | 0,336/0,194 |
| 3 | 0,052/0,030 | 0,077/0,045 | 0,092/0,053 | 0,105/0,061 | 0,126/0,073 | 0,128/0,074 | 0,146/0,084 | 0,163/0,094 | 0,187/0,108 | 0,209/0,120 | 0,221/0,127 | 0,240/0,138 | 0,258/0,149 |
| 4 | 0,044/0,025 | 0,065/0,038 | 0,078/0,045 | 0,089/0,051 | 0,107/0,062 | 0,108/0,062 | 0,123/0,071 | 0,138/0,079 | 0,157/0,091 | 0,176/0,102 | 0,186/0,107 | 0,202/0,117 | 0,218/0,126 |
| 5 | | | 0,069/0,040 | 0,078/0,045 | 0,94/0,054 | 0,095/0,055 | 0,108/0,063 | 0,121/0,070 | 0,139/0,080 | 0,155/0,089 | 0,164/0,095 | 0,178/0,103 | 0,192/0,111 |
| 6 | | | | 0,072/0,041 | 0,085/0,049 | 0,086/0,050 | 0,098/0,057 | 0,110/0,063 | 0,125/0,072 | 0,140/0,081 | 0,148/0,086 | 0,161/0,093 | 0,173/0,100 |
| 7 | | | | | | 0,079/0,046 | 0,090/0,052 | 0,101/0,058 | 0,115/0,067 | 0,129/0,074 | 0,136/0,079 | 0,148/0,086 | 0,159/0,092 |
| 8 | | | | | | 0,073/0,042 | 0,084/0,048 | 0,094/0,054 | 0,107/0,062 | 0,120/0,069 | 0,127/0,073 | 0,138/0,080 | 0,148/0,086 |
| 9 | | | | | | | | 0,088/0,051 | 0,101/0,058 | 0,113/0,065 | 0,119/0,069 | 0,129/0,075 | 0,139/0,080 |
| 10 | | | | | | | | 0,082/0,048 | 0,095/0,055 | 0,106/0,061 | 0,113/0,065 | 0,122/0,071 | 0,132/0,076 |
| 11 | | | | | | | | | 0,092/0,052 | 0,101/0,058 | 0,107/0,062 | 0,116/0,067 | 0,125/0,072 |
| 12 | | | | | | | | | | 0,097/0,056 | 0,102/0,059 | 0,111/0,064 | 0,120/0,069 |
| 13 | | | | | | | | | | | 0,098/0,057 | 0,107/0,062 | 0,115/0,066 |
| 14 | | | | | | | | | | | 0,095/0,055 | 0,103/0,059 | 0,111/0,064 |
| 15 | | | | | | | | | | | | 0,099/0,057 | 0,107/0,062 |
| 16 | | | | | | | | | | | | | 0,103/0,060 |

## Rosca UN, corte de rosca exterior

| TPI | 24 | 20 | 18 | 16 | 14 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| profundidad | 0,649 | 0,779 | 0,866 | 0,974 | 1,113 | 1,299 | 1,416 | 1,558 | 1,731 | 1,948 | 2,226 | 2,597 | 3,116 |
| número de pasadas | 5 | 6 | 6 | 7 | 9 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | valores de avance de flanco (X/Z) | | | | | | | | | | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,206/- | 0,210/- | 0,233/- | 0,226/- | 0,196/- | 0,229/- | 0,220/- | 0,214/- | 0,210/- | 0,211/- | 0,213/- | 0,218/- | 0,229/- |
| 2 | 0,148/0,086 | 0,163/0,094 | 0,181/0,104 | 0,188/0,109 | 0,189/0,110 | 0,222/0,128 | 0,228/0,132 | 0,240/0,139 | 0,256/0,148 | 0,276/0,160 | 0,304/0,176 | 0,343/0,198 | 0,399/0,230 |
| 3 | 0,114/0,066 | 0,125/0,072 | 0,139/0,080 | 0,145/0,083 | 0,146/0,084 | 0,170/0,098 | 0,176/0,102 | 0,184/0,106 | 0,196/0,113 | 0,212/0,122 | 0,234/0,135 | 0,263/0,152 | 0,306/0,177 |
| 4 | 0,096/0,055 | 0,105/0,061 | 0,117/0,068 | 0,122/0,070 | 0,123/0,071 | 0,143/0,083 | 0,148/0,086 | 0,155/0,090 | 0,165/0,095 | 0,179/0,103 | 0,197/0,114 | 0,222/0,128 | 0,258/0,149 |
| 5 | 0,085/0,049 | 0,093/0,054 | 0,103/0,059 | 0,107/0,062 | 0,108/0,062 | 0,126/0,073 | 0,131/0,075 | 0,137/0,079 | 0,146/0,084 | 0,158/0,091 | 0,173/0,100 | 0,195/0,113 | 0,227/0,131 |
| 6 | | 0,084/0,048 | 0,093/0,054 | 0,097/0,056 | 0,098/0,056 | 0,114/0,066 | 0,118/0,068 | 0,124/0,072 | 0,132/0,076 | 0,142/0,082 | 0,157/0,091 | 0,177/0,102 | 0,205/0,119 |
| 7 | | | | 0,089/0,052 | 0,090/0,052 | 0,105/0,061 | 0,109/0,063 | 0,114/0,066 | 0,121/0,070 | 0,131/0,076 | 0,144/0,083 | 0,163/0,094 | 0,189/0,109 |
| 8 | | | | | 0,084/0,048 | 0,098/0,056 | 0,101/0,058 | 0,106/0,061 | 0,113/0,065 | 0,122/0,070 | 0,134/0,078 | 0,151/0,087 | 0,176/0,101 |
| 9 | | | | | 0,079/0,045 | 0,092/0,053 | 0,095/0,055 | 0,100/0,057 | 0,106/0,061 | 0,114/0,066 | 0,126/0,073 | 0,142/0,082 | 0,165/0,095 |
| 10 | | | | | | | 0,090/0,052 | 0,094/0,054 | 0,100/0,058 | 0,108/0,063 | 0,119/0,069 | 0,134/0,078 | 0,156/0,090 |
| 11 | | | | | | | | 0,090/0,052 | 0,095/0,055 | 0,103/0,059 | 0,113/0,065 | 0,128/0,074 | 0,149/0,086 |
| 12 | | | | | | | | | 0,091/0,053 | 0,098/0,057 | 0,108/0,063 | 0,122/0,071 | 0,142/0,082 |
| 13 | | | | | | | | | | 0,094/0,054 | 0,104/0,060 | 0,117/0,068 | 0,136/0,079 |
| 14 | | | | | | | | | | | 0,100/0,058 | 0,113/0,065 | 0,131/0,076 |
| 15 | | | | | | | | | | | | 0,109/0,063 | 0,126/0,073 |
| 16 | | | | | | | | | | | | | 0,122/0,071 |

## Rosca UN, corte de rosca interior

| TPI | 24 | 20 | 18 | 16 | 14 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| profundidad | 0,573 | 0,687 | 0,764 | 0,860 | 0,982 | 1,146 | 1,250 | 1,375 | 1,528 | 1,719 | 1,964 | 2,291 | 2,750 |
| número de pasadas | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | valores de avance de flanco (X/Z) | | | | | | | | | | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,193/- | 0,200/- | 0,222/- | 0,219/- | 0,220/- | 0,228/- | 0,250/- | 0,247/- | 0,246/- | 0,252/- | 0,262/- | 0,278/- | 0,302/- |
| 2 | 0,127/0,073 | 0,239/0,081 | 0,155/0,089 | 0,161/0,093 | 0,173/0,100 | 0,190/0,110 | 0,207/0,120 | 0,216/0,125 | 0,229/0,132 | 0,247/0,142 | 0,271/0,156 | 0,304/0,176 | 0,353/0,204 |
| 3 | 0,098/0,056 | 0,107/0,062 | 0,119/0,069 | 0,124/0,072 | 0,132/0,076 | 0,146/0,084 | 0,159/0,092 | 0,166/0,096 | 0,176/0,101 | 0,189/0,109 | 0,208/0,120 | 0,234/0,135 | 0,271/0,156 |
| 4 | 0,082/0,048 | 0,090/0,052 | 0,100/0,058 | 0,104/0,060 | 0,112/0,064 | 0,123/0,071 | 0,134/0,077 | 0,140/0,081 | 0,148/0,086 | 0,160/0,092 | 0,175/0,101 | 0,197/0,114 | 0,228/0,132 |
| 5 | 0,073/0,042 | 0,072/0,041 | 0,088/0,051 | 0,092/0,053 | 0,098/0,057 | 0,108/0,062 | 0,118/0,068 | 0,123/0,071 | 0,130/0,075 | 0,141/0,081 | 0,154/0,089 | 0,173/0,100 | 0,201/0,116 |
| 6 | | | 0,080/0,046 | 0,083/0,048 | 0,089/0,051 | 0,098/0,056 | 0,107/0,062 | 0,111/0,064 | 0,118/0,068 | 0,127/0,073 | 0,140/0,081 | 0,157/0,091 | 0,182/0,105 |
| 7 | | | | 0,077/0,044 | 0,082/0,047 | 0,090/0,052 | 0,098/0,057 | 0,102/0,059 | 0,108/0,063 | 0,117/0,067 | 0,128/0,074 | 0,144/0,083 | 0,167/0,097 |
| 8 | | | | | 0,076/0,044 | 0,084/0,048 | 0,091/0,053 | 0,095/0,055 | 0,101/0,058 | 0,109/0,063 | 0,119/0,069 | 0,134/0,078 | 0,156/0,090 |
| 9 | | | | | | 0,079/0,045 | 0,086/0,050 | 0,090/0,052 | 0,095/0,055 | 0,102/0,059 | 0,112/0,065 | 0,126/0,073 | 0,146/0,084 |
| 10 | | | | | | | | 0,085/0,049 | 0,090/0,052 | 0,097/0,056 | 0,106/0,061 | 0,119/0,069 | 0,138/0,080 |
| 11 | | | | | | | | | 0,085/0,049 | 0,092/0,053 | 0,101/0,058 | 0,113/0,065 | 0,131/0,076 |
| 12 | | | | | | | | | | 0,088/0,051 | 0,096/0,056 | 0,108/0,063 | 0,126/0,073 |
| 13 | | | | | | | | | | | 0,092/0,053 | 0,104/0,060 | 0,121/0,070 |
| 14 | | | | | | | | | | | | 0,100/0,058 | 0,116/0,067 |
| 15 | | | | | | | | | | | | | 0,112/0,065 |

## Rosca NPT, mecanizado exterior e interior

| paso, Gg/Z | 27,0 | 18,0 | 14,0 | 11,5 | 8,0 |
|---|---|---|---|---|---|
| profundidad | 0,0750 | 1,129 | 1,451 | 1,767 | 2,540 |
| número de pasadas | 6 | 8 | 10 | 12 | 14 |
| | valores de avance de flanco (X/Z) | | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,19/— | 0,22/— | 0,240/— | 0,24/— | 0,255/— |
| 2 | 0,15/0,087 | 0,181/0,104 | 0,200/0,115 | 0,208/0,120 | 0,250/0,144 |
| 3 | 0,13/0,075 | 0,152/0,088 | 0,170/0,098 | 0,182/0,105 | 0,245/0,141 |
| 4 | 0,11/0,063 | 0,141/0,081 | 0,150/0,086 | 0,168/0,097 | 0,230/0,133 |
| 5 | 0,09/0,052 | 0,131/0,075 | 0,140/0,081 | 0,155/0,089 | 0,210/0,121 |
| 6 | 0,08/0,046 | 0,121/0,070 | 0,130/0,075 | 0,145/0,084 | 0,195/0,112 |
| 7 | | 0,101/0,058 | 0,120/0,069 | 0,138/0,079 | 0,180/0,104 |
| 8 | | 0,082/0,047 | 0,110/0,063 | 0,124/0,072 | 0,175/0,101 |
| 9 | | | 0,100/0,058 | 0,117/0,067 | 0,170/0,098 |
| 10 | | | 0.091/0,052 | 0,105/0,060 | 0,155/0,089 |
| 11 | | | | 0,095/0,055 | 0,140/0,080 |
| 12 | | | | 0,090/0,052 | 0,125/0,072 |
| 13 | | | | | 0,110/0,063 |
| 14 | | | | | 0,100/0,058 |

## Rosca BSPT, mecanizado exterior e interior

| paso, Gg/Z | 28 | 19 | 14 | 11 |
|---|---|---|---|---|
| profundidad | 0,581 | 0,856 | 1,162 | Rosca BSPT |
| número de pasadas | 5 | 6 | 8 | 10 |
| | valores de avance de flanco (X/Z) | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,179/— | 0,223/— | 0,222/— | 0,214/— |
| 2 | 0,134/0,070 | 0,181/0,094 | 0,213/0,111 | 0,242/0,126 |
| 3 | 0,103/0,054 | 0,139/0,072 | 0,163/0,085 | 0,186/0,097 |
| 4 | 0,087/0,045 | 0,1171/0,061 | 0,138/0,072 | 0,157/0,082 |
| 5 | 0,078/0,040 | 0,103/0,054 | 0,121/0,063 | 0,138/0,072 |
| 6 | | 0,093/0,049 | 0,110/0,057 | 0,125/0,065 |
| 7 | | | 0,101/0,052 | 0,115/0,060 |
| 8 | | | 0,094/0,049 | 0,107/0,056 |
| 9 | | | | 0,100/0,052 |
| 10 | | | | 0,095/0,049 |

## Rosca trapezoidal para DIN 103, mecanizado exterior e interior

| paso | 27,0 | 18,0 | 14,0 | 11,5 | 8,0 |
|---|---|---|---|---|---|
| profundidad | 0,0750 | 1,129 | 1,451 | 1,767 | 2,540 |
| número de pasadas | 6 | 8 | 10 | 12 | 14 |
| | valores de avance de flanco (X/Z) | | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,240/— | 0,250/— | 0,260/— | 0,265/— | 0,285/— |
| 2 | 0,190/0,051 | 0,230/0,062 | 0,245/0,066 | 0,270/0,072 | 0,295/0,079 |
| 3 | 0,137/0,037 | 0,175/0,047 | 0,220/0,059 | 0,250/0,067 | 0,275/0,074 |
| 4 | 0,124/0,033 | 0,149/0,040 | 0,200/0,054 | 0,230/0,062 | 0,255/0,068 |
| 5 | 0,110/0,029 | 0,126/0,034 | 0,175/0,047 | 0,210/0,056 | 0,235/0,063 |
| 6 | 0,099/0,027 | 0,114/0,031 | 0,160/0,043 | 0,190/0,051 | 0,215/0,058 |
| 7 | | 0,106/0,028 | 0,145/0,039 | 0,175/0,047 | 0,200/0,054 |
| 8 | | 0,100/0,028 | 0,103/0,035 | 0,160/0,043 | 0,185/0,050 |
| 9 | | | 0,115/0,031 | 0,145/0,039 | 0,170/0,046 |
| 10 | | | 0,100/0,027 | 0,130/0,035 | 0,155/0,042 |
| 11 | | | | 0,120/0,032 | 0,140/0,038 |
| 12 | | | | 0,105/0,028 | 0,125/0,033 |
| 13 | | | | | 0,115/0,031 |
| 14 | | | | | 0,100/0,027 |

## Rosca redonda para DIN 405, mecanizado exterior e interior

| paso, Gg/Z | 10 | 8 | 6 |
|---|---|---|---|
| profundidad | 1,31 | 1,63 | 2,17 |
| número de pasadas | 8 | 10 | 12 |
| | valores de avance de flanco (X/Z) | | |
| orden de pasadas | X/Z | X/Z | X/Z |
| 1 | 0,210/— | 0,220/— | 0,206/— |
| 2 | 0,205/0,055 | 0,210/0,058 | 0,250/0,067 |
| 3 | 0,195/0,052 | 0,200/0,055 | 0,024/0,064 |
| 4 | 0,180/0,048 | 0,190/0,051 | 0,230/0,062 |
| 5 | 0,160/0,042 | 0,175/0,047 | 0,215/0,059 |
| 6 | 0,140/0,037 | 0,160/0,043 | 0,195/0,540 |
| 7 | 0,115/0,031 | 0,145/0,039 | 0,180/0,048 |
| 8 | 0,090/0,024 | 0,136/0,035 | 0,160/0,043 |
| 9 | | 0,110/0,029 | 0,140/0,038 |
| 10 | | 0,140/0,038 | 0,120/0,032 |
| 11 | | | 0,100/0,027 |
| 12 | | | 0,080/0,024 |

## Whitworth, corte de rosca exterior e interior

| paso, TPI | 28 | 20 | 19 | 16 | 14 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| profundidad | 0,581 | 0,813 | 0,813 | 0,856 | 1,017 | 1,355 | 1,479 | 1,626 | 1,807 | 2,033 | 2,324 | 2,711 | 3,251 |
| número de pasadas | 5 | 6 | 6 | 8 | 8 | 9 | 9 | 10 | 11 | 12 | 14 | 15 | 16 |
| | valores de avance de flanco (X/Z) | | | | | | | | | | | | |
| orden de pasadas | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z | X/Z |
| 1 | 0,179/— | 0,211/— | 0,223/— | 0,196/— | 0,223/— | 0,226/— | 0,246/— | 0,236/— | 0,230/— | 0,255/— | 0,195/— | 0,197/— | 0,204/— |
| 2 | 0,134/0,070 | 0,172/0,089 | 0,181/0,094 | 0,186/0,097 | 0,213/0,111 | 0,234/0,122 | 0,255/0,133 | 0,266/0,139 | 0,282/0,147 | 0,304/0,158 | 0,322/0,167 | 0,361/0,189 | 0,421/0,219 |
| 3 | 0,104/0,054 | 0,132/0,069 | 0,139/0,072 | 0,142/0,074 | 0,163/0,085 | 0,180/0,093 | 0,197/0,102 | 0,206/0,106 | 0,216/0,113 | 0,233/0,121 | 0,247/0,128 | 0,278/0,145 | 0,323/0,168 |
| 4 | 0,087/0,045 | 0,111/0,058 | 0,117/0,061 | 0,120/0,063 | 0,138/0,072 | 0,150/0,079 | 0,165/0,086 | 0,172/0,090 | 0,182/0,095 | 0,197/0,102 | 0,208/0,108 | 0,234/0,122 | 0,272/0,142 |
| 5 | 0,077/0,040 | 0,098/0,051 | 0,103/0,054 | 0,160/0,055 | 0,121/0,063 | 0,133/0,069 | 0,145/0,076 | 0,152/0,079 | 0,161/0,084 | 0,173/0,090 | 0,183/0,095 | 0,207/0,108 | 0,240/0,125 |
| 6 | | 0,098/0,051 | 0,093/0,049 | 0,096/0,050 | 0,110/0,057 | 0,121/0,063 | 0,131/0,068 | 0,137/0,071 | 0,145/0,076 | 0,157/0,082 | 0,166/0,086 | 0,187/0,097 | 0,217/0,113 |
| 7 | | | | 0,088/0,046 | 0,101/0,052 | 0,111/0,058 | 0,121/0,063 | 0,126/0,066 | 0,134/0,070 | 0,144/0,075 | 0,152/0,079 | 0,172/0,089 | 0,200/0,104 |
| 8 | | | | 0,082/0,043 | 0,093/0,049 | 0,103/0,054 | 0,113/0,059 | 0,117/0,061 | 0,124/0,065 | 0,134/0,070 | 0,142/0,074 | 0,160/0,083 | 0,186/0,097 |
| 9 | | | | | | 0,97/0,050 | 0,106/0,055 | 0,110/0,057 | 0,117/0,061 | 0,126/0,066 | 0,133/0,069 | 0,150/0,078 | 0,174/0,091 |
| 10 | | | | | | | | 0,104/0,054 | 0,111/0,058 | 0,119/0,062 | 0,126/0,066 | 0,135/0,074 | 0,165/0,086 |
| 11 | | | | | | | | | 0,105/0,055 | 0,113/0,059 | 0,120/0,062 | 0,135/0,070 | 0,157/0,082 |
| 12 | | | | | | | | | | 0,108/0,056 | 0,114/0,060 | 0,129/0,067 | 0,150/0,078 |
| 13 | | | | | | | | | | | 0,110/0,057 | 0,124/0,064 | 0,144/0,075 |
| 14 | | | | | | | | | | | 0,106/0,055 | 0,119/0,062 | 0,138/0,072 |
| 15 | | | | | | | | | | | | 0,115/0,060 | 0,133/0,069 |
| 16 | | | | | | | | | | | | | 0,129/0,067 |

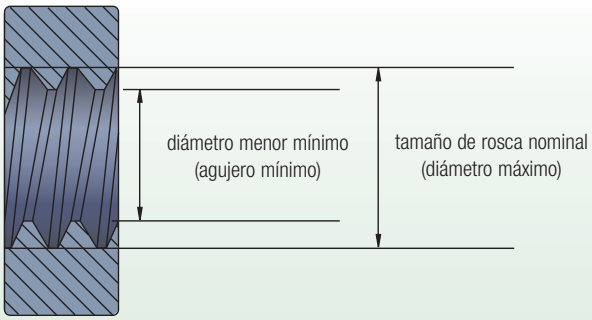
## Roscas de dientes múltiples, interiores

| | ISO Sistema métrico | | | | | | ISO UN | | | | | Whitworth | NPT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tipo | 3M | 2M | 3M | 2M | 3M | 2M | 2M | 3M | 2M | 3M | 2M | 2M | 2M | 3M | 2M |
| paso (mm) | 1,0 | 1,5 | 1,5 | 2,0 | 2,0 | 3,0 | — | — | — | — | — | — | — | — | — |
| TPI | — | — | — | — | — | — | 16 | 16 | 12 | 12 | 8 | 11 | 11.5 | 11.5 | 8 |
| profundidad total (mm) | 0,609 | 0,838 | 0,838 | 1,168 | 1,168 | 1,778 | 0,939 | 0,939 | 1,245 | 1,245 | 1,880 | 1,575 | 1,753 | 1,753 | 2,540 |
| pasada 1,0 mm | 0,330 | 0,381 | 0,508 | 0,508 | 0,711 | 0,558 | 0,431 | 0,558 | 0,558 | 0,762 | 0,584 | 0,736 | 0,584 | 0,812 | 0,889 |
| 2 | 0,279 | 0,254 | 0,330 | 0,381 | 0,457 | 0,482 | 0,304 | 0,381 | 0,406 | 0,482 | 0,508 | 0,482 | 0,508 | 0,558 | 0,635 |
| 3 | — | 0,203 | — | 0,279 | — | 0,431 | 0,203 | — | 0,279 | — | 0,431 | 0,355 | 0,355 | 0,381 | 0,558 |
| 4 | — | — | — | — | — | 0,304 | — | — | — | — | 0,355 | — | 0,304 | — | 0,457 |

## Recomendaciones para piezas de trabajo de acero (<300 BHN)

| | | | profundidad total: en el radio | | |
|---|---|---|---|---|---|
| número de catálogo | tamaño de la plaquita | Perfil TPI | 1ª pasada | 2ª pasada | 3ª pasada |
| NTC-8R/L8EM | 8 | 8 UN | 1,21 | 1,63 | 2,00 |
| NTC-8R/L8IM | 8 | 8 UN | 1,19 | 1,55 | 1,88 |
| NTC-8R/L10EM | 8 | 10 UN | 0,92 | 1,27 | 1,60 |
| NTC-8R/L10IM | 8 | 10 UN | 0,90 | 1,22 | 1,52 |
| NTC-8R/L12EM | 8 | 12 UN | 0,76 | 1,04 | 1,32 |
| NTC-8R/L12IM | 8 | 12 UN | 0,76 | 0,93 | 1,20 |
| NTC-8R/L14EM | 8 | 14 UN | 0,68 | 0,95 | 1,12 |
| NTC-8R/L14IM | 8 | 14 UN | 0,60 | 0,78 | 1,04 |
| NTC-8R/L16EM | 8 | 16 UN | 0,58 | 0,81 | 0,96 |
| NTC-8R/L16IM | 8 | 16 UN | 0,50 | 0,68 | 0,93 |
| NTC-8R/L18EM | 8 | 18 UN | 0,48 | 0,66 | 0,86 |
| NTC-8R/L18IM | 8 | 18 UN | 0,48 | 0,60 | 0,83 |
| NDC-68RDR/L-75M | 8 | 8 redonda | 1,47 | 1,65 | 1,85 |
| NDC-61RDR/L-75M | 8 | 10 redonda | 1,11 | 1,29 | 1,45 |
| NDC-88RDRD/L-75M | 8 | 8 redonda | 1,29 | 1,75 | 1,85 |
| NDC-88VR/L-75M | 8 | 8 NPT | 1,01 | 1,72 | 2,45 |
| NDC-8115VR/L-75M | 8 | 11.5 NPT | 0,96 | 1,37 | 1,70 |
| NDN-814VR/L-75M | 8 | 14 NPT | 0,96 | 1,22 | 1,36 |

Las siguientes tablas enumeran el paso de rosca más grande que se puede aplicar en aplicaciones interiores con plaquitas de roscado TopThread para un roscado en V de 60° y roscado Acme.




## Límites de roscado en V de 60° medidos de forma métrica

**limitaciones de roscado interior**
**plaquitas de roscado en V de 60º NT-1 y NT-2**

| TPI | tamaño de rosca nominal | | diámetro de rosca mínimo (mm) | |
|---|---|---|---|---|
| | NT-1 | NT-2 | NT-1 | NT-2 |
| 4,00 | M48 x 4.00 | — | 43,67 | — |
| 3,00 | M42 x 3.00 | — | 38,75 | — |
| 2,50 | M39 x 2.50 | M24 x 2,50 | 36,29 | 21,29 |
| 2,00 | M33 x 2.00 | M15 x 2,00 | 30,84 | 12,84 |
| 1,75 | M32 x 1.75 | M15 x 1,75 | 30,11 | 13,11 |
| 1,50 | M32 x 1.50 | M15 x 1,50 | 30,38 | 13,38 |
| 1,25 | M29 x 1.29 | M14 x 1,25 | 27,65 | 12,65 |
| 1,00* | M27 x 1.00 | M14 x 1,00 | 25,92 | 12,92 |
| 0,75 | M22 x 0.75 | M12 x 0,75 | 21,19 | 11,19 |

*Se puede cortar un paso de rosca de 1,0 mm como máximo con una plaquita NT-2 siempre que el diámetro de la rosca central sea de 25,0 mm como mínimo (11,0 mm como mínimo con NT-1).

**limitaciones de roscado interior**
**plaquitas de roscado en V de 60º NT-3 y NT-4**

| TP | tamaño de rosca nominal | diámetro de rosca mínimo (mm) |
|---|---|---|
| 6,00** | M76 x 6.00 | 69,50 |
| 5,50** | M73 x 5.50 | 67,05 |
| 5,00 | M70 x 5.00 | 64,59 |
| 4,00 | M64 x 4.00 | 59,67 |
| 3,00 | M52 x 3.00 | 48,75 |
| 2,50 | M48 x 2.50 | 45,29 |
| 2,00 | M42 x 2.00 | 39,84 |
| 1,75 | M40 x 1.75 | 38,11 |
| 1,50* | M38 x 1.50 | 36,38 |

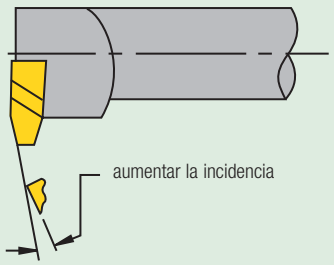
*Se puede cortar un paso de rosca de 1,5 mm como máximo siempre que el diámetro de la rosca central sea 35,0 mm o superior.
**Sólo plaquita NT-4.

## Límites de roscado Acme

**limitaciones de roscado interior**
**plaquitas de roscado Acme NA y NAS-2, -3, -4 y -6**

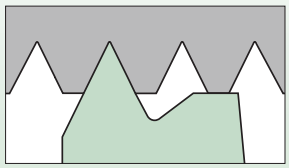
| TPI | tamaño de rosca nominal | diámetro de rosca mínimo (mm) | |
|---|---|---|---|
| | | pulgadas | mm |
| 2** | 5 | 4.500 | 114.3 |
| 2-1/2** | 4-1/2 | 4.100 | 104.1 |
| 3** | 4 | 3.665 | 93.1 |
| 4 | 3-1/2 | 3.250 | 82.6 |
| 5 | 3 | 2.800 | 71.1 |
| 6 | 2-1/2 | 2.333 | 59.3 |
| 8 | 2-1/4 | 2.125 | 54.0 |
| 10 | 2 | 1.900 | 48.3 |
| 12 | 1-3/4 | 1.667 | 42.4 |
| 14 | 1-5/8 | 1.554 | 39.5 |
| 16* | 1-1/2 | 1.438 | 36.5 |

*Se pueden cortar dieciséis roscas por pulgada y más fino siempre que el diámetro menor sea de 36,5 mm como mínimo.
**Sólo plaquita NA-6.



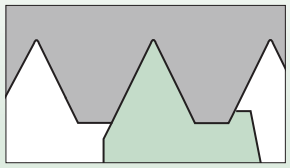

Se puede rectificar una incidencia adicional en el filo de corte de la plaquita para proporcionar la suficiente incidencia helicoidal para el mecanizado de roscas más bastas y de entrada múltiple. Se pueden suministrar plaquitas estándar modificadas para el mecanizado de roscas que salgan de los límites aquí expuestos.

## Datos de aplicaciones de torneado en cresta de roscas en V de 60°



dirección del avance

plaquita de torneado en cresta NTC para (P ≤ 2,0 mm) y más fina.



dirección del avance

plaquita de torneado en cresta NTC para (P ≥ 3,0 mm) y más basta.

*NOTA: las plaquitas NTC controlan automáticamente las dimensiones de la base a la cresta. Por lo tanto, al preparar operaciones de roscado con plaquitas NTC, compruebe que el diámetro exterior o interior en la cresta de la rosca posea las dimensiones correctas.*

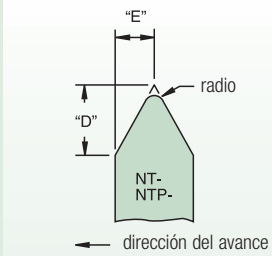
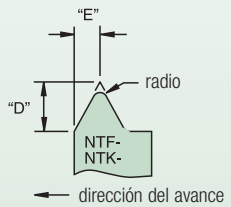
## Datos de aplicaciones de torneado en cresta de roscas en V de 60°

| número de catálogo de plaquitas | radio de nariz en plaquita (pulgadas) | radio de rosca por MIL-S-8879A (pulgadas) |
|---|---|---|
| NJ-3014R/L12<br>NJK-3008R/L20 | .0125/.0135<br>.0075/.0085 | .0125/.0150<br>.0075/.0090 |

**Nota de rosca "J" para el catálogo**

La forma de la rosca (SAE8879C) de radio de base controlada se define sólo para la rosca exterior. Para mecanizar la rosca interior correspondiente, elija cualquier plaquita que corte una rosca de clase 2B unificada y, a continuación, mandrine el diámetro menor según tamaño. Consulte en SAE8879C, MIL-S-8879C y SAEAS8879D los valores correctos del diámetro menor de la rosca "J".

## Datos de aplicaciones de roscas en V de 60°

| descripción de la plaquita | plaquita | D (mm) | E (mm) | recomendación de TPI | | recomendación de TP | |
|---|---|---|---|---|---|---|---|
| | | | | exterior | interior | exterior | interior |
|  | NT-1 | 1,91 | 1,12 | — | 24–12 | — | 1,00–2,00 |
| | NT-2 | 2,87 | 1,91 | 36–8 | 20–7 | 0,70–3,00 | 1,25–3,50 |
| | NT-2-K | 2,87 | 1,91 | 36–8 | 20–7 | 0,70–3,00 | 1,25–3,50 |
| | NTF-2 | 1,57 | 1,02 | 44–14 | 24–12 | 0,60–1,75 | 1,00–2,00 |
| | NTK-2 | 1,57 | 1,02 | 44–14 | 24–12 | 0,60–1,75 | 1,00–2,00 |
| | NTP-2 | 2,87 | 1,91 | 36–8 | 20–7 | 0,70–3,00 | 1,25–3,50 |
| | NT-3 | 3,76 | 2,46 | 20–6 | 12–5 | 1,25–4,00 | 2,00–5,00 |
| | NT-3-K | 3,76 | 2,46 | 20–6 | 12–5 | 1,25–4,00 | 2,00–5,00 |
| | NT-3-C | 3,76 | 2,46 | 11–6 | 6 (solamente) | 2,50–4,00 | 4,00 (solamente) |
| | NT-3-CK | 3,76 | 2,46 | 11–6 | 6 (solamente) | 2,50–4,00 | 4,00 (solamente) |
|  | NTF-3 | 2,11 | 1,37 | 44–10 | 24–9 | 0,60–2,50 | 1,00–2,50 |
| | NTK-3 | 2,11 | 1,37 | 44–10 | 24–9 | 0,60–2,50 | 1,00–2,50 |
| | NTP-3 | 3,76 | 2,46 | 20–6 | 12–5 | 1,25–4,00 | 2,00–5,00 |
| | NT-4 | 4,98 | 3,23 | 20–4 | 12–4 | 1,25–6,25 | 2,00–6,25 |
| | NT-4-K | 4,98 | 3,23 | 20–4 | 12–4 | 1,25–6,25 | 2,00–6,25 |
| | NTP-4 | 4,98 | 3,23 | 20–4 | 12–4 | 1,25–6,25 | 2,00–6,25 |

**Basado en el tamaño máximo del radio de la plaquita y las especificaciones de rosca de clase 2A y 2B.*

## Tabla de aplicaciones de plaquitas con formas de rosca API para conexiones de escuadras giratorias API

| forma de la rosca | plaquita WIDIA™ | | aplicación de la junta de herramienta | tamaño mínimo de caja* |
|---|---|---|---|---|
| | con cresta | sin cresta | | |
| V-.038R<br>2" TPF<br>4 TPI | NDC-4038R/L2<br>4-E/IR4API382 | ND-3038R/L | 2-3/8 API vaciado interior<br>2-7/8 API vaciado interior<br>3-1/2 API vaciado interior<br>4 API vaciado interior<br>4-1/2 API vaciado interior<br>5-1/2 API vaciado interior<br>6-5/8 API vaciado interior<br>4 API orificio completo<br>API #23, API #26, API #31,<br>API #35, API #38, API #40,<br>API #44, API #46, API #50 | API #31<br>2-7/8 IF |
| V-.038R<br>3" TPF<br>4 TPI | NDC-4038R/L3<br>4-E/IR4API383 | ND-3038R/L | API #56<br>API #61<br>API #70<br>API #77 | API #56 |
| V-.050<br>2" TPF<br>4 TPI | NDC-4050R/L2<br>4-E/IRAPI502 | ND-4050R/L | 5-1/2 API orificio completo<br>6-5/8 API regular<br>6-5/8 API orificio completo | 5-1/2 API orificio completo |
| V-.050<br>3" TPF<br>4 TPI | NDC-4050R/L3<br>4-E/IR4API503 | ND-4050R/L | 5-1/2 API regular<br>7-5/8 API regular<br>8-5/8 API regular | 5-1/2 API regular |
| V-.040<br>3" TPF<br>5 TPI | NDC-3040R/L3<br>NDC-4040R/L3<br>4-E/IR5API403 | ND-3040R/L<br>ND-4040R/L | 2-3/8 API regular<br>2-7/8 API regular<br>3-1/2 API regular<br>4-1/2 API regular | 3-1/2 API regular |

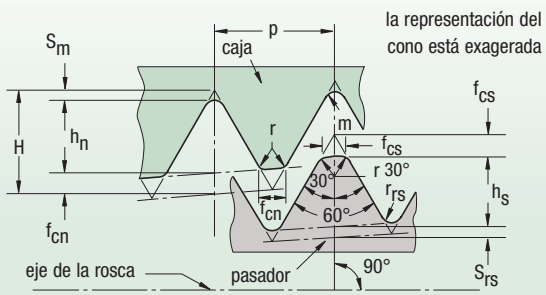
*Tamaño mínimo de la caja que se puede roscar con una plaquita TopThread estándar debido a un equipamiento de mandrinado mínimo.

## Formas de rosca API
## Dimensiones de rosca del producto • Conexiones de escuadras giratorias (Pulgadas)

| forma de la rosca | pulgadas por pie del cono | altura de la rosca, no truncada H | altura de la rosca, truncada $h_n=h_s$ | base truncada $S_m=S_{rs}$ $f_m=f_{rs}$ | cresta truncada $f_{cn}=f_{cs}$ | ancho de plano | | base radio $r_m=r_{rs}$ | radio en esquinas de rosca r | paso p |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | cresta $f_{cn}=f_{cs}$ | cresta $f_m=f_{rs}$ | | | |
| V-.038R | 2 | .216005 | .121844 | .038000 | .056161 | .065 | — | .038 | .015 | .250 |
| V-.038R | 3 | .215379 | .121381 | .038000 | .055998 | .065 | — | .038 | .015 | |
| V-.040 | 3 | .172303 | .117842 | .020000 | .034461 | .040 | — | .020 | .015 | .250 |
| V-.050 | 3 | .215379 | .147303 | .025000 | .043076 | .050 | — | .025 | .015 | |
| V-.050 | 2 | .216005 | .147804 | .025000 | .043201 | .050 | — | .025 | .015 | .250 |

*NOTA: todas las dimensiones son en pulgadas.*

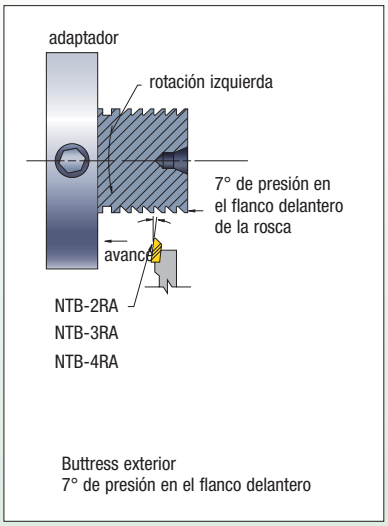
## Forma de rosca de producto V-.040 y V-.050

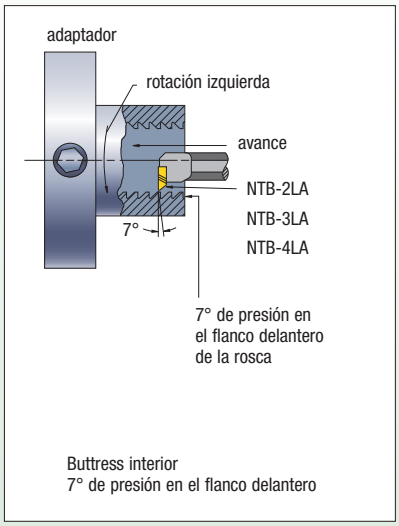


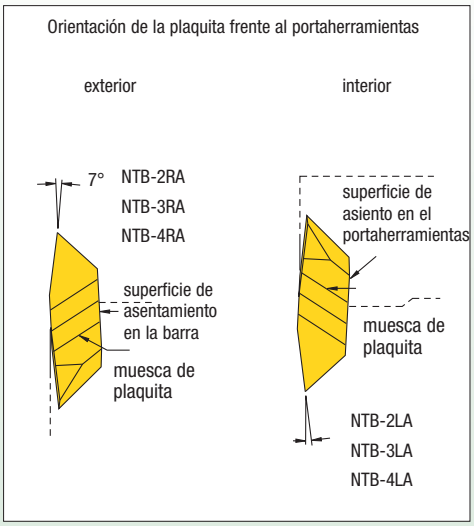

## Rosca redonda de tuberías y carcasas (Dimensiones de altura)

| elemento de la rosca | 10 TPI p=.1000 | 8 TPI p=.1250 |
|---|---|---|
| H = .866p | .08660 | .10825 |
| $H_s=h_n$ = .626p-.007 | .05560 | .07125 |
| $S_{rs}=S_m$ = .120p+.002 | .01400 | .01700 |
| $S_{cs}=S_{cn}$ = .120p+.005 | .01700 | .02000 |

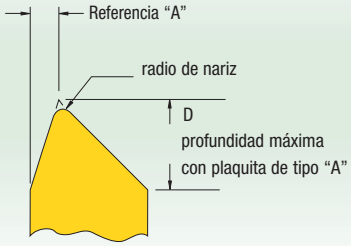
## Plaquitas NTB-A Buttress americano (7° de presión en el flanco delantero) • Tipo de empuje



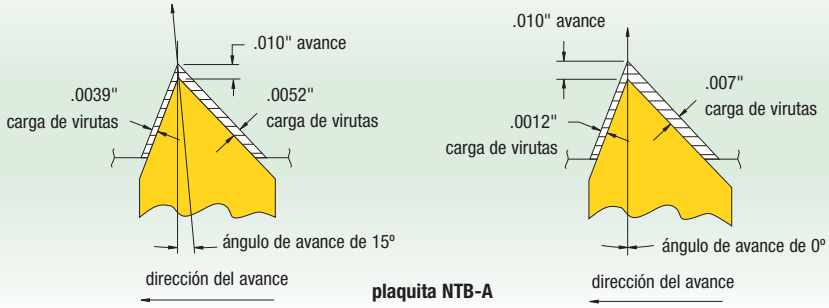




## Dimensiones de referencia




## Ángulo de avance frente a carga de virutas: 7° de presión en el flanco delantero




| plaquita | D (pulgadas) | Ref. "A" (pulgadas) | radio de nariz (pulgadas) | paso basado en radio máximo |
|---|---|---|---|---|
| NTB-2A | .133 | .024 | .002–.004 | 16–20 TPI |
| NTB-3A | .171 | .031 | .005–.008 | 8–16 TPI |
| NTB-4A | .218 | .049 | .008–.012 | 4–6 TPI |

*NOTA: para una carga de virutas equilibrada, se recomienda un ángulo de avance de 15°.*

## Limitaciones de roscado interior

**limitaciones de roscado interior**
**plaquitas de roscado tipo Buttress NTB-2A**

| TPI | tamaño de rosca nominal | diámetro menor mínimo (pulgadas) |
|---|---|---|
| 8 | 1-3/4 | 1.600 |
| 10 | 1-5/8 | 1.505 |
| 12 | 1-1/2 | 1.400 |
| 16 | 1-1/4 | 1.175 |
| 20 | 1-1/16 | 1.002 |

**limitaciones de roscado interior**
**plaquitas de roscado tipo Buttress NTB-3 y NTB-4A**

| TPI | tamaño de rosca nominal | diámetro menor mínimo (pulgadas) |
|---|---|---|
| 4* | 2-1/2 | 2.200 |
| 5 | 2-1/4 | 2.010 |
| 6 | 2 | 1.800 |
| 8 | 1-3/4 | 1.600 |
| 10 | 1-5/8 | 1.505 |
| 12** | 1-1/2 | 1.400 |

*Sólo plaquita NTB-4A.
**Puede cortar 16 o 20 roscas por pulgada siempre que el diámetro menor sea de 1,375".

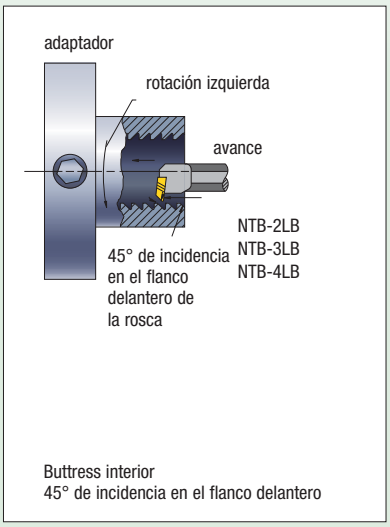
## Tabla de roscas por pulgada frente a radio máximo de base (pulgadas)

| TPI | 20 | 16 | 12 | 10 | 8 | 6 | 5 | 4 | 3 | 2-1/2 | 2 | 1-1/2 | 1-1/4 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| radio máximo de base | .0036 | .0045 | .0059 | .0071 | .0089 | .0119 | .0143 | .0179 | .0238 | .0286 | .0375 | .0476 | .0572 | .0714 |

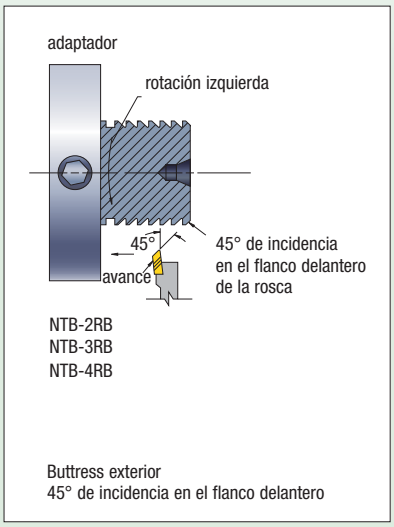
*NOTA: las formas especiales tipo Buttress están disponibles previa solicitud.*

## Líneas generales de aplicación de Buttress americano para el sistema TopThread

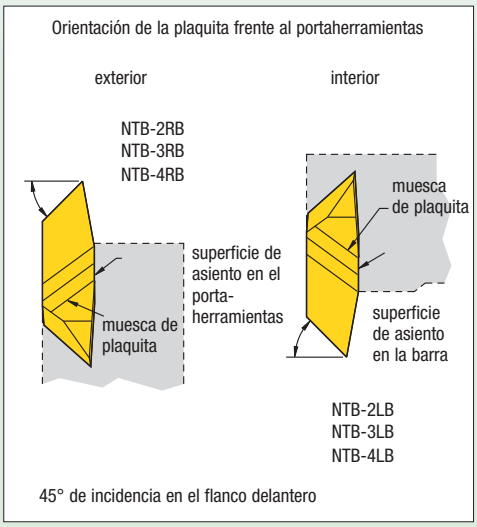
### Buttress americano (45° de incidencia en el flanco delantero): plaquitas NTB-B • tipo de tracción




Buttress interior
45° de incidencia en el flanco delantero

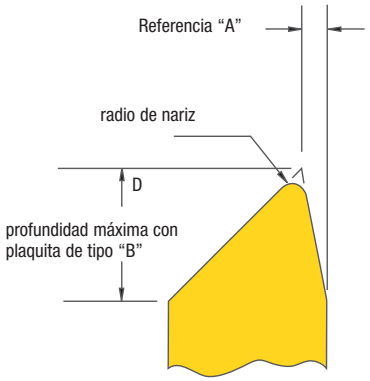



Buttress exterior
45° de incidencia en el flanco delantero

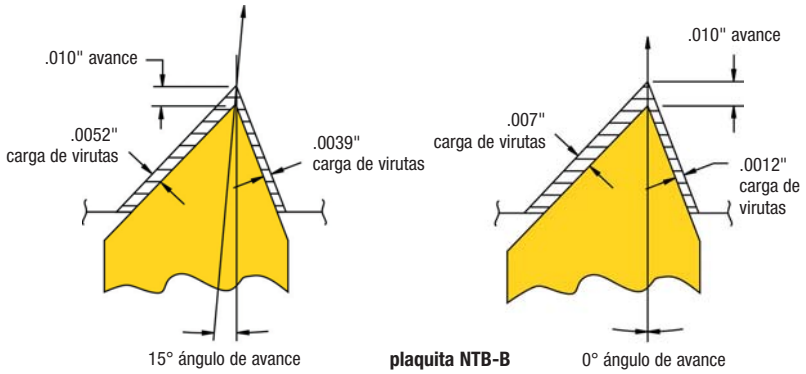



45° de incidencia en el flanco delantero

### Dimensiones de referencia




### Ángulo de avance frente a carga de virutas: 45° de incidencia en el flanco delantero




| plaquita | D (pulgadas) | Ref. "A" (pulgadas) | radio de nariz (pulgadas) | paso basado en radio máximo |
|---|---|---|---|---|
| NTB-3B | .171 | .031 | .005–.004 | 8–16 TPI |

*NOTA: para una carga de virutas equilibrada, se recomienda un ángulo de avance inverso de 15°.*

### Limitaciones de roscado interior

| Limitaciones de roscado interior plaquitas de roscado tipo Buttress NTB-2B | | |
|---|---|---|
| **TPI** | **tamaño de rosca nominal** | **diámetro menor mínimo (pulgadas)** |
| 8 | 1-3/4 | 1.600 |
| 10 | 1-5/8 | 1.505 |
| 12 | 1-1/2 | 1.400 |
| 16 | 1-1/4 | 1.175 |
| 20 | 1-1/16 | 1.002 |

| Limitaciones de roscado interior plaquitas de roscado tipo Buttress NTB-3 y NTB-4B | | |
|---|---|---|
| **TPI** | **tamaño de rosca nominal** | **diámetro menor mínimo (pulgadas)** |
| 4* | 2-7/8 | 2.575 |
| 5 | 2-3/4 | 2.510 |
| 6 | 2-3/8 | 2.175 |
| 8 | 2-1/8 | 1.975 |
| 10 | 1-7/8 | 1.755 |
| 12 | 1-5/8 | 1.525 |
| 16 | 1-1/2 | 1.407 |
| 20 | 1-7/16 | 1.378 |

*Sólo plaquita NTB-4B.

# WIN WITH WIDIA™

WIDIA™

## Sistema **TopThread**™

Una elección excelente para las aplicaciones pesadas como el mecanizado de roscas Acme, Buttress y API. El sistema TopThread de WIDIA™ es la mejor solución para aplicaciones de roscado de multi-dientes y paso ancho. Gracias a su tecnología de herramientas incomparable, puede estar seguro de que las herramientas TopThread de WIDIA proporcionarán todo lo que necesite para el roscado y ranurado.

- La mayor selección de geometrías y calidades de plaquitas del sector.
- Un diseño de fijación rígida de la plaquita asegura que la vida de la herramienta, el acabado superficial y la calidad de la pieza de trabajo sean las mejores.
- Minimiza los recrecimientos del filo, reduce las fuerzas de corte y corta con precisión los materiales más comunes.
- Asegura unas roscas precisas de gran calidad. Excelente para operaciones de roscado interior.

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Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

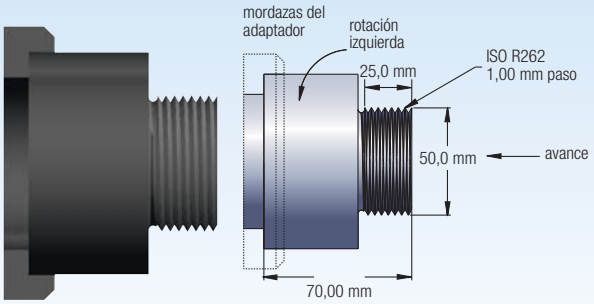
## Información necesaria

**Del plano de la pieza:**

material: 316SS, 200 HB
forma de rosca: ISO R262 1,00 mm paso
operación: roscado exterior
diámetro de paso: 50,0 mm x 25,0 mm de profundidad

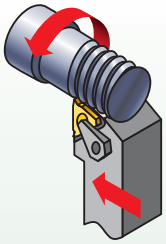
**De los datos de configuración de la máquina:**

herramientas: 20,0 mm x 20,0 mm
rotación del husillo: izquierda
avance: hacia el adaptador




## Pasos para un roscado correcto

### Paso 1 • Determine el método de roscado



**Le interesa saber:**

- Operación (exterior).
- Rotación del husillo (izquierda).
  *Rotación izquierda.*
- Dirección de avance (hacia el adaptador).
- Portaherramientas derecha.
- Plaquita derecha (ER).
- Método de hélice estándar.

### Paso 2 • Seleccione la plaquita

**Le interesa saber:**

- Forma de rosca (ISO R262 paso de 1,00 mm).
- Lado de la plaquita (derecha — ER).

**Elija la solución de alto rendimiento**

| número de catálogo | tamaño de la plaquita | TN6025 |
|---|---|---|
| 3ER10ISO | 3 | ● |

**Selección de alto rendimiento**

*NOTA: use la plaquita con el mayor tamaño disponible.*

plaquita: 3ER10ISO
calidad: TN6025
velocidad: 150 m/min

### Paso 3 • Seleccione la velocidad y calidad

**Le interesa saber:**

- Material de la pieza de trabajo (316SS-200HB).
- Operación (exterior).

Opciones: Directrices de selección de la calidad y velocidad

| roscado operación | acero inoxidable |
|---|---|
| exterior | Aplicaciones generales y alto rendimiento |
| | KC6025 |
| | 50–360 m/min |

### Paso 4 • Seleccione el portaherramientas

**Le interesa saber:**

- Sentido exterior o interior (exterior).
- Diámetro del paso para determinar el diámetro de agujero mínimo (N/A).
- Tipo de herramientas — portaherramientas, barra de mandrinar (portaherramientas).
- Sentido de la herramienta (derecha).
- Tamaño de la plaquita (16).

Opciones:

| número de catálogo | tamaño de la plaquita | apoyo |
|---|---|---|
| ALA203R | 3 | SM-YE3 |

**Primera opción: LSASR2020K16 porta**

### Paso 5 • Seleccione el apoyo

**Le interesa saber:**

- Forma de rosca — TPI o paso (paso de 1,00 mm).
- Diámetro del paso (50,0 mm).
- Método de hélice (estándar).
  *Consulte la tabla de selección de apoyos LT.*

**Seleccione SM-YE3**

*NOTA: para esta aplicación el apoyo estándar suministrado debe sustituirse por el apoyo recomendado, SM-YE3.*

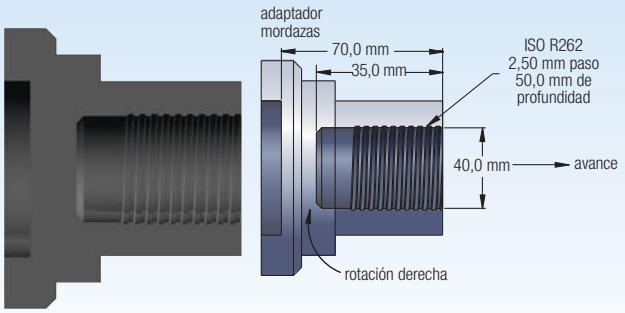
## Información necesaria

**Del plano de la pieza:**

material: 4140 acero
forma de rosca: ISO R262 2,50 mm paso
operación: roscado interior
diámetro de paso: 40,0 mm x 35,0 mm de profundidad

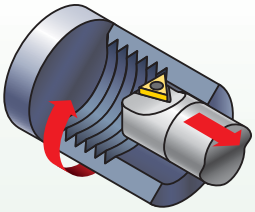
**De los datos de configuración de la máquina:**

herramientas: 20,0 mm barra de mandrinar
rotación del husillo: derecha
avance: desde el adaptador




# Pasos para un roscado correcto

### Paso 1 • Determine el método de roscado



**Le interesa saber:**

- Sentido (interior).
- Rotación del husillo (derecha).
  *Rotación derecha.*
- Dirección del avance (desde el adaptador).
- Portaherramientas izquierda.
- Plaquita izquierda (NL).
- Método de hélice en retroceso.

### Paso 2• Seleccione la plaquita

**Le interesa saber:**

- Forma de rosca (tipo de sistema métrico ISO 6G/6H).
- Sentido de la plaquita (a izquierdas — NL).

**Elija la solución de alto rendimiento**

| número de catálogo | tamaño de la plaquita | TN6025 |
|---|---|---|
| 3IL25ISO | 3 | ● |

**Selección de alto rendimiento**

*NOTA: use la plaquita con el tamaño máximo más ancho posible para ajustarse al agujero.*

plaquita: 3IL25ISO
calidad: TN6025
velocidad: 130 m/min

### Paso 3 • Seleccione la velocidad y calidad

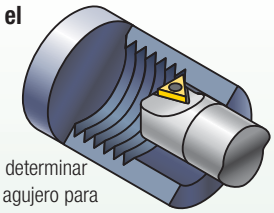
**Le interesa saber:**

- Material de la pieza de trabajo (4010 acero).
- Sentido (interior).

Opciones: Directrices de selección de la calidad y velocidad

| operación de roscado | acero | |
|---|---|---|
| | aplicaciones generales | tipo |
| interior | TN6025 | ISO Sistema métrico |
| | 40–200 m/min | |

### Paso 4 • Seleccione el portaherramientas



**Le interesa saber:**

- Sentido exterior o interior (interior).
- Diámetro del paso para determinar el diámetro mínimo del agujero para el roscado interior (40,0 mm).
- Tipo de herramienta — portaherramientas, barra de mandrinar (barra de mandrinar).
- Sentido de la herramienta (a izquierdas).
- Tamaño de la plaquita (16).

Opciones:

| número de catálogo | tamaño de la plaquita | diámetro mínimo del agujero | apoyo |
|---|---|---|---|
| A2020LSEL16 | 3 | 24 | SM-YI3 |

**Primera opción: S1212-LSEL3 barra**

### Paso 5 • Seleccione el apoyo

**Le interesa saber:**

- Forma de rosca — TPI o paso (paso de 2,50 mm).
- Diámetro del paso (40,0 mm).
- Método de hélice (en retroceso).
  *Consulte la tabla de selección de apoyos LT.*

**Seleccione SM-YI3**

*NOTA: para esta aplicación, el apoyo estándar suministrado debe sustituirse por el apoyo recomendado, SM-YI3.*

## Directrices de selección de apoyo para el roscado Laydown

Plantéese las siguientes preguntas antes de empezar con el roscado:

A — Seleccione el método de corte del roscado:
- mecanizado hacia el mandril (hélice estándar)
- mecanizado desde el mandril (hélice inversa)

B — Seleccione el ángulo de ataque y el apoyo.

C — Seleccione el tamaño de la plaquita y del portaherramientas.

D — Seleccione la calidad de la plaquita.

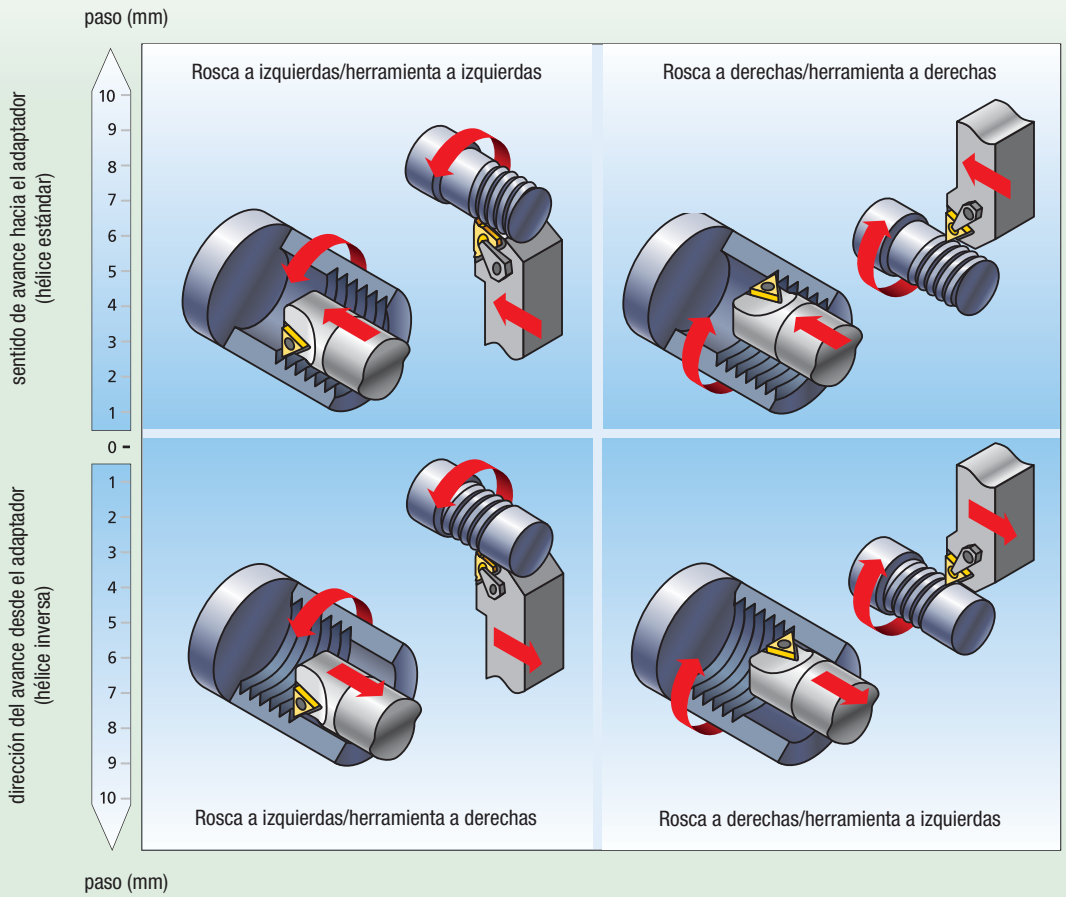
E — Seleccione la velocidad.

F — Seleccione el número de pasos de rosca.

G — Seleccione el método de avance.

*NOTA: para determinar el método de corte del roscado, tenga en cuenta la estabilidad y la forma de la pieza, así como el flujo de virutas para tomar su decisión.*

## Gráfica de selección de roscado Laydown




*NOTA: para las roscas con varias entradas, use el valor de ataque en lugar del valor del paso.*

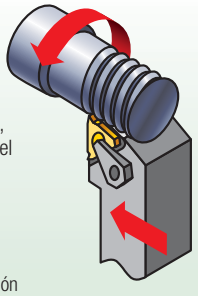
## Diagrama de los ángulos de ataque de la rosca

Para calcular el ángulo de ataque de una rosca determinada, use esta fórmula:

$$\beta = \text{Arcotangente } \frac{P \bullet S}{\pi \, De}$$

ß = ángulo de ataque de la rosca
De = diámetro del paso efectivo del desgaste de la rosca
P = 1/TPI
TPI = roscas por pulgada
S = número de entradas
entrada única, ataque = paso
varias entradas, ataque = número de entradas del paso (x)

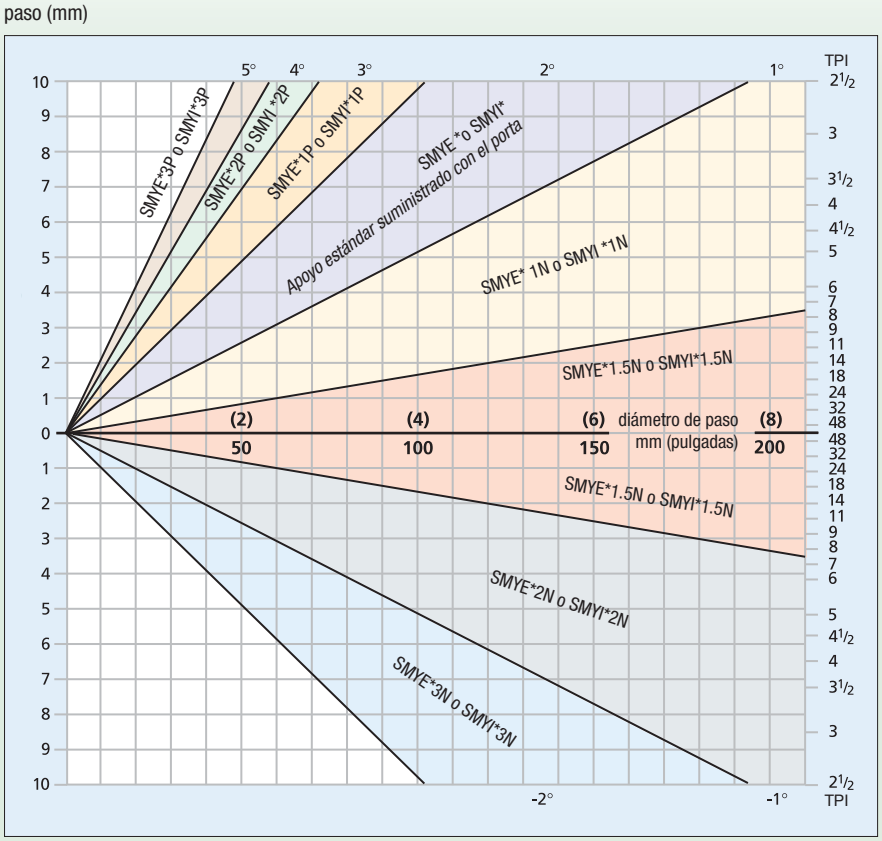
Todos los portaherramientas están diseñados con un ángulo de inclinación = 1,5°. Al tornear las roscas estándar con un ángulo de ataque de 1–2°, se garantiza una incidencia adecuada en los flancos del diente de la rosca de la plaquita. El ángulo de ataque de la rosca y el ángulo de inclinación de la plaquita se obtienen de ß (de la ecuación de la izquierda).



La altura del filo de corte es constante en cada combinación de apoyo y plaquita. Todos los portaherramientas se suministran con un ángulo de ataque de 1-1/2°.

*NOTA: el arco tangente es igual a la Tan$^{-1}$ (consulte la tabla siguiente para obtener los ángulos de ataque aproximados.)*

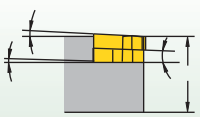
## Gráfica de selección de roscado Laydown




*indica el tamaño del apoyo: 3 = tamaño de la plaquita 16 (3/8" D)
4 = tamaño de la plaquita 22 (1/2" D)

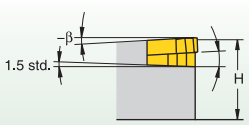
**método de hélice estándar:**

Se usa cuando la rosca a izquierdas se corta con una herramienta a derechas o una rosca a derechas con una herramienta a izquierdas.



**método de hélice en retroceso:**

Se usa cuando la rosca a derechas se corta con una herramienta a izquierdas o cuando la rosca a izquierdas se corta con una herramienta a derechas.



## Tabla de selección de apoyos para el roscado Laydown • Sistema métrico

| | portaherramientas | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| tamaño de la plaquita | exterior | interior | código de pedido del apoyo (mm) | | | | | | | |
| | | | | | | estándar | | | | |
| 3 (9,52) | a derechas | a izquierdas | SM–YE3–3P | SM–YE3–2P | SM–YE3–1P | SM–YE3 | SM–YE3–1N | SM–YE3–1.5N | SM–YE3–2N | SM–YE3–3N |
| 3 (9,52) | a izquierdas | a derechas | SM–YI3–3P | SM–YI3–2P | SM–YI3–1P | SM–YI3 | SM–YI3–1N | SM–YI3–1.5N | SM–YI3–2N | SM–YI3–3N |
| 4 (12,7) | a derechas | a izquierdas | SM–YE4–3P | SM–YE4–2P | SM–YE4–1P | SM–YE4 | SM–YE4–1N | SM–YE4–1.5N | SM–YE4–2N | SM–YE4–3N |
| 4 (12,7) | a izquierdas | a derechas | SM–YI4–3P | SM–YI4–2P | SM–YI4–1P | SM–YI4 | SM–YI4–1N | SM–YI4–1.5N | SM–YI4–2N | SM–YI4–3N |
| TPI | | paso (mm) | diámetro de paso (mm) | | | | | | | |
| 72 | | | | | | 3,1–8 | 8–21,4 | >21,4 | 21,4–8 | 8–3,1 |
| | | 0,35 | | | | 3,0–8 | 8–21,3 | >21,3 | 21,3–8 | 3–8 |
| 64 | | | | | | 3,4–9 | 9–24,1 | >24,1 | 24,1–9 | 9–3,4 |
| | | 0,40 | | | | 3,5–9,1 | 9,1–24,3 | >24,3 | 24,3–9,1 | 9,1–3,5 |
| 56 | | 0,45 | | | | 3,9–10,3 | 10,3–27,6 | >27,6 | 27,6–10,3 | 10,3–3,9 |
| | | 0,50 | | | 2,8–4,3 | 4,3–11,4 | 11,4–30,4 | >30,4 | 30,4–11,4 | 11,4–4,3 |
| 48 | | | | | 3–4,6 | 4,6–12,1 | 12,1–32,2 | >32,2 | 32,2–12,1 | 12,1–4,6 |
| 44 | | | | | 3,3–5 | 5–13,2 | 13,2–35,1 | >35,1 | 35,1–13,2 | 13,2–5 |
| | | 0,60 | | 2,6–3,4 | 3,4–5,2 | 5,2–13,7 | 13,7–36,5 | >36,5 | 36,5–13,7 | 13,7–5,2 |
| 40 | | | | 2,8–3,6 | 3,6–5,5 | 5,5–14,5 | 14,5–38,6 | >38,6 | 38,6–14,5 | 14,5–5,5 |
| | | 0,70 | | 3,0–4 | 4–6,1 | 6,1–16 | 16–42,6 | >42,6 | 42,6–16 | 16–6,1 |
| 36 | | | | 3,1–4 | 4–6,1 | 6,1–16,1 | 16,1–42,9 | >42,9 | 42,9–16,1 | 16,1–6,1 |
| | | 0,75 | 2,8–3,2 | 3,3–4,3 | 4,3–6,5 | 6,5–17,1 | 17,1–45,6 | >45,6 | 45,6–17,1 | 17,1–6,5 |
| 32 | | | 3–3,4 | 3,4–4,5 | 4,5–6,9 | 6,9–18,1 | 18,1–48,3 | >48,3 | 48,3–18,1 | 18,1–6,9 |
| | | 0,80 | 3–3,5 | 3,5–4,6 | 4,6–6,9 | 6,9–18,2 | 18,2–48,6 | >48,6 | 48,6–18,2 | 18,2–6,9 |
| 28 | | | 3,4–3,9 | 3,9–5,2 | 5,2–7,9 | 7,9–20,7 | 20,7–55,1 | >55,1 | 55,1–20,7 | 20,7–7,9 |
| 27 | | | 3,6–4,1 | 4,1–5,4 | 5,4–8,2 | 8,2–21,4 | 21,4–57,2 | >57,2 | 57,2–21,4 | 21,4–8,2 |
| | | 1,00 | 3,8–4,3 | 4,3–5,7 | 5,7–8,7 | 8,7–22,8 | 22,8–60,8 | >60,8 | 60,8–22,8 | 22,8–8,7 |
| 24 | | | 4–4,6 | 4,6–6 | 6–9,2 | 9,2–24,1 | 24,1–64,3 | >64,3 | 64,3–24,1 | 24,1–9,2 |
| | | 1,25 | 4,7–5,4 | 5,4–7,1 | 7,1–10,8 | 10,9–28,5 | 28,5–76 | >76,0 | 76–28,5 | 28,5–10,8 |
| 20 | | | 4,8–5,5 | 5,5–7,2 | 7,2–11 | 11–28,9 | 29–77,2 | >77,2 | 77,2–28,9 | 29–11 |
| 18 | | | 5,3–6,1 | 6,1–8 | 8–12,2 | 12,2–32,2 | 32,2–85,8 | >85,8 | 85,8–32,2 | 32,2–12,2 |
| | | 1,50 | 5,7–6,5 | 6,5–8,5 | 8,5–13 | 13–34,2 | 34,2–91,2 | >91,2 | 91,2–34,2 | 34,2–13 |
| 16 | | | 6–6,9 | 6,9–9 | 9–13,8 | 13,8–36,2 | 36,2–96,5 | >96,5 | 96,5–36,2 | 36,2–13,8 |
| | | 1,75 | 6,6–7,96 | 7,6–10 | 10–15,2 | 15,2–39,9 | 39,9–106,4 | >106,4 | 106,4–39,9 | 39,9–15,2 |
| 14 | | | 6,9–7,9 | 7,9–10,3 | 10,3–15,7 | 15,7–41,4 | 41,4–110,3 | >110,3 | 110,3–41,4 | 41,4–15,7 |
| 13 | | | 7,4–8,5 | 8,5–11,1 | 11,1–17 | 17–44,5 | 44,5–118,8 | >118,8 | 118,8–44,5 | 44,5–17 |
| | | 2,00 | 7,6–8,7 | 8,7–11,4 | 11,4–17,4 | 17,4–45,6 | 45,6–121,6 | >121,6 | 121,6–45,6 | 45,6–17,4 |
| 12 | | | 8–9,2 | 9,2–12 | 12,1–18,4 | 18,4–48,2 | 48,3–128,7 | >128,7 | 128,7–48,2 | 48,2–18,4 |
| 11,5 | | | 8,4–9,6 | 9,6–12,6 | 12,6–19,2 | 19,2–50,3 | 50,3–134,3 | >134,3 | 134,3–50,3 | 50,3–19,2 |
| 11 | | | 8,8–10 | 10–13,1 | 13,1–20 | 20–52,6 | 52,6–140,4 | >140,4 | 140,4–52,6 | 52,6–20 |
| | | 2,50 | 9,5–10,8 | 10,8–14,2 | 14,2–21,7 | 21,7–57 | 57–152 | >152,0 | 152–57 | 57–21,7 |
| 10 | | | 9,6–11 | 11–14,5 | 14,5–22 | 22–57,9 | 57,9–154,4 | >154,4 | 154,4–57,9 | 57,9–22 |
| 9 | | | 10,7–12,2 | 12,2–16,1 | 16,1–24,5 | 24,5–64,3 | 64,3–171,6 | >171,6 | 171,6–64,3 | 64,3–24,5 |
| | | 3,00 | 11,4–13 | 13–17,1 | 17,1–26 | 26–68,4 | 68,4–182,4 | >182,4 | 182,4–68,4 | 68,4–26 |
| 8 | | | 12–13,8 | 13,8–18,1 | 18,1–27,6 | 27,6–72,4 | 72,4–193 | >193,0 | 193–72,4 | 72,4–27,6 |
| | | 3,50 | 13,3–15,2 | 15,2–19,9 | 19,9–30,4 | 30,4–79,8 | 79,8–212,8 | >212,8 | 212,8–79,8 | 79,8–30,4 |
| 7 | | | 13,8–15,7 | 15,7–20,7 | 20,7–31,5 | 31,5–82,7 | 82,7–220,6 | >220,6 | 220,6–82,7 | 82,7–31,5 |
| | | 4,00 | 15,2–17,3 | 17,3–22,8 | 22,8–34,7 | 34,7–91,2 | 91,2–243,2 | >243,2 | 243,2–91,2 | 91,2–34,7 |
| 6 | | | 16–18,3 | 18,3–24,1 | 24,1–36,7 | 36,7–96,5 | 96,5–257,4 | >257,4 | 257,4–96,5 | 96,5–36,7 |
| | | 5,00 | 19–21,7 | 21,7–28,5 | 28,5–43,4 | 43,4–114 | 114–304 | >304,0 | 304–114 | 114–43,4 |
| 5 | | | 19,3–22 | 22–28,9 | 28,9–44,1 | 44,1–115,8 | 115,8–308,8 | >308,8 | 308,8–115,8 | 115,8–44,1 |
| 4,5 | | | 21,4–24,5 | 24,5–32,1 | 32,1–49 | 49–128,7 | 128,7–343,1 | >343,1 | 343,1–128,7 | 128,7–49 |
| | | 6,00 | 22,7–26 | 26–34,2 | 34,2–52,1 | 52,1–136,8 | 136,8–364,8 | >364,8 | 364,8–136,8 | 136,8–52,1 |
| 4 | | | 24,1–27,5 | 27,5–36,2 | 36,2–55,1 | 55,1–144,8 | 144,8–386 | >386 | 386–144,8 | 144,8–55,1 |
| ángulo de inclinación | | | 4.5 | 3.5 | 2.5 | 1.5 | 0.5 | 0.0 | –0.5 | –1.5 |
| | | | hélice estándar (avance hacia el adaptador) | | | | | | hélice inversa (avance desde el adaptador) | |

*1. Seleccione el TPI o TP en las columnas de la izquierda.*

*2. Recorra la fila hasta el diámetro de paso especificado y el sentido de avance correcto.*

*3. Recorra la columna hasta la parte superior para obtener el apoyo correspondiente al tamaño de la plaquita y al portaherramientas.*

# WIN WITH WIDIA™

WIDIA™

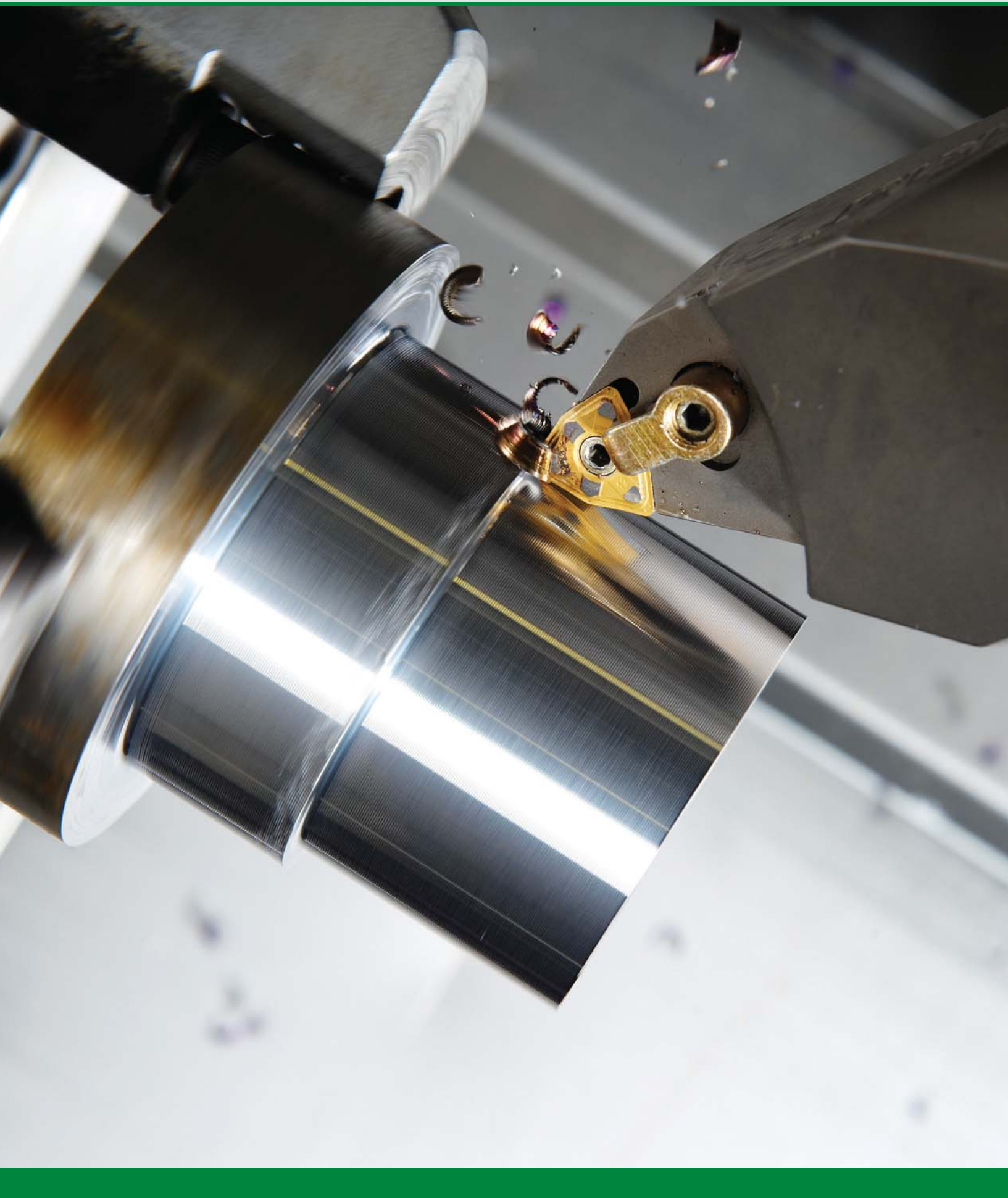
## Sistema de roscado **Laydown**

El sistema de roscado Laydown de WIDIA™ diseñado especialmente asegura la mayor precisión y calidad disponibles para satisfacer todos los estándares de producción modernos. Con una amplia gama de plaquitas y portaherramientas disponible, la plataforma de roscado Laydown es ideal para todos sus requisitos de roscado exterior.

- Una amplia selección de formas de rosca comunes en Europa y métricas (ISO).
- Diseño de perfil bajo que permite un flujo de virutas sin restricciones.
- Formas de rosca rectificadas con precisión para cortes precisos.
- Ideal para roscas de paso fino, roscas de hélice elevada/entrada múltiple y roscado de un solo punto en mandrinados de diámetro pequeño.

WIDIA™
Win with WIDIA™

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.



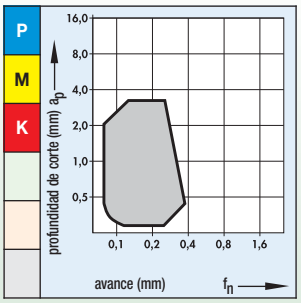
# Valor WIDIA™

**Geometría del rompevirutas • Negativa** ..... **F2–F3**
**Geometría del rompevirutas • Positiva** ..... **F3**
**Calidades y descripciones de calidades** ..... **F4**
**Tabla de velocidades y avances** ..... **F6–F7**
**Sistema de numeración de catálogo** ..... **F8–F9**
**Plaquitas de metal duro** ..... **F10–F21**

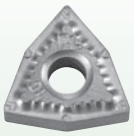
## Plaquitas negativas de doble cara

### 22

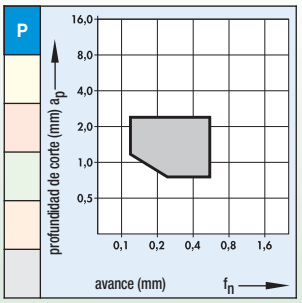
Para el torneado en acabado y la producción de superficies suaves y precisas. Excelente control de virutas, especialmente a bajas profundidades de corte.




### FL

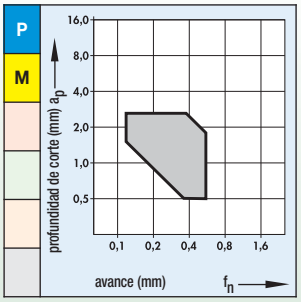


Plaquita de doble cara con ángulo de inclinación ajustado para lograr un buen control de virutas a bajas profundidades de corte.



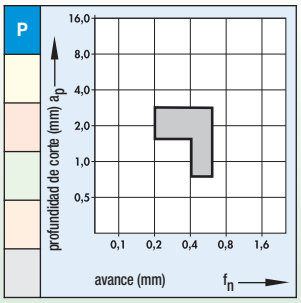

### FM

Para operaciones de torneado de aplicaciones medias. Rompevirutas de corte suave. Para aplicaciones que produzcan varias secciones de virutas, como el torneado copiado y de perfil. Buena precisión dimensional. Para materiales de acero suave y aceros inoxidables.



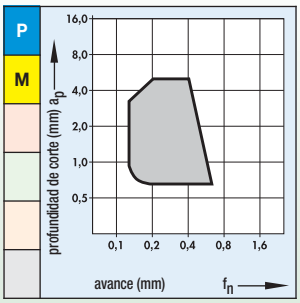

### FR

Plaquita de doble cara con geometría positiva media. Un ángulo de inclinación ajustado reduce las fuerzas de corte y proporciona un buen control de virutas sobre un amplio rango de avance.



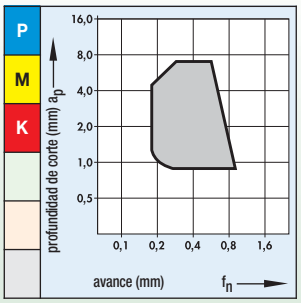

### 49

Para un torneado medio y en desbaste. Control de virutas excelente debido a un elemento de rompevirutas configurado especialmente en el área de las esquinas. Buena formación de virutas con bajas profundidades de corte.

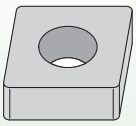



### 5

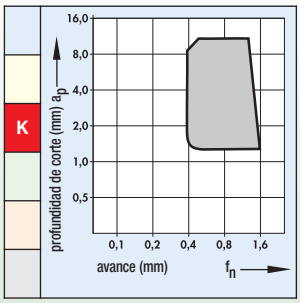
Para un torneado de aplicaciones medias y en desbaste. Excepcional control de virutas. Gran fuerza en los filos para cortes interrumpidos, costra forjada o cascarilla. Ideal para todas las fundiciones como la gris, la maleable y la nodular.



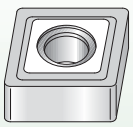

### ..MA



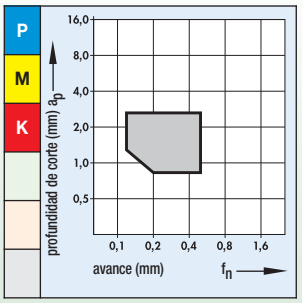
Geometría superior de planos para el mecanizado de fundición. Para aplicaciones de acabado y desbaste.




### ..MG



Para mecanizado ligero y desbaste ligero.

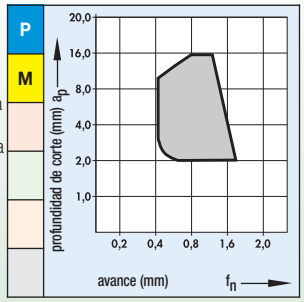



| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

## Plaquitas negativas de una cara

### 8

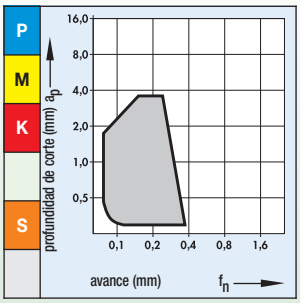
Filo del corte estable para las mayores secciones de virutas y las tasas de evacuación de metal más altas. Para un corte interrumpido y aplicaciones con una alta carga del filo de corte. Profundidades de corte de hasta 16,0 mm y avances de hasta 1,6 mm.




## Plaquitas positivas de una cara

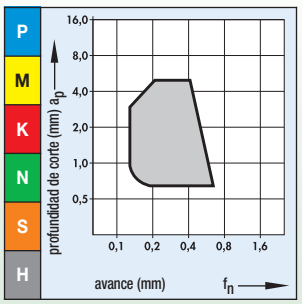
### MU

El torneado medio universal incluye un mecanizado en desbaste con cargas medias de virutas y un mecanizado en acabado con bajas cargas de virutas.




### ..MT

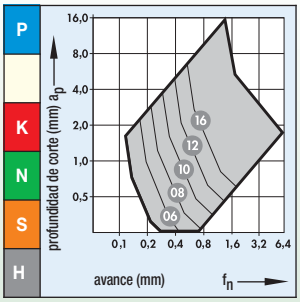
Filo de corte estabilizado para secciones de virutas medias. Eficaz en operaciones que exigen una gran tenacidad o incluyen cortes interrumpidos.



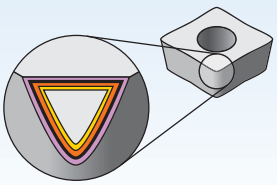

## Plaquitas positivas y redondas

### RCMT/RCMX

Para torneado recto, planeado y torneado de perfil. Para pequeñas profundidades de corte y altos avances de hasta 0,1 x D.



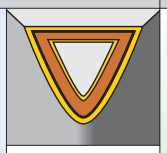
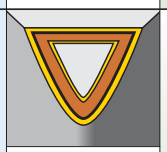
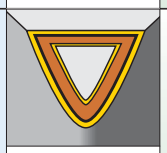
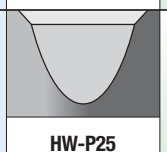
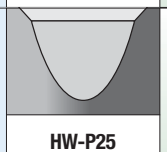
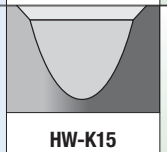
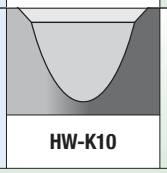

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |



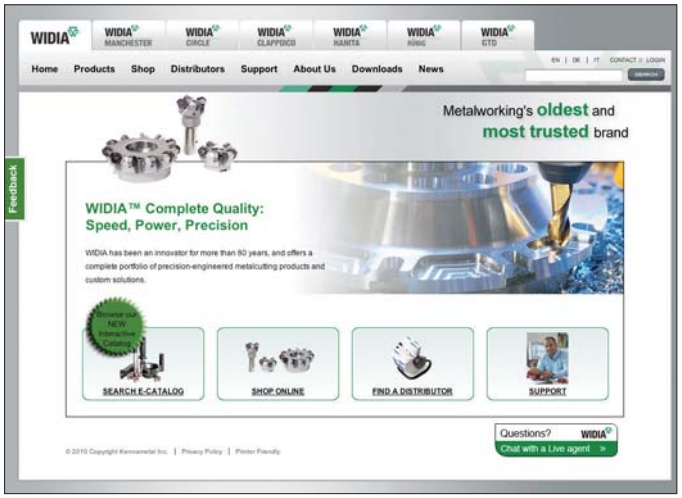
**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para operaciones desde acabado hasta desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|
| **TN1000**  **HC-P10** | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Una calidad metálica dura con recubrimiento de CVD y sustrato enriquecido con cobalto posee una gran resistencia a las deformaciones. Un recubrimiento de CVD se compone de MTCVD – TiCN grueso para una resistencia al desgaste y $Al_2O_3$ térmicamente estable para resistencia a cráteres. TN1000 es una calidad de metal duro altamente resistente al desgaste para el acabado y el mecanizado medio de aceros y fundición. | P K | P K | P K | P K | | | | | |
| **TN2000**  **HC-P20** | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Un sustrato enriquecido con cobalto y con recubrimiento de CVD posee la tenacidad en masa necesaria con un recubrimiento MTCVD multicapa que proporciona la resistencia al desgaste y a los cráteres que se requiere en el mecanizado de aceros. TN2000 es una calidad óptima y la primera opción para el mecanizado mínimo de acero. TN2000 ofrece la resistencia a impactos de virutas necesaria, proporcionando una mayor vida a la herramienta. | P | P | P | P | P | P | | | |
| **TN4000** **HC-P35** | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Un sustrato metálico duro con recubrimiento de CVD con mayor contenido en cobalto ofrece una buena tenacidad, lo necesario para aplicaciones de desbaste. El sustrato posee una capa superior enriquecida con cobalto para ofrecer al filo de corte la fuerza adicional necesaria en aplicaciones de desbaste. TN4000 es la primera opción para aplicaciones de desbastado y puede soportar tanto cortes interrumpidos como grandes profundidades de corte. | P M | M | M | | P | P | P | P | |
| **HK1500**  **HC-K15** | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Un sustrato de metal duro con recubrimiento de CVD resistente al desgaste y con recubrimiento grueso de TiCN y alfa-alúmina, lo cual ofrece la resistencia al desgaste necesaria para el mecanizado de materiales que formen virutas discontinuas, como la fundición. TN1500 es ideal para el mecanizado de fundición. Para aplicaciones de mecanizado ligero y medio de fundiciones. | K | K | K | K | K | | | | |
| **TTS**  **HW-P25** | Calidad universal sin recubrir para el mecanizado de acero. Recomendada para torneado de acabado y desbastado de materiales de astillamiento largos con corte transversal de virutas grandes a velocidades de corte medias. También de utilidad para ranurado y roscado. | P | P | P | P | P | P | | | |
| **TTR-X**  **HW-P25** | Calidad muy dura y sin recubrir. Apta para desbaste de acero y acero inoxidable. También para condiciones difíciles de mecanizar con bajas velocidades de corte. | P M | P M | P M | P M | P M | P M | P M | P M | |
| **THM-X**  **HW-K15** | Calidad sin recubrir y con buena estabilidad del filo. Calidad ideal para el mecanizado medio de fundiciones y materiales no férreos. | K N | K N | K N | K N | | | | | |
| **THMF-X**  **HW-K10** | Micrograno fino con buena fuerza de compresión. Para mecanizado ligero y medio de materiales de fundición dura y fundición gris aleada. También apta para metales no férreos y materiales plásticos duros. Ideal para mecanizado de acabado de fundición. | K N | K N | K N | | | | | | |

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

## *Productos WIDIA*

Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.

# Tabla de velocidades y avances

Plaquitas negativas • Sistema métrico

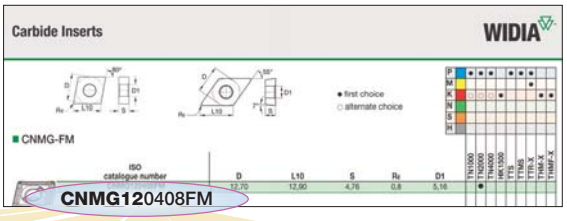


| DIN ISO 513 | VDI 3323 | A • Acabado (ap x avance = 1 x 0,1) | | | B • Medio (ap x avance = 2 x 0,2) | | | | | | C • Desbastado (ap x avance = 4 x 0,25) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | ap [mm] | - / -FL / -FR | | | -22 / -49 / - / -FR / -FM / -5 | | | | | | -49 / - / -5 / -8 | | | | | |
| | avance [mm] | 0,3–2,0 | | | 0,3–2,5 | | | | | | 0,3–2,5 | | | | | |
| | | 0,05–0,35 | | | 0,10–0,40 | | | | | | 0,10–0,40 | | | | | |
| | | TN1000 | | | TN1000 | | | TN2000 | | | TN2000 | | | TN4000 | | |
| P | 1 | 340 | **490** | 590 | 280 | **400** | 480 | 250 | **360** | 430 | 200 | **290** | 350 | 180 | **260** | 310 |
| P | 2 | 340 | **480** | 580 | 260 | **370** | 440 | 240 | **340** | 410 | 190 | **270** | 320 | 130 | **190** | 230 |
| P | 3 | 290 | **420** | 500 | 180 | **260** | 310 | 170 | **240** | 290 | 160 | **230** | 280 | 130 | **180** | 220 |
| P | 4 | 260 | **370** | 440 | 190 | **270** | 320 | 180 | **250** | 300 | 130 | **190** | 230 | 110 | **150** | 180 |
| P | 5 | 200 | **280** | 340 | 140 | **200** | 240 | 130 | **190** | 230 | 90 | **130** | 160 | 75 | **110** | 130 |
| P | 6 | 270 | **390** | 470 | 200 | **290** | 350 | 190 | **270** | 320 | 140 | **200** | 240 | 110 | **160** | 190 |
| P | 7 | 260 | **370** | 440 | 190 | **270** | 320 | 180 | **250** | 300 | 130 | **190** | 230 | 110 | **150** | 180 |
| P | 8 | 220 | **320** | 380 | 160 | **230** | 280 | 150 | **210** | 250 | 110 | **150** | 180 | 85 | **120** | 140 |
| P | 9 | 200 | **280** | 340 | 140 | **200** | 240 | 130 | **190** | 230 | 90 | **130** | 160 | 75 | **110** | 130 |
| P | 10 | 270 | **390** | 470 | 200 | **290** | 350 | 190 | **270** | 320 | 140 | **200** | 240 | 110 | **160** | 190 |
| P | 11 | 200 | **280** | 340 | 130 | **190** | 230 | 120 | **170** | 200 | 90 | **130** | 160 | 75 | **110** | 130 |
| P | 12 | 150 | **220** | 260 | 140 | **200** | 240 | 130 | **180** | 220 | 120 | **170** | 200 | 110 | **160** | 190 |
| P | 13.1 | 130 | **190** | 230 | 120 | **170** | 200 | 110 | **150** | 180 | 100 | **140** | 170 | 90 | **130** | 160 |
| P | 13.2 | 65 | **95** | 115 | 60 | **85** | 100 | 55 | **75** | 90 | 50 | **70** | 85 | 45 | **65** | 80 |
| | ap [mm] | - / -5 | | | | | | | | | | | | | | |
| | avance [mm] | 0,2–2 | | | | | | | | | | | | | | |
| | | 0,05–0,2 | | | | | | | | | | | | | | |
| | | HK1500 | | | | | | | | | | | | | | |
| K | 15 | 180 | **260** | 310 | | | | | | | | | | | | |
| K | 16 | 140 | **200** | 240 | | | | | | | | | | | | |
| K | 17 | 180 | **250** | 300 | | | | | | | | | | | | |
| K | 18 | 150 | **210** | 250 | | | | | | | | | | | | |
| K | 19 | 240 | **340** | 410 | | | | | | | | | | | | |
| K | 20 | 180 | **260** | 310 | | | | | | | | | | | | |
| | ap [mm] | 1,00 – 4,00 | | | 1,00 – 4,00 | | | | | | 1,00 – 4,00 | | | | | |
| | avance [mm] | 0,10 – 0,40 | | | 0,10 – 0,40 | | | | | | 0,10 – 0,40 | | | | | |
| | | THM-X | | | THM-X | | | | | | THM-X | | | | | |
| N | 21 | 800 | **1000** | 3000 | 800 | **1000** | 3000 | | | | 300 | **1000** | 2000 | | | |
| N | 22 | 400 | **1000** | 2000 | 400 | **1000** | 2000 | | | | 300 | **1000** | 1500 | | | |
| N | 23 | 600 | **1000** | 1500 | 600 | **1000** | 1500 | | | | 200 | **700** | 1200 | | | |
| N | 24 | 600 | **1000** | 1500 | 600 | **1000** | 1500 | | | | 200 | **700** | 1200 | | | |
| N | 25 | 400 | **700** | 1000 | 400 | **700** | 1000 | | | | 200 | **500** | 700 | | | |
| N | 26 | 400 | **500** | 600 | 400 | **500** | 600 | | | | 250 | **350** | 400 | | | |
| N | 27 | 400 | **500** | 600 | 400 | **500** | 600 | | | | 200 | **300** | 400 | | | |
| N | 28 | 200 | **300** | 400 | 200 | **300** | 400 | | | | 100 | **200** | 300 | | | |
| N | 29 | 100 | **150** | 200 | 100 | **150** | 200 | | | | 80 | **120** | 150 | | | |
| N | 30 | 150 | **200** | 250 | 150 | **200** | 250 | | | | 100 | **150** | 200 | | | |

| DIN ISO 513 | VDI 3323 | A • Acabado (ap x avance = 1 x 0,1) | | | B • Medio (ap x avance = 2 x 0,2) | | | | | | C • Desbastado (ap x avance = 4 x 0,25) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grupo de materiales | | Velocidad de corte • vc m/min | | | | | | | | | | | | | | |
| | | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. | mín. | Inicio | máx. |
| | ap [mm] | – / –R / –MU | | | – / – 2 / –MU | | | | | | – / –MU | | | | | |
| | avance [mm] | 0,3–2 | | | 0,3–2,5 | | | | | | 0,7–5 | | | | | |
| | | 0,05–0,35 | | | 0,10–0,40 | | | | | | 0,12–0,4 | | | | | |
| | | TN1000 | | | TN1000 | | | TN2000 | | | TN2000 | | | TN4000 | | |
| P | 1 | 340 | **490** | 590 | 280 | **400** | 480 | 250 | **360** | 430 | 200 | **290** | 350 | 180 | **260** | 310 |
| | 2 | 340 | **480** | 580 | 260 | **370** | 440 | 240 | **340** | 410 | 190 | **270** | 320 | 130 | **190** | 230 |
| | 3 | 290 | **420** | 500 | 180 | **260** | 310 | 170 | **240** | 290 | 160 | **230** | 280 | 130 | **180** | 220 |
| | 4 | 260 | **370** | 440 | 190 | **270** | 320 | 180 | **250** | 300 | 130 | **190** | 230 | 110 | **150** | 180 |
| | 5 | 200 | **280** | 340 | 140 | **200** | 240 | 130 | **190** | 230 | 90 | **130** | 160 | 75 | **110** | 130 |
| | 6 | 270 | **390** | 470 | 200 | **290** | 350 | 190 | **270** | 320 | 140 | **200** | 240 | 110 | **160** | 190 |
| | 7 | 260 | **370** | 440 | 190 | **270** | 320 | 180 | **250** | 300 | 130 | **190** | 230 | 110 | **150** | 180 |
| | 8 | 220 | **320** | 380 | 160 | **230** | 280 | 150 | **210** | 250 | 110 | **150** | 180 | 85 | **120** | 140 |
| | 9 | 200 | **280** | 340 | 140 | **200** | 240 | 130 | **190** | 230 | 90 | **130** | 160 | 75 | **110** | 130 |
| | 10 | 270 | **390** | 470 | 200 | **290** | 350 | 190 | **270** | 320 | 140 | **200** | 240 | 110 | **160** | 190 |
| | 11 | 200 | **280** | 340 | 130 | **190** | 230 | 120 | **170** | 200 | 90 | **130** | 160 | 75 | **110** | 130 |
| | 12 | 150 | **220** | 260 | 140 | **200** | 240 | 130 | **180** | 220 | 120 | **170** | 200 | 110 | **160** | 190 |
| | 13.1 | 130 | **190** | 230 | 120 | **170** | 200 | 110 | **150** | 180 | 100 | **140** | 170 | 90 | **130** | 160 |
| | 13.2 | 65 | **95** | 115 | 60 | **85** | 100 | 55 | **75** | 90 | 50 | **70** | 85 | 45 | **65** | 80 |
| | ap [mm] | – / –MU | | | – / –MU | | | | | | | | | | | |
| | avance [mm] | 0,2–2 | | | 0,3–4,5 | | | | | | | | | | | |
| | | 0,05–0,2 | | | 0,08–0,35 | | | | | | | | | | | |
| | | HK1500 | | | HK1500 | | | | | | | | | | | |
| K | 15 | 290 | **410** | 490 | 230 | **330** | 400 | | | | | | | | | |
| | 16 | 230 | **330** | 400 | 180 | **250** | 300 | | | | | | | | | |
| | 17 | 250 | **360** | 430 | 210 | **300** | 360 | | | | | | | | | |
| | 18 | 240 | **340** | 410 | 190 | **270** | 320 | | | | | | | | | |
| | 19 | 340 | **490** | 590 | 290 | **410** | 490 | | | | | | | | | |
| | 20 | 290 | **410** | 490 | 230 | **330** | 400 | | | | | | | | | |
| | ap [mm] | 1,00 – 4,00 | | | 1,00 – 4,00 | | | | | | 1,00 – 4,00 | | | | | |
| | avance [mm] | 0,10 – 0,20 | | | 0,10 – 0,20 | | | | | | 0,10 – 0,40 | | | | | |
| | | THM-X | | | THM-X | | | | | | THM-X | | | | | |
| N | 21 | 800 | **1000** | 3000 | 500 | **1000** | 2500 | | | | 300 | **1000** | 2000 | | | |
| | 22 | 400 | **1000** | 2000 | 300 | **1000** | 1800 | | | | 300 | **1000** | 1500 | | | |
| | 23 | 600 | **1000** | 1500 | 500 | **800** | 1300 | | | | 200 | **700** | 1200 | | | |
| | 24 | 600 | **1000** | 1500 | 500 | **800** | 1300 | | | | 200 | **700** | 1200 | | | |
| | 25 | 400 | **700** | 1000 | 300 | **600** | 800 | | | | 200 | **500** | 700 | | | |
| | 26 | 400 | **500** | 600 | 300 | **400** | 500 | | | | 250 | **350** | 400 | | | |
| | 27 | 400 | **500** | 600 | 300 | **400** | 500 | | | | 200 | **300** | 400 | | | |
| | 28 | 200 | **300** | 400 | 150 | **250** | 350 | | | | 100 | **200** | 300 | | | |
| | 29 | 100 | **150** | 200 | 100 | **140** | 180 | | | | 80 | **120** | 150 | | | |
| | 30 | 150 | **200** | 250 | 120 | **180** | 220 | | | | 100 | **150** | 200 | | | |

## ¿Cómo funcionan los números de catálogo?

Cada carácter de nuestro número de catálogo hace referencia a un detalle específico de ese producto. Utilice las siguientes columnas de claves y las imágenes correspondientes para identificar con facilidad los atributos en cuestión.




### C — Forma de la plaquita

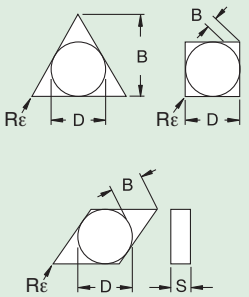
| | | |
|---|---|---|
| H | Hexagonal 120° | |
| O | Octogonal 135° | |
| P | Pentagonal 108° | |
| R | Redonda — | |
| S | Cuadrada 90° | |
| T | Triangular 60° | |
| C<br>D<br>E<br>M<br>V | Romboide<br>80°<br>55°<br>75°<br>86°<br>35° | |
| W | Trígona 80° con mayores ángulos de esquina | |
| L | Rectangular 90° | |
| A<br>B<br>N/K | Paralelogramo<br>85°<br>82°<br>55° | |

### N — Ángulo de incidencia de la plaquita

| | | |
|---|---|---|
| A | 3° | |
| B | 5° | |
| C | 7° | |
| D | 15° | |
| E | 20° | |
| F | 25° | |
| G | 30° | |
| N | 0° | |
| P | 11° | |
| O | Indicado para otros ángulos de incidencia que requieran una descripción. | |

### M — Clase de tolerancia

**Las tolerancias se aplican antes de la preparación y el recubrimiento de los filos**




D: Diámetro teórico del círculo inscrito en la plaquita
S: Grosor
B: Consulte las cifras que se expresan a continuación

### G — Características de la plaquita

| | |
|---|---|
| N | |
| R | |
| F | |
| A | |
| M | |
| G | |
| W | |
| T | |
| Q | |
| U | |
| B | |
| H | |
| C | |
| J | |
| X | Diseño especial |

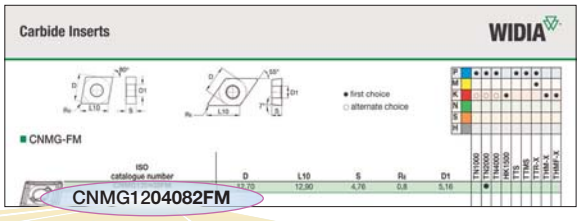
### 12 — Plaquita

Código para longitud métrica del filo de corte "L10"

| "D" mm | C | D | R | S | T | V | W |
|---|---|---|---|---|---|---|---|
| 3,97 | S4 | 04 | 03 | 03 | 06 | — | — |
| 4,76 | 04 | 05 | 04 | 04 | 08 | 08 | S3 |
| 5,56 | 05 | 06 | 05 | 05 | 09 | 09 | 03 |
| 6,00 | — | — | 06 | — | — | — | — |
| 6,35 | 06 | 07 | 06 | 06 | 11 | 11 | 04 |
| 7,94 | 08 | 09 | 07 | 07 | 13 | 13 | 05 |
| 8,00 | — | — | 08 | — | — | — | — |
| 9,52 | 09 | 11 | 09 | 09 | 16 | 16 | 06 |
| 10,00 | — | — | 10 | — | — | — | — |
| 11,11 | 11 | 13 | 11 | 11 | 19 | 19 | 07 |
| 12,00 | — | — | 12 | — | — | — | — |
| 12,70 | 12 | 15 | 12 | 12 | 22 | 22 | 08 |
| 14,29 | 14 | 17 | 14 | 14 | 24 | 24 | 09 |
| 15,88 | 16 | 19 | 15 | 15 | 27 | 27 | 10 |
| 16,00 | — | — | 16 | — | — | — | — |
| 17,46 | 17 | 21 | 17 | 17 | 30 | 30 | 11 |
| 19,05 | 19 | 23 | 19 | 19 | 33 | 33 | 13 |
| 20,00 | — | — | 20 | — | — | — | — |
| 22,22 | 22 | 27 | 22 | 22 | 38 | 38 | 15 |
| 25,00 | — | — | 25 | — | — | — | — |
| 25,40 | 25 | 31 | 25 | 25 | 44 | 44 | 17 |
| 31,75 | 32 | 38 | 31 | 31 | 54 | 54 | 21 |
| 32,00 | — | — | 32 | — | — | — | — |

| clase de tolerancia | tolerancia en "D" | tolerancia en "B" | tolerancia en "S" |
|---|---|---|---|
| C | ±0,025 | ±0,013 | ±0,025 |
| H | ±0,013 | ±0,013 | ±0,025 |
| E | ±0,025 | ±0,025 | ±0,025 |
| G | ±0,025 | ±0,025 | ±0,013 |
| M | Consulte las tablas de la columna de tamaños | | ±0,013 |
| U | Consulte las tablas de la columna de tamaños | | ±0,013 |

*Con esta guía de fácil uso, podrá identificar el producto correcto para satisfacer sus necesidades.*




## 04

Grosor
*aparece como "S"*

| símbolo mm | grosor mm |
|---|---|
| — | 0,79 |
| T0 | 1,00 |
| 01 | 11,59 |
| T1 | 1,98 |
| 02 | 2,38 |
| 03 | 3,18 |
| T3 | 3,97 |
| 04 | 4,76 |
| 05 | 5,56 |
| 06 | 6,35 |
| 07 | 7,94 |
| 09 | 9,52 |
| 11 | 11,11 |
| 12 | 12,70 |

## 08

Radio de esquina
*aparece como "Rε"*

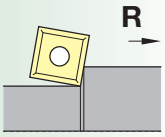
| símbolo mm | radio de esquina mm |
|---|---|
| X0 | 0,04 |
| 01 | 0,1 |
| 02 | 0,2 |
| 04 | 0,4 |
| 08 | 0,8 |
| 12 | 1,2 |
| 16 | 1,6 |
| 20 | 2,0 |
| 24 | 2,4 |
| 28 | 2,8 |
| 32 | 3,2 |
| 00 | plaquita redonda |
| M0 | |

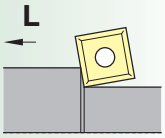
Dirección de la plaquita
*(opcional)*

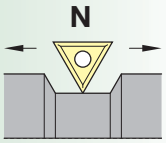
**R** = a derechas

**L** = a izquierdas

**N** = neutral




Filo de corte
*(opcional)*

**F**

Afilado

**E**

Redondeado

**T**

Biselado

**S**

Biselado y redondeado

**K**

Biselado doble

**P**

Biselado doble y redondeado

## FM

Rompevirutas
*(opcional)*

**5**
Desbaste medio

**8**
Desbaste pesado

**22**
Acabado

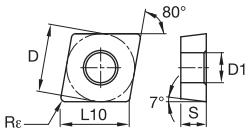
**49**
Inoxidable medio

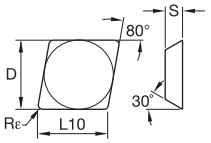
**FL**
Acabado ligero

**FM**
Acabado medio

**FR**
Acabado en desbaste

**MU**
Medio universal

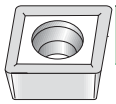



● primera elección
○ elección alternativa

| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## CCMT



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMT060204** | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | ● | ● | ● | ● | ● | | | ● | |
| **CCMT090304** | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | | ● | ● | ● | ● | | | ● | |
| **CCMT090308** | 9,53 | 9,67 | 3,18 | 0,8 | 4,40 | | ● | ● | ● | | | | ● | |
| **CCMT09T304** | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | | ● | ● | ● | ● | | | ● | |
| **CCMT09T308** | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | | ● | ● | ● | ● | | | ● | |
| **CCMT120408** | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | | ● | | | | | | ● | |

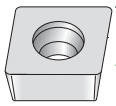
## CCMT-MU

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMT09T304MU** | 9,53 | 9,67 | 3,97 | 0,4 | 4,40 | | ● | | | | | | ● | |
| **CCMT09T308MU** | 9,53 | 9,67 | 3,97 | 0,8 | 4,40 | | ● | | | | | | ● | |
| **CCMT090304MU** | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | | ● | | | | | | | |

## CCMT-R

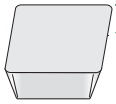
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMT060208R** | 6,35 | 6,45 | 2,38 | 0,8 | 2,80 | | ● | | | | | | | |

## CCMW

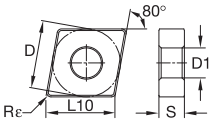


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CCMW060204** | 6,35 | 6,45 | 2,38 | 0,4 | 2,80 | | | | | | | | ● | |
| **CCMW090304** | 9,53 | 9,67 | 3,18 | 0,4 | 4,40 | | | | | | | | ● | |
| **CCMW090308** | 9,53 | 9,67 | 3,18 | 0,8 | 4,40 | | | | | | | | ● | |
| **CCMW120408** | 12,70 | 12,90 | 4,76 | 0,8 | 5,50 | | | | | | | | ● | |

## CGGN



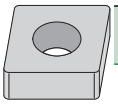
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CGGN120304** | 12,70 | 12,90 | 3,18 | 0,4 | – | | | | | | | | ● | |




● primera elección
○ elección alternativa

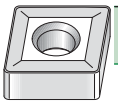
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## CNMA



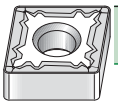
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMA120404 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | | | | ● | | | | ● | |
| CNMA120408 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | | | ● | | | | ● | ● |
| CNMA120412 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | | | ● | | | | | ● |

## CNMG



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG120404 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | | ● | ● | ● | ● | | | ● | |
| CNMG120408 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | ● | ● | ● | ● | | ● | ● | |
| CNMG120412 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | ● | | | | | | | ● |
| CNMG190612 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 | | ● | ● | ● | ● | | | ● | |
| CNMG190616 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 | | ● | ● | ● | ● | | | ● | |

## CNMG-22

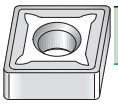


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG12040422 | 12,70 | 12,90 | 4,76 | 0,4 | 5,16 | | ● | | | | | | | |
| CNMG12040822 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | ● | | | | | | | |

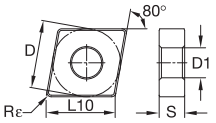
## CNMG-49

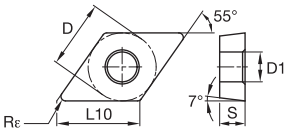
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG12040849 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | ● | ● | | | | | | |

## CNMG-5



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG1204085 | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | ● | ● | ● | | | | | |
| CNMG1204125 | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | | ● | ● | ● | | | | | |
| CNMG1906125 | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 | | ● | ● | | | | | | |
| CNMG1906165 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 | | ● | ● | | | | | | |




● primera elección
○ elección alternativa

| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

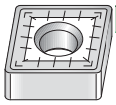
## CNMG-FM

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG120408FM | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | | ● | | | | | | | |

## CNMG-FR

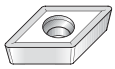
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMG120408FR | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 | ● | ● | | | | | | | |
| CNMG120412FR | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 | ● | | | | | | | | |

## CNMM-8



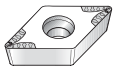
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CNMM1906168 | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 | | | ● | | | | | | |

## DCMT



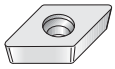
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMT11T304 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | | ● | | ● | | | | ● | |
| DCMT11T308 | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | | ● | | ● | | | | ● | |

## DCMT-MU

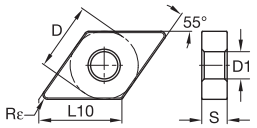


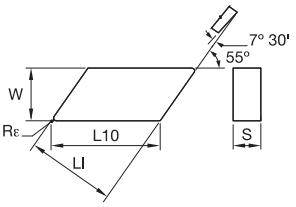
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMT11T308MU | 9,53 | 11,63 | 3,97 | 0,8 | 4,40 | | ● | | | | | | | |

## DCMW



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DCMW11T304 | 9,53 | 11,63 | 3,97 | 0,4 | 4,40 | | | | | | | | ● | |

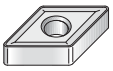



● primera elección
○ elección alternativa

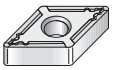
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## ■ DNMG



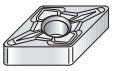
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG150604** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | | ● | ● | | ● | | | | |
| **DNMG150608** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | ● | ● | ● | | | | ● | |
| **DNMG150612** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | | | ● | | | | | | |

## ■ DNMG-22



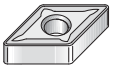
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG15060422** | 12,70 | 15,50 | 6,35 | 0,4 | 5,16 | | ● | | | | | | | |

## ■ DNMG-49



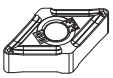
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG15060849** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | ● | | | | | | | |

## ■ DNMG-5



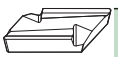
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG1104085** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | | ● | ● | | | | | | |
| **DNMG11T3085** | 9,53 | 11,63 | 3,97 | 0,8 | 4,05 | | ● | | | | | | | |
| **DNMG1506085** | 12,70 | 15,50 | 6,35 | 0,8 | 5,16 | | ● | ● | | | | | | |
| **DNMG1506125** | 12,70 | 15,50 | 6,35 | 1,2 | 5,16 | ● | ● | | | | | | | |
| **DNMG1506165** | 12,70 | 15,50 | 6,35 | 1,6 | 5,16 | | | ● | | | | | | |

## ■ DNMG-FM

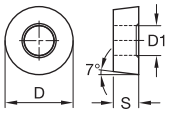


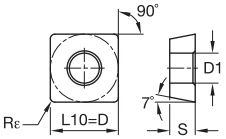
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DNMG110408FM** | 9,53 | 11,63 | 4,76 | 0,8 | 3,81 | | ● | | | | | | | |

## ■ KNUX



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **KNUX160405L11** | 9,52 | 19,72 | 16,15 | 4,76 | 0,5 | | ● | ● | | ● | | | | |
| **KNUX160405R11** | 9,52 | 19,72 | 16,15 | 4,76 | 0,5 | | ● | ● | | ● | | | | |
| **KNUX160410L11** | 9,52 | 19,72 | 16,15 | 4,76 | 1,0 | | ● | | | | | | | |
| **KNUX160410L12** | 9,52 | 19,72 | 16,15 | 4,76 | 1,0 | | | ● | | | | | | |
| **KNUX160410R11** | 9,52 | 19,72 | 16,15 | 4,76 | 1,0 | | ● | | | | | | | |
| **KNUX160410R12** | 9,52 | 19,72 | 16,15 | 4,76 | 1,0 | | | ● | | | | | | |
| **KNUX160415R12** | 9,52 | 19,72 | 16,15 | 4,72 | 1,5 | | | ● | | | | | | |

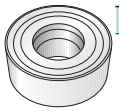



● primera elección
○ elección alternativa

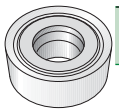
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## ■ RCMT



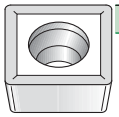
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RCMT0602M0** | 6,00 | – | 2,38 | – | 2,80 | | ● | | | | | | ● | |

## ■ RCMX



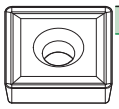
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RCMX1003M0** | 10,00 | – | 3,18 | – | 3,70 | | | ● | | | | | | |
| **RCMX1204M0** | 12,00 | – | 4,76 | – | 5,50 | | ● | ● | | | | | | ● |
| **RCMX2006M0** | 20,00 | – | 6,35 | – | 6,65 | | ● | | | | | ● | ● | |
| **RCMX2507M0** | 25,00 | – | 7,94 | – | 7,40 | | | | | | | ● | | |
| **RCMX3209M0** | 32,00 | – | 9,53 | – | 10,35 | | | | | | | ● | | |

## ■ SCMT

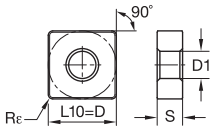


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMT120408** | 12,70 | 12,70 | 4,76 | 0,8 | 5,50 | | | ● | | | | | | |

## ■ SCMX



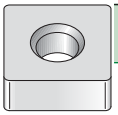
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SCMX190412** | 19,05 | 19,05 | 4,76 | 1,2 | 5,80 | | | | | | | ● | | |




● primera elección
○ elección alternativa

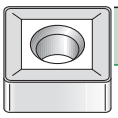
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## ■ SNMA



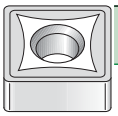
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMA120404 | 12,70 | 12,70 | 4,76 | 0,4 | 5,13 | | | | ● | | | | | |
| SNMA120408 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | | ● | | | | ● | ● |
| SNMA120412 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | ● | | | | | ● |
| SNMA250724 | 25,40 | 25,40 | 7,94 | 2,4 | 9,12 | | | | | | | ● | ● | |

## ■ SNMG



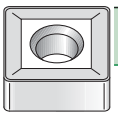
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG120404 | 12,70 | 12,70 | 4,76 | 0,4 | 5,16 | | ● | | | | | | | |
| SNMG120408 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | ● | ● | ● | ● | | | ● | |
| SNMG120412 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | | | ● | | | | | |
| SNMG190612 | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | ● | ● | | ● | | ● | ● | |
| SNMG190616 | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | ● | | | | | | |
| SNMG250716 | 25,40 | 25,40 | 7,94 | 1,6 | 9,12 | | ● | ● | | | | | | |
| SNMG250724 | 25,40 | 25,40 | 7,94 | 2,4 | 9,12 | | | ● | | | | ● | | |

## ■ SNMG-5



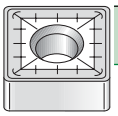
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMG1204085 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | ● | ● | | | | | | |
| SNMG1204125 | 12,70 | 12,70 | 4,76 | 1,2 | 5,16 | | ● | ● | | | | | | |
| SNMG1906125 | 19,05 | 19,05 | 6,35 | 1,2 | 7,93 | | ● | ● | | | | | | |

## ■ SNMM

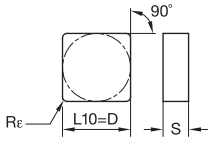


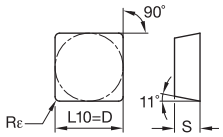
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMM190616 | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | ● | | | | | | |
| SNMM250724 | 25,40 | 25,40 | 7,94 | 2,4 | 9,12 | | | ● | | | | ● | | |

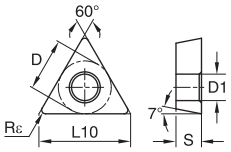
## ■ SNMM-8



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNMM1204088 | 12,70 | 12,70 | 4,76 | 0,8 | 5,16 | | | ● | | | | | | |
| SNMM1906168 | 19,05 | 19,05 | 6,35 | 1,6 | 7,93 | | | ● | | | | | | |
| SNMM2507248 | 25,40 | 25,40 | 7,94 | 2,4 | 9,12 | | | ● | | | | | | |



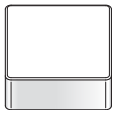




● primera elección
○ elección alternativa

| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## SNUN

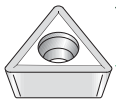


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SNUN120408 | 12,70 | 12,70 | 4,76 | 0,8 | – | | | | | ● | | | ● | |
| SNUN190416 | 19,05 | 19,05 | 4,76 | 1,6 | – | | | | | ● | | | | |

## SPUN

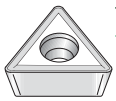
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPUN090308 | 9,53 | 9,53 | 3,18 | 0,8 | – | | | | | ● | | | | |
| SPUN120308 | 12,70 | 12,70 | 3,18 | 0,8 | – | | ● | | ● | ● | | | ● | ● |
| SPUN120312 | 12,70 | 12,70 | 3,18 | 1,2 | – | | | | | ● | | | ● | |
| SPUN190416 | 19,05 | 19,05 | 4,76 | 1,6 | – | | | | | ● | | | ● | |

## TCMT

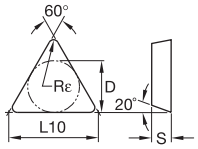


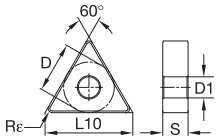
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCMT110204 | 6,35 | 11,00 | 2,38 | 0,4 | 2,80 | | ● | | ● | ● | | | ● | |
| TCMT16T304 | 9,53 | 16,50 | 3,97 | 0,4 | 4,40 | | ● | | | | | | | |
| TCMT16T308 | 9,53 | 16,50 | 3,97 | 0,8 | 4,40 | | ● | ● | | | | | ● | |

## TCMT-R



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TCMT110208R | 6,35 | 11,00 | 2,38 | 0,8 | 2,80 | | ● | | ● | | | | | |

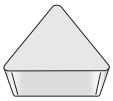



● primera elección
○ elección alternativa

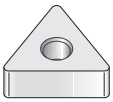
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## TEGN



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TEGN110304 | 6,35 | 11,00 | 3,18 | 0,4 | – | | | | | | | | ● | |
| TEGN160304 | 9,53 | 16,50 | 3,18 | 0,1 | – | | | | | | | | ● | |
| TEGN160308 | 9,53 | 16,50 | 3,18 | 0,8 | – | | | | | | | | ● | |

## TNMA

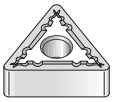


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMA160408 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | | | ● | | | | ● | ● |

## TNMG

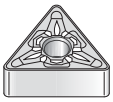
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG160404 | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | ● | | ● | | | | ● | |
| TNMG160408 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | ● | ● | ● | | | ● | ● |
| TNMG160412 | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | ● | | ● | | | | | |
| TNMG220408 | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | ● | ● | | | | | | |
| TNMG220412 | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | ● | ● | ● | | | | ● | |
| TNMG220416 | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | | ● | | | | | | |

## TNMG-22

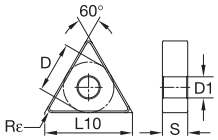


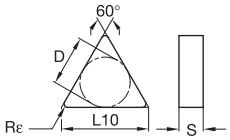
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG16040422 | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | | ● | ● | | | | | | |
| TNMG16040822 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | | | | | | | |

## TNMG-49



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG16040849 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | ● | | | | | | |

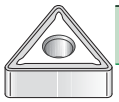



● primera elección
○ elección alternativa

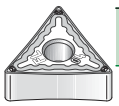
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## ■ TNMG-5



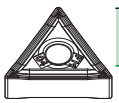
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG1604085 | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | ● | ● | | | | ● | |
| TNMG1604125 | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | | ● | ● | | | | | | |
| TNMG2204085 | 12,70 | 22,00 | 4,76 | 0,8 | 5,16 | | ● | ● | | | | | | |
| TNMG2204125 | 12,70 | 22,00 | 4,76 | 1,2 | 5,16 | | ● | ● | ● | | | | | |
| TNMG2204165 | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | | ● | | | | | | |

## ■ TNMG-FL



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG160404FL | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | ● | | | | | | | | |
| TNMG160408FL | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | ● | | | | | | | | |

## ■ TNMG-FM

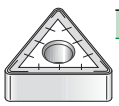


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG160404FM | 9,53 | 16,50 | 4,76 | 0,4 | 3,81 | ● | ● | | | | | | | |
| TNMG160408FM | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | | ● | | | | | | | |

## ■ TNMG-FR

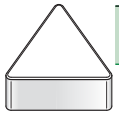
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMG160408FR | 9,53 | 16,50 | 4,76 | 0,8 | 3,81 | ● | | | | | | | | |
| TNMG160412FR | 9,53 | 16,50 | 4,76 | 1,2 | 3,81 | ● | | | | | | | | |

## ■ TNMM-8

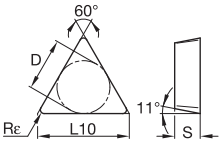


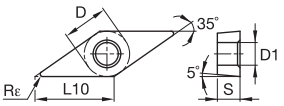
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNMM2204168 | 12,70 | 22,00 | 4,76 | 1,6 | 5,16 | | | ● | | | | | | |

## ■ TNUN



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TNUN160308 | 9,53 | 16,50 | 3,18 | 0,8 | – | | | | | ● | | | | |
| TNUN160408 | 9,53 | 16,50 | 4,76 | 0,8 | – | | | | | ● | | | | |
| TNUN220412 | 12,70 | 22,00 | 4,76 | 1,2 | – | | | | | ● | | | | |

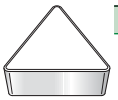



● primera elección
○ elección alternativa

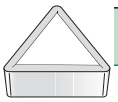
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## TPGN



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPGN110304 | 6,35 | 11,00 | 3,18 | 0,4 | – | | | | | | | | ● | |

## TPMR

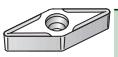


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPMR110304 | 6,35 | 11,00 | 3,18 | 0,4 | – | | ● | | | ● | | | ● | |
| TPMR110308 | 6,35 | 11,00 | 3,18 | 0,8 | – | | ● | ● | | | | | | |
| TPMR160304 | 9,53 | 16,50 | 3,18 | 0,4 | – | | ● | | | ● | | | | |
| TPMR160308 | 9,53 | 16,50 | 3,18 | 0,8 | – | | ● | | | | | | | |

## TPUN

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPUN110304 | 6,35 | 11,00 | 3,18 | 0,4 | – | | | | | ● | | | ● | |
| TPUN110308 | 6,35 | 11,00 | 3,18 | 0,8 | – | | | | | ● | | | ● | ● |
| TPUN160304 | 9,53 | 16,50 | 3,18 | 0,4 | – | | ● | ● | | ● | | ● | ● | ● |
| TPUN160308 | 9,53 | 16,50 | 3,18 | 0,8 | – | | ● | ● | ● | ● | | ● | ● | ● |
| TPUN160312 | 9,53 | 16,50 | 3,18 | 1,2 | – | | | | | ● | | | ● | ● |
| TPUN220412 | 12,70 | 22,00 | 4,76 | 1,2 | – | | | | | ● | | ● | ● | |

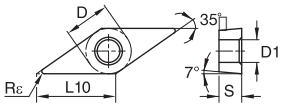
## VBMT

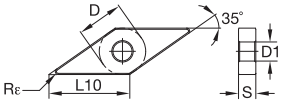


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VBMT160404 | 9,53 | 16,61 | 4,76 | 0,4 | 4,40 | | ● | ● | | | | | | |
| VBMT160408 | 9,53 | 16,61 | 4,76 | 0,8 | 4,40 | | ● | ● | ● | | | | ● | |

## VBMT-T

| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VBMT160412T | 9,53 | 16,60 | 4,76 | 1,2 | 4,40 | | ● | | | | | | | |

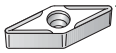



● primera elección
○ elección alternativa

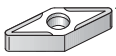
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## ■ VCMT

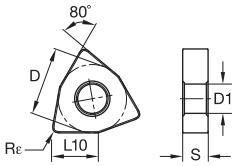


| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VCMT16T304** | 9,53 | 16,61 | 3,97 | 0,4 | 4,40 | | ● | | | | | | ● | |
| **VCMT16T308** | 9,53 | 16,61 | 3,97 | 0,8 | 4,40 | | ● | ● | ● | | | | | |

## ■ VNMG



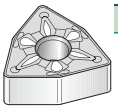
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VNMG12T304** | 7,14 | 12,45 | 3,97 | 0,4 | 3,60 | ● | ● | ● | | | | | | |
| **VNMG12T308** | 7,14 | 12,45 | 3,97 | 0,8 | 3,65 | | ● | | ● | | | | | |




● primera elección
○ elección alternativa

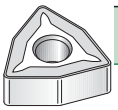
| | | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|
| P | | ● | ● | ● | | ● | ● | ● | | |
| M | | | | | | | | ● | | |
| K | | ○ | ○ | ○ | ● | | | | ● | ● |
| N | | | | | | | | | | |
| S | | | | | | | | | | |
| H | | | | | | | | | | |

## ■ WNMG-49



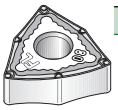
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG08040849** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | | ● | | | | | | | |

## ■ WNMG-5



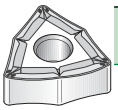
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG0604085** | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 | | ● | ● | ● | | | | | |
| **WNMG0804085** | 12,70 | 8,69 | 4,76 | 0,8 | 5,16 | | ● | ● | ● | | | | | |
| **WNMG0804125** | 12,70 | 8,69 | 4,76 | 1,2 | 5,16 | | ● | | ● | | | | | |

## ■ WNMG-FL



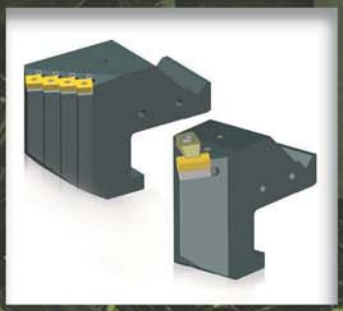
| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG060404FL** | 9,53 | 6,52 | 4,76 | 0,4 | 3,81 | ● | | | | | | | | |

## ■ WNMG-FR



| Número de catálogo ISO | D | L10 | S | Rε | D1 | TN1000 | TN2000 | TN4000 | HK1500 | TTS | TTMS | TTR-X | THM-X | THMF-X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WNMG060408FR** | 9,53 | 6,52 | 4,76 | 0,8 | 3,81 | ● | | | | | | | | |
| **WNMG060412FR** | 9,53 | 6,52 | 4,76 | 1,2 | 3,81 | ● | | | | | | | | |

WIDIA



# Portaherramientas especiales WIDIA™

**Significado del desbaste de barra en la fabricación de barras** ..... **G4**

**Gama de aplicaciones de herramientas WIDIA para el desbaste de barras** ..... **G5**

**Sugerencias de aplicación para herramientas WIDIA de desbaste de barra** ..... **G5–G6**

**Calidades de metal duro WIDIA recubierto y sin recubrir** ..... **G7**

**Sistema de numeración de catálogo** ..... **G8**

**Calidades y descripciones de calidades** ..... **G9**

**Plaquitas intercambiables WIDIA para calibrado de barra** ..... **G10–G14**

**Portaherramientas WIDIA para desbaste de barra** ..... **G15–G23**
- WDHF 20, WDH 20, WDH 50 T y WDH 50 ajustable ..... G15
- WDH 50, WDH 50 K y WDH 75 T ..... G16–G17
- WDHE 80, WDH 100, WDH 360 y S80 ..... G18–G19

**Portas básicos para portaplaquitas WIDIA WDH 75 T y WDHE 80** ..... **G20**

**Portaplaquitas WIDIA WDH 75** ..... **G21**

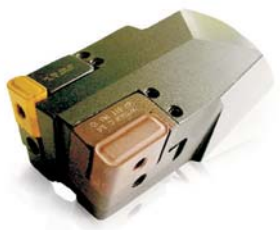
**Cabezas para desbaste de barra WIDIA WDH 75 T y WDHE 80** ..... **G22–G23**

**Herramientas WIDIA para vías de ferrocarril • Mecanizado de ruedas** ..... **G24–G50**
- Portaherramientas ..... G28–G37
- Portaplaquitas para portaherramientas ..... G38–G39
- Recomendaciones de herramientas ..... G40–G48
- Plaquitas intercambiables ..... G49
- Calidades y descripciones de calidades ..... G50

**Herramientas WIDIA para mecanizado pesado** ..... **G52–G60**
- Plaquitas intercambiables ..... G54–G59
- Calidades y descripciones de calidades ..... G60

**Portaherramientas fabricados a medida**

Ofrecemos unos portaherramientas especiales para toda máquina de torneado pesado, eje y rueda de ferrocarril y desbaste de barra; están diseñados y fabricados únicamente con la tecnología más moderna. El diseño asistido por ordenador (CAD) y las máquinas herramienta de control numérico son nuestra especialidad.



# Herramientas WIDIA™ para desbaste de barra

El desbaste de barra es una operación de mecanizado económica y única para la producción de superficies cilíndricas de barras en bruto (p. ej., barras redondeadas, cables, bloques y tubos) con alto acabado superficial y precisión dimensional. Durante el proceso de desbaste de barra se eliminan incrustaciones, roturas y acumulaciones de arena (u otras impurezas). Esto suele implicar el uso de un cabezal portaherramientas rotatorio de múltiples dientes en una aplicación con elevadas tasas de avance.

Sistema de fijación por tornillo para plaquitas intercambiables con orificio avellanado.

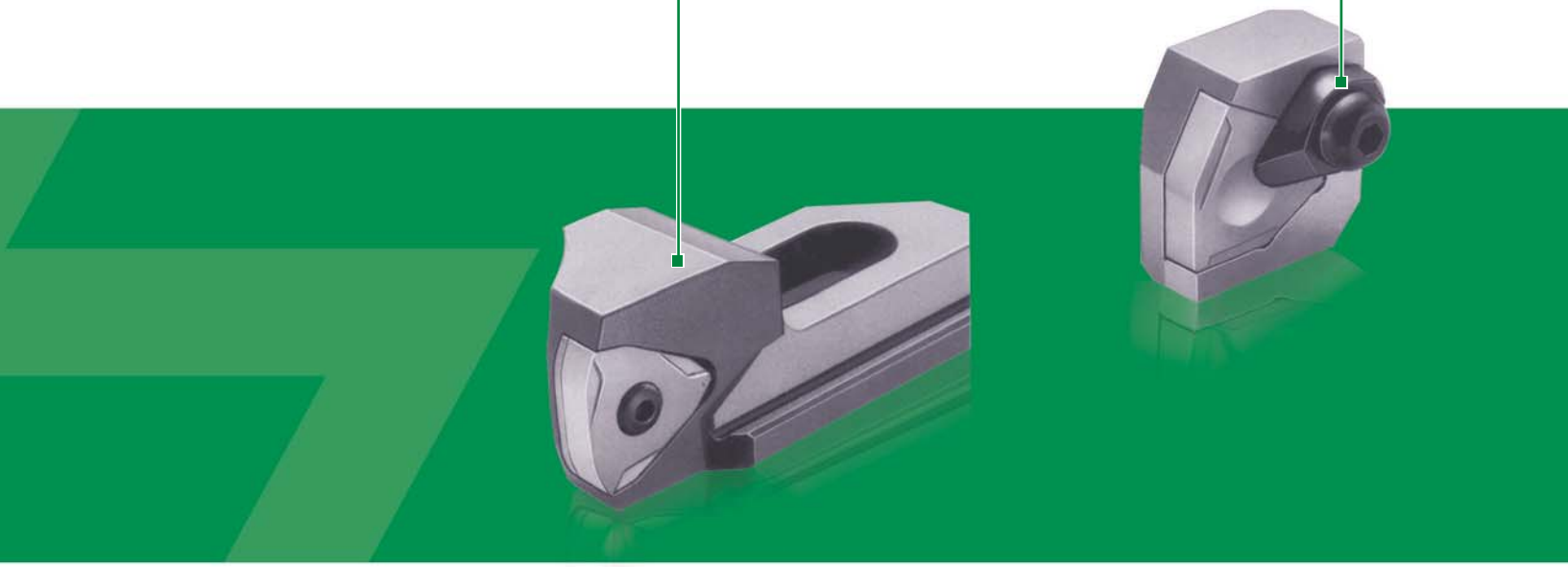
Diseño compacto con un mínimo de recambios para una gran fiabilidad y rentabilidad.

Un apoyo de metal duro ofrece una mayor protección a la herramienta.

Sistema de fijación superior para plaquitas intercambiables negativas.

Este sistema de fijación universal es resistente y fácil de manejar.

Un apoyo de metal duro ofrece una mayor protección a la herramienta.

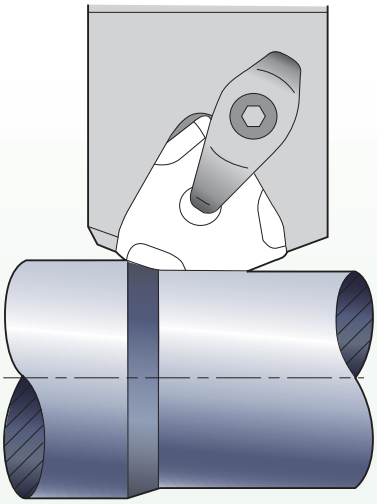


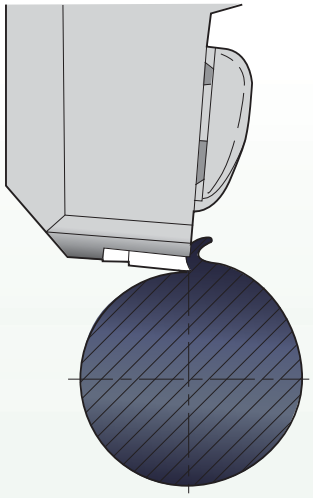
WIDIA puede ofrecer portaherramientas para el desbaste de barra, cabezas de corte, plaquitas y accesorios para todas sus necesidades de desbaste de barra.

## ¿Qué función tiene el desbaste de barra en la fabricación de barras?

El desbaste de barra suele aplicarse preferentemente en la fabricación de barras brillantes, un producto en bruto con un acabado superficial relativamente suave y una gran precisión dimensional. El material de barras en bruto se emplea en la producción en masa moderna (p. ej, el sector de automoción y sus subproveedores). Debido al desarrollo de máquinas con el alto rendimiento adecuado, el desbaste de barra ofrece un mayor conocimiento a los productores de acero; aporta el mismo servicio al mecanizado intermedio de productos redondos producidos por fabricantes de muelles y tuberías. En los bloques redondos, barras redondas o bielas forjadas o moldeadas por inyección, se pueden eliminar operaciones tales como el soplado, el flameado y el rectificado, sustituyéndolas por el desbaste de barra. Este proceso no sólo es más económico, sino que contribuye a que el lugar de trabajo sea más eficiente.

La plaquita de metal duro WIDIA™ de tipo N y seis filos se emplea en múltiples fábricas de todo el mundo. Esta plaquita intercambiable multi-filo con un ángulo de viruta positivo se amarra mediante una fijación por tornillo o en la parte superior en el porta o el cartucho. El asiento de la plaquita y el amarre están diseñados para eliminar cualquier salto de la plaquita durante su corte. La geometría de filo de corte favorable ofrece un corte suave. La misma geometría está diseñada para un buen control de virutas y una rotura de virutas segura.





Nuestra oferta actual se compone de una amplia gama de herramientas para distintos métodos de desbaste de barra. Para las instalaciones de distintas máquinas herramienta, se pueden emplear…

- Portas (p. ej., cartuchos)
- Plaquitas intercambiables (forma y tamaño)
- Tipos de fijación de plaquitas
- Geometrías de filo de corte principales
- Calidades de metal duro (calidades WIDIA con y sin recubrimiento)

…varias combinaciones de elementos de corte óptimos por cada tipo de aplicación. El desarrollo de herramientas de corte adicionales continuará según lo dictado por las demandas y requisitos del mercado.

Además, las barras ya tratadas ofrecen estupendas ventajas:

- La eliminación de costra de fundición o forja, polución, roturas y otros errores de la superficie.
- Gran precisión dimensional y redondeado.
- Acabados superficiales suaves.

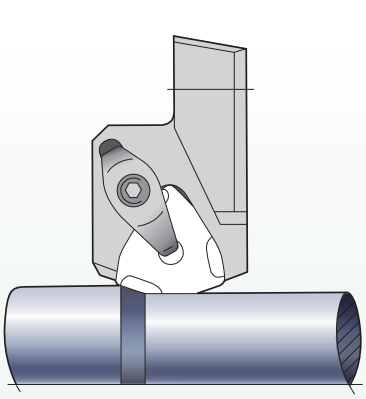
Gracias al desbaste de las barras, se consiguen condiciones mejores y más consistentes para las operaciones de eliminación de metal.

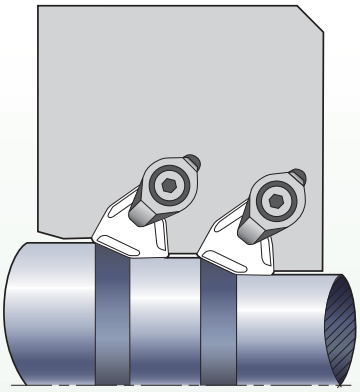
## Gama de aplicaciones de herramientas WIDIA™ para el desbaste de barras

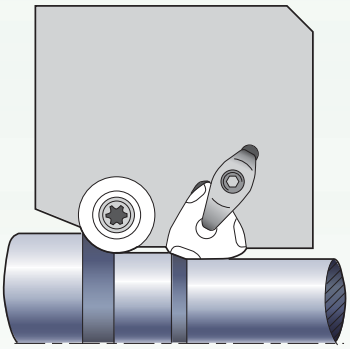
Las máquinas de desbaste de barras nuevas necesitan un elevado nivel de uso y requieren unas herramientas de corte de alto rendimiento. WIDIA ofrece unas herramientas WIDIA desarrolladas especialmente con plaquitas intercambiables para el desbaste de barras, capaces de satisfacer estas demandas y convirtiendo a la fabricación en un proceso menos costoso.

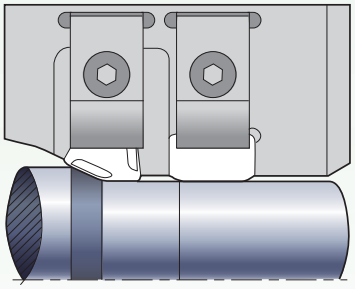
## Sugerencias de aplicación para herramientas WIDIA de desbaste de barra

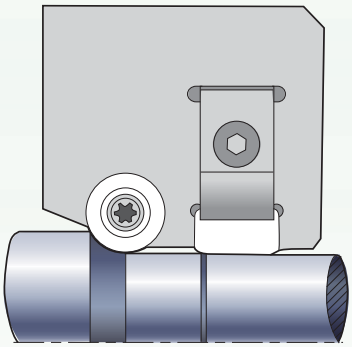
La selección de la calidad de metal duro apropiada para el desbaste de barras sigue los mismos criterios que el torneado convencional, incluyendo la maquinabilidad del material de la pieza de trabajo, la sección transversal de virutas y la velocidad de corte.











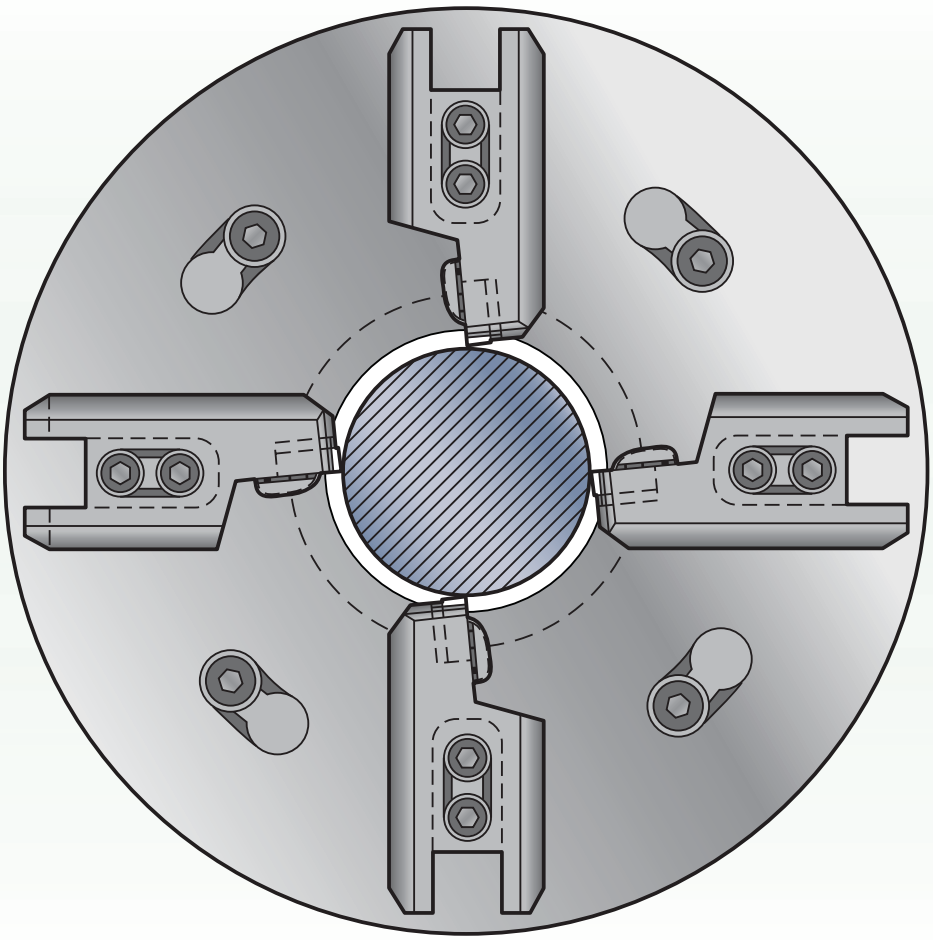
*(continuación)*

## Sugerencias de aplicación para herramientas WIDIA™ de desbaste de barra *(continuación)*

El rendimiento influye especialmente en la rigidez de la máquina, la pieza de trabajo y el sistema de herramientas, el tipo y la cantidad de refrigerante empleado y la potencia total de la máquina. En condiciones de mecanizado desfavorables (p. ej. un condicionamiento inestable o incorrecto), es necesario aplicar calidades de metal duro con gran tenacidad.

En condiciones favorables, se pueden aplicar calidades de metal duro resistentes al desgaste, que permiten altas velocidades de corte. Por lo general son preferibles las velocidades de corte elevadas, ya que los costes de las máquinas herramienta para el desbaste de barras son muy altos y, por tanto, resulta apropiado un mayor uso. Los costes de las herramientas sólo tienen una importancia secundaria en los costes de fabricación totales, puesto que los costes de herramientas mayores (debido a las mayores velocidades de corte) se compensan con los ahorros que proporcionan los colectores.

Los datos óptimos para las velocidades de corte y los avances deben optimizarse teniendo en cuenta los puntos anteriormente mencionados. Es absolutamente necesario aplicar refrigerante en las operaciones de desbaste de barra. Esto reducirá el desgaste en las herramientas, además del calor de las demás piezas y componentes de la máquina. El suministro de refrigerante debe contar con la presión adecuada.



## Calidades de metal duro con y sin recubrimiento para el desbaste de barra

### WIDIA™ TTX HW-P10

Calidad de metal duro principal sin recubrimiento para el desbaste de barra de acero aleado y sin alear, así como acero fundido, en condiciones de mecanizado favorables. La buena resistencia al calor de esta calidad que contiene TiC y TaC viene acompañada de alta resistencia al desgaste y a los cráteres con una tenacidad excelente.

### WIDIA TTM HW-P25

Calidad de metal duro universal sin recubrimiento para el desbaste de barra con baja resistencia a la tensión. Esta calidad ofrece una suficiente tenacidad y una buena resistencia al desgaste en condiciones desfavorables.

## Calidades de metal duro recubierto

### WIDIA TN7115, HC-P15

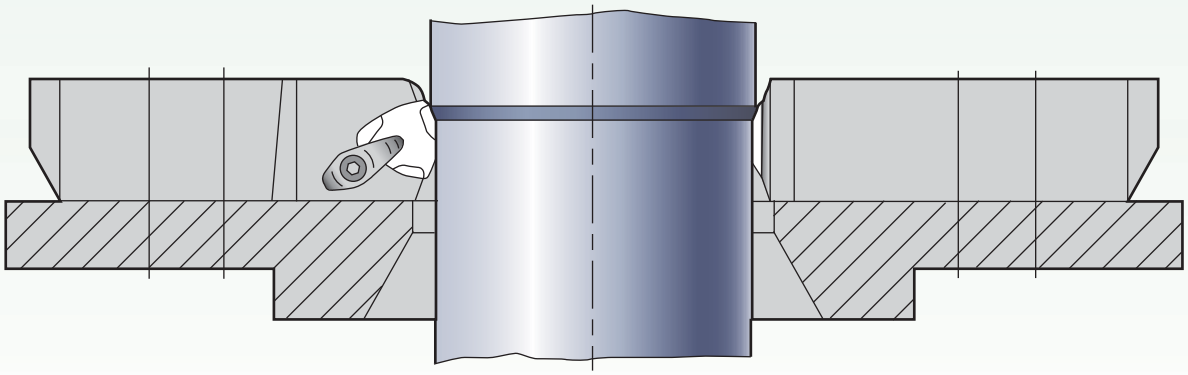
Recubrimiento de TiN-TiCN (MT)-TiOCN-alfa $Al_2O_3$
Calidad de metal duro principal recubierto para el desbaste de barra de acero aleado y sin alear, así como acero fundido, en condiciones de mecanizado favorables. Excelente resistencia al desgaste para una mayor vida de la herramienta y reducción de las fricciones, lo cual proporciona mejores acabados superficiales.

### WIDIA TN7125, HC-P25

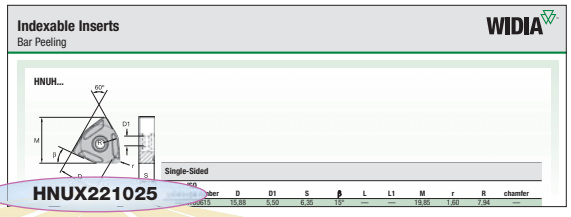
Recubrimiento de TiN-TiCN (MT)-TiOCN-alfa $Al_2O_3$
Suplemento de TN7115 con tenacidad y resistencia adicional del filo para el desbaste de barras de acero aleado y sin alear, así como fundido, en condiciones de mecanizado desfavorables.

### WIDIA TN8025, HC-M25

Recubrimiento de MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-ZrCN
Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio para la serie AISI 300 de acero inoxidable austenítico.



# Sistema de diámetro interior de desbaste de barra




## H — Forma de la plaquita

- **H**
- **L**
- **N**
- **R**
- **S**
- **T**
- **O**
- **Z**

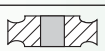
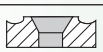
## N — Ángulo de incidencia

- **N 0°**

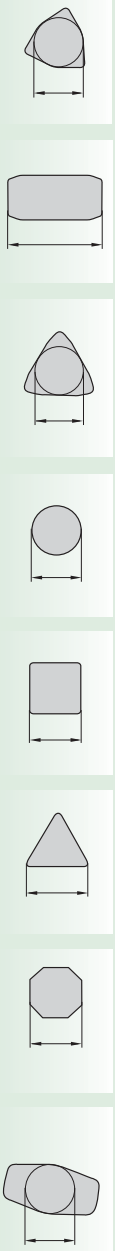
## U — Tolerancia refrigeración interior

| | |
|---|---|
| **G** | ± 0,001 |
| **H** | ± 0,0005 |
| **K** | de ± 0,002 a ± 0,006 según el tamaño |
| **M** | de ± 0,002 a ± 0,006 según el tamaño |
| **U** | de ± 0,003 a ± 0,010 según el tamaño |

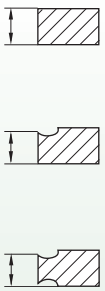
## X — Detalles de amarre y geometría

| | | |
|---|---|---|
| **N** | | |
| **R** | Sin orificio | |
| **F** | | |
| **A** | Con orificio cilíndrico | |
| **M** | | |
| **G**  | | |
| **T**  | Con avellanado de cara única para tornillos con cono de 40–60°. | |
| **W** | | |
| **U** | Con avellanado de cara doble para tornillos con cono de 40–60°. | |
| **Q** | | |
| **H** | Con avellanado de cara única para tornillos con cono de 70–90°. | |
| **J** | Con avellanado de cara doble para tornillos con cono de 70–90°. | |
| **C** | | |
| **X** | Plaquitas intercambiables con características de diseño especiales. | |

## 22 — Tamaño de la plaquita



## 10 — Grosor de plaquita

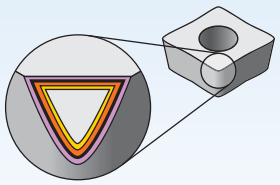


## 25 — Radio/ángulo

- **H**
- **L**
- **N**
- **R**
- **S**
- **T**
- **O**
- **Z**

## Información de rompevirutas adicional

- **-1**
- **-10**
- **-11**
- **-12**
- **-13**
- **-1A**
- **-1B**
- **-1C**
- **-1D**



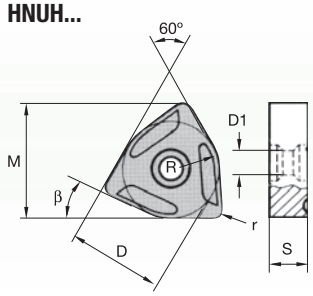
Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para acabado y desbaste ligero.

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TN8025 | HC-M25 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-ZrCN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para la serie AISI 300 de acero inoxidable austenítico. | | | | M | M | M | | | |
| TN7125 | HC-P25 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buenas propiedades de tenacidad. Mecanizado medio y pesado. Para aceros. | | | | P M | P M | P M | | | |
| TN7115 | HC-P15 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para aceros. | | P | P | P | | | | | |
| TN5120 | HC-K20 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$. Mecanizado ligero y medio. Para fundiciones. | | | K | K | K | | | | |
| TN6010 | HC-S10 | Metal duro recubierto. Nanomulticapa de PVD — TiAlN. Mecanizado ligero. Para aleaciones difíciles de mecanizar. | | | S | S | S | | | | |
| TN6025 | HC-S25 | Metal duro recubierto. Nanomulticapa de PVD — TiAlN. Mecanizado ligero y medio. Para aleaciones difíciles de mecanizar. | | | | S | S | S | | | |
| TTX | HW-P35 | Metal duro sin recubrir. Calidad muy resistente al desgaste. Mecanizado ligero. Debe usarse en condiciones favorables. | | | P M | P M | P | P | | | |
| TTM | HW-K15 | Metal duro sin recubrir. Mecanizado medio. Para aceros y fundición nodular. | | | | P M | P M | P M | | | |
| THM | HW-K15 | Metal duro sin recubrir. Equilibrio extraordinariamente bueno de dureza, resistencia al desgaste, estabilidad del filo y tenacidad. Mecanizado ligero y medio. Para fundición, todos los metales no férreos y materiales no metálicos. Útil en condiciones desfavorables. | | | K N S H | K N S H | K N S H | | | | |

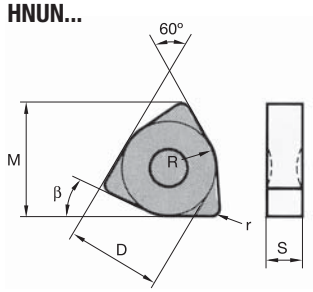
## HNUH...




**Una cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **16** | **HNUH160615** | 15,88 | 5,50 | 6,35 | 15° | — | — | 19,85 | 1,60 | 7,94 | — |
| **22** | **HNUH220725** | 22,00 | 7,00 | 7,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | — |
| **32** | **HNUH321425** | 31,75 | 9,00 | 14,00 | 25° | — | — | 37,93 | 2,00 | 15,875 | 0,60 |

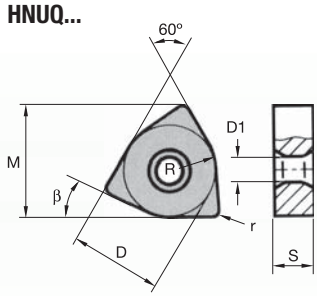
## HNUN...




**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **16** | **HNUN160615** | 15,88 | — | 6,35 | 15° | — | — | 19,85 | 1,60 | 7,94 | 0,60 |
| **22** | **HNUN221015** | 22,00 | — | 10,00 | 15° | — | — | 27,66 | 2,00 | 11,00 | — |
| | **HNUN221025** | 22,00 | — | 10,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | — |

## HNUQ...

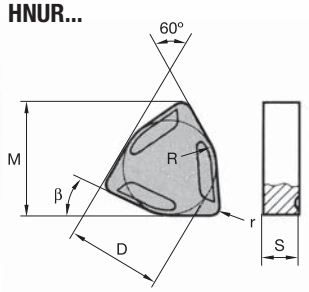



**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **16** | **HNUQ160612** | 15,88 | 5,50 | 6,35 | 15° | — | — | 19,85 | 1,60 | 7,94 | — |

*NOTA: productos disponibles previa solicitud.*

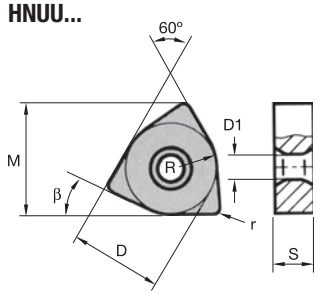
## HNUR...




**Una cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | HNUR220725 | 22,00 | — | 7,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | — |
| | HNUR221025 | 22,00 | — | 10,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | — |

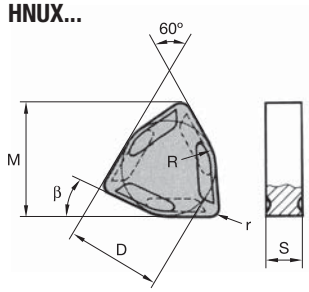
## HNUU...




**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | HNUU120625 | 12,70 | 4,40 | 6,35 | 25° | — | — | 14,99 | 1,20 | 6,35 | — |
| 16 | HNUU160615 | 15,88 | 5,50 | 6,35 | 15° | — | — | 19,85 | 1,60 | 7,94 | 0,50 |

## HNUX...




**Doble cara**

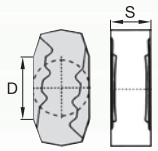
| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | HNUX120625 | 12,70 | — | 6,35 | 25° | — | — | 14,99 | 1,20 | 6,35 | — |
| 16 | HNUX160615 | 15,88 | — | 6,35 | 15° | — | — | 19,85 | 1,60 | 7,94 | 0,50 |
| | HNUX160625 | 15,88 | — | 6,35 | 25° | — | — | 18,70 | 1,60 | 7,94 | 0,50 |
| | HNUX160725 | 15,88 | — | 7,94 | 25° | — | — | 18,70 | 1,60 | 7,94 | 0,20 |
| 22 | HNUX221015 | 22,00 | — | 10,00 | 15° | — | — | 27,65 | 2,00 | 11,00 | — |
| | HNUX221025–1A | 22,00 | — | 10,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | 0,60 |
| | HNUX221025 | 22,00 | — | 10,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | 1,10 |
| 28 | HNUX280930 | 28,58 | — | 8,94 | 30° | — | — | 33,32 | 1,20 | 7,62 | — |

**Una cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | HNUX221025–10 | 22,00 | — | 10,00 | 25° | — | — | 26,00 | 2,00 | 11,00 | 0,50 |
| 28 | HNUX280930–10 | 28,58 | — | 9,64 | 30° | — | — | 33,32 | 1,20 | 7,62 | 0,35 |

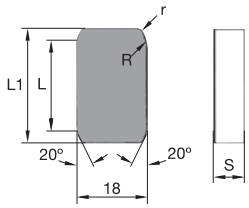
*NOTA: productos disponibles previa solicitud.*

## LNMX...



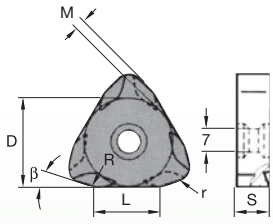

| | Doble cara | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
| 18 | LNMX181220–HP | 18,00 | — | 12,50 | — | 20,00 | — | — | — | — | 0,50 |
| | LNMX181220–SP | 18,00 | — | 12,50 | — | 20,00 | — | — | — | — | 1,00 |

## LNUN...




| | Doble cara | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
| 30 | LNUN301020 | — | — | 10,00 | 20° | 24,00 | 30,00 | — | 0,80 | 10,00 | — |
| 38 | LNUN381020 | — | — | 10,00 | 20° | 30,00 | 38,00 | — | 0,80 | 10,00 | — |
| 40 | LNUN401020 | — | — | 10,00 | 20° | 30,00 | 38,00 | — | 0,80 | 10,00 | — |
| 50 | LNUN501020 | — | — | 10,00 | 20° | 32,00 | 50,00 | — | 0,80 | 10,00 | — |

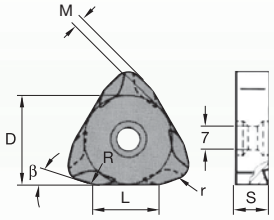
## NNGJ...




| | Doble cara | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
| 28 | NNGJ281020 | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 0,50 |
| | NNGJ281020–1A | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 0,50 |
| | NNGJ281020–1D | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 1,00 |
| | NNGJ281020–HP | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 0,50 |
| | NNGJ281020–SP | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 1,00 |

*NOTA: productos disponibles previa solicitud.*

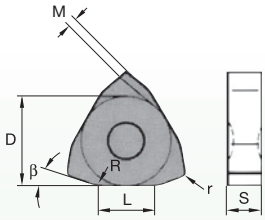
## NNUJ...




**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | **NNUJ220820–11** | 22,00 | 7,00 | 8,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| | **NNUJ220820–12** | 22,00 | 7,00 | 8,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| | **NNUJ221020–12** | 22,00 | 7,00 | 10,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| 28 | **NNUJ280820** | 28,00 | 7,00 | 8,00 | 20° | 22,00 | — | 2,10 | 1,00 | 10,00 | 0,50 |
| | **NNUJ281020–1A** | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 0,50 |
| | **NNUJ281020–10** | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 1,00 |
| | **NNUJ281020–1B** | 28,00 | 7,00 | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 1,00 |

## NNUN...

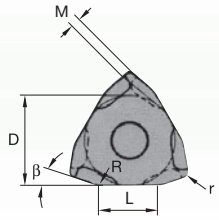



**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | **NNUN220820** | 22,00 | — | 8,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,50 |
| | **NNUN221020** | 22,00 | — | 10,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,50 |
| 28 | **NNUN281020** | 28,00 | — | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | 0,50 |

*NOTA: productos disponibles previa solicitud.*

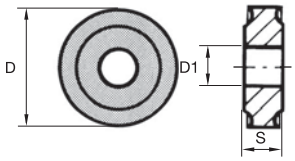
## NNUX...




**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | NNUX220820 | 22,00 | — | 8,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| | NNUX220820–10 | 22,00 | — | 8,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| | NNUX220820–11 | 22,00 | — | 8,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| | NNUX221020 | 22,00 | — | 10,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | — |
| | NNUX221020–1 | 22,00 | — | 10,00 | 20° | 16,00 | — | 2,10 | 1,00 | 10,00 | 0,60 |
| 28 | NNUX281020 | 28,00 | — | 10,00 | 20° | 22,00 | — | 2,90 | 5,00 | 10,00 | — |

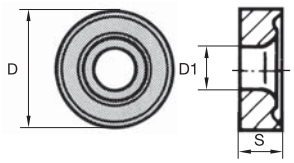
## RNMG...




**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 09 | RNMG090300 | 9,52 | 3,81 | 3,18 | — | — | — | — | — | — | — |
| 12 | RNMG120400 | 12,70 | 5,16 | 4,76 | — | — | — | — | — | — | — |
| 15 | RNMG150600 | 15,88 | 6,35 | 6,35 | — | — | — | — | — | — | — |
| 19 | RNMG190600 | 19,05 | 7,94 | 6,35 | — | — | — | — | — | — | — |
| 28 | RNMG250900 | 25,45 | 9,12 | 9,52 | — | — | — | — | — | — | — |

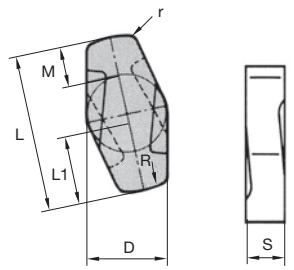
## RNM...




**Una cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | RNMH281000 | 28,50 | 8,80 | 10,50 | — | — | — | — | — | — | — |
| 38 | RNMH381200–11 | 38,10 | 12,70 | 12,70 | — | — | — | — | — | — | — |
| | RNMH381200–13 | 38,10 | 12,70 | 12,70 | — | — | — | — | — | — | — |
| | RNMM381200 | 38,10 | 12,70 | 12,70 | — | — | — | — | — | — | — |
| 50 | RNMH501800 | 50,00 | 12,70 | 18,00 | — | — | — | — | — | — | — |

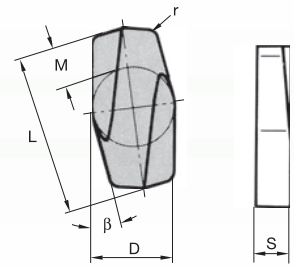
## ZNU...




**Doble cara**

| | Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | ZNUX120715L | 12,00 | — | 7,00 | 15° | 30,50 | 13,50 | — | — | — | 0,50 |
| 18 | ZNUG181215 | 18,00 | — | 12,00 | 15° | 37,00 | 14,50 | — | — | — | — |
| | ZNUN181215 | 18,00 | — | 12,00 | 15° | 37,00 | 14,50 | — | — | — | — |
| | ZNUX181215–1 | 18,00 | — | 12,00 | 15° | 37,00 | 14,50 | — | — | — | 0,60 |
| | ZNUX181215L | 18,00 | — | 12,00 | 15° | 36,00 | 15,80 | — | — | — | — |
| 25 | ZNUX251815L | 25,00 | — | 18,00 | 15° | 47,60 | 19,50 | — | — | — | — |
| 30 | ZNUX302020–1 | 30,00 | — | 20,00 | 20° | 56,00 | 28,00 | — | — | — | 1,10 |

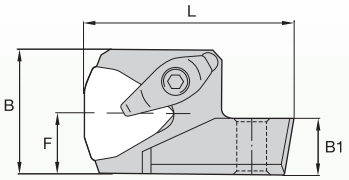
## ZNUR...

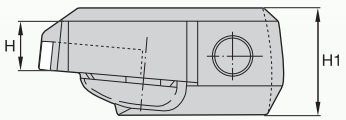



**Una cara**

| Número de catálogo ISO | D | D1 | S | β | L | L1 | M | r | R | biselado |
|---|---|---|---|---|---|---|---|---|---|---|
| ZNUR181215 | 18,00 | — | 12,00 | 15° | 37,00 | 14,50 | — | — | — | — |

*NOTA: productos disponibles previa solicitud.*



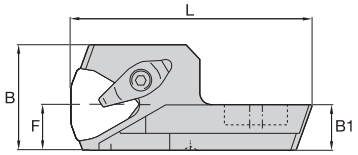



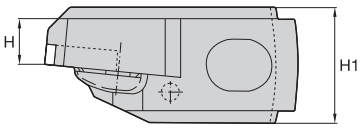

**Número de catálogo**

| diámetro | WDHF 20 | WDH 20 |
|---|---|---|
| 8–20 | **219.40**.801 | — |
| 8–13 | — | **219.40**.601 |
| 10–15 | — | ...602 |
| 15–20 | — | ...603 |

**Dimensión técnica**

| B | B1 | F | H | H1 | L | plaquitas intercambiables |
|---|---|---|---|---|---|---|
| 42 | 17,5 | 18 | 13 | 33,4 | 68 | **NNU...220820** |
| 38 | 17,5 | 18 | 12,5 | 28,5 | 64,25 | |
| 38 | 17,5 | 18 | 12,5 | 28,5 | 62,65 | |
| 38 | 17,5 | 18 | 12,5 | 28,5 | 60,15 | |



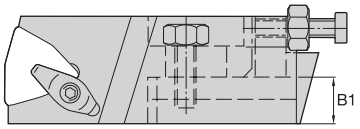



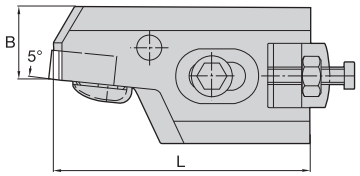

**Número de catálogo**

| diámetro | WDH 50 T |
|---|---|
| 8–20 | **219.40**.520 |
| 18–30 | ...521 |
| 28–40 | ...522 |
| 38–50 | ...523 |

**Dimensión técnica**

| B | B1 | F | H | H1 | L | plaquitas intercambiables |
|---|---|---|---|---|---|---|
| 40 | 18 | 23,5 | 17,5 | 44 | 113 | **NNU...220820** |
| 40 | 18 | 23,5 | 17,5 | 44 | 108 | |
| 40 | 18 | 23,5 | 17,5 | 44 | 103 | |
| 40 | 18 | 23,5 | 17,5 | 44 | 98 | |




**Número de catálogo**

| diámetro | WDH 50 ajustable |
|---|---|
| 8–22 | **219.40**.554 |

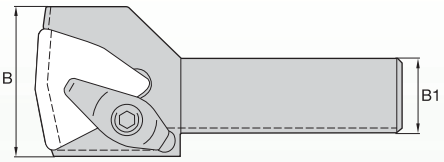
**Dimensión técnica**

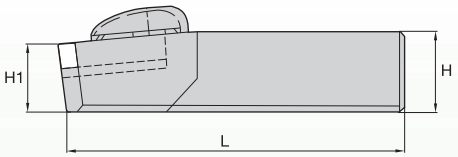
| B | B1 | L | plaquitas intercambiables |
|---|---|---|---|
| 30 | 13 | 94,4 | **HNUX...160615** |

**Número de catálogo • Recambios**

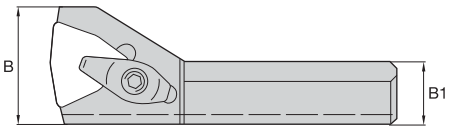
| | manguito de tensión | apoyo | amarre por retención | tornillo de amarre | tornillo roscado doble | espaciador | tornillo de cilindro | tuerca hex. |
|---|---|---|---|---|---|---|---|---|
| WDHF, WDH 20 | — | — | **214.75**.340 | — | **214.85**.740 | — | — | — |
| WDH 50 T | — | — | ...340 | — | ...740 | — | — | — |
| WDH 50 Ajustable | **214.75**.382 | **214.80**.070 | **214.80**.447 | **214.80**.448 | | **214.77**.516 | **214.87**.005 | **214.77**.515 |

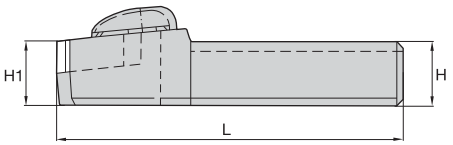
*NOTA: productos disponibles previa solicitud.*




| Número de catálogo | | Dimensión técnica | | | | | |
|---|---|---|---|---|---|---|---|
| diámetro | WDH 50 con mango descentrado | B | B1 | H | H1 | L | plaquitas intercambiables |
| 38–50 | **219.40**.562 | 26 | 12,7 | 15 | 12,7 | 63 | **HNUX...120625** |

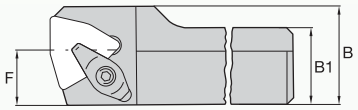


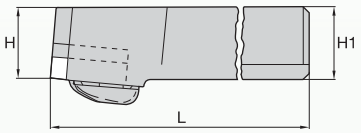




| Número de catálogo | Dimensión técnica | | | | | |
|---|---|---|---|---|---|---|
| WDH 50 | B | B1 | H | H1 | L | plaquitas intercambiables |
| **219.40**.730 | 20 | 12 | 12 | 12 | 62 | **HNUX...120625** |

| Número de catálogo • Recambios | | |
|---|---|---|
| | amarre por retención | tornillo de amarre |
| **219.40**.562 | **214.80**.447 | **214.80**.448 |
| **219.40**.730 | ...447 | ...448 |

*NOTA: productos disponibles previa solicitud.*



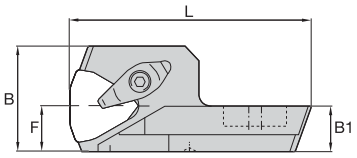



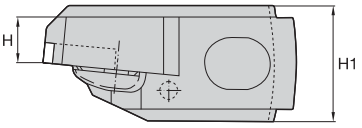

**Número de catálogo**

| diámetro | WDH 50 K |
|---|---|
| 7–50 | **219.40**.560 |

**Dimensión técnica**

| B | B1 | F | H | H1 | L | plaquitas intercambiables |
|---|---|---|---|---|---|---|
| 28,6 | 22 | 16 | 20,5 | 20,5 | 82 | **HNU...160615** |




**Número de catálogo**

| diámetro | WDH 75 T |
|---|---|
| 8–20 | **219.40**.700 |
| 19–32 | ...701 |
| 31–44 | ...703 |
| 43–56 | ...704 |
| 55–68 | ...705 |
| 67–80 | ...706 |

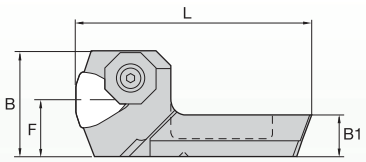
**Dimensión técnica**

| B | B1 | F | H | H1 | H2 | L | plaquitas intercambiables |
|---|---|---|---|---|---|---|---|
| 44,5 | 20 | 19 | 24,5 | 51 | 41,9 | 113,6 | **NNU...220820** |
| 44,5 | 20 | 19 | 24,5 | 51 | 41,9 | 107,6 | |
| 44,5 | 20 | 19 | 24,5 | 51 | 41,9 | 101,6 | |
| 44,5 | 20 | 19 | 24,5 | 51 | 41,9 | 95,6 | |
| 44,5 | 20 | 19 | 24,5 | 51 | 41,9 | 89,6 | |
| 44,5 | 20 | 19 | 24,5 | 51 | 41,9 | 83,6 | |

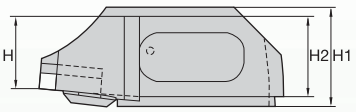
**Número de catálogo • Recambios**

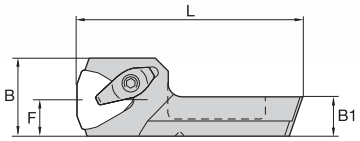
| | amarre por retención | tornillo de amarre | tornillo roscado doble | manguito de tensión | apoyo |
|---|---|---|---|---|---|
| WDH 50 K | **214.80**.447 | **214.80**.448 | — | **214.75**.382 | **214.80**.070 |
| WDH 75 T | **214.75**.340 | — | **214.85**.740 | ...382 | ...034 |

*NOTA: productos disponibles previa solicitud.*

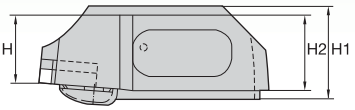


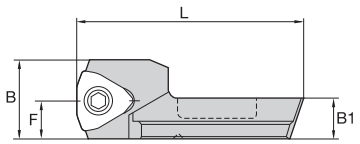

Con tornillo de retención



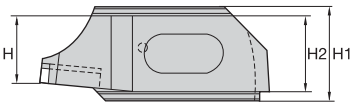




Con amarre por retención




Con tornillo

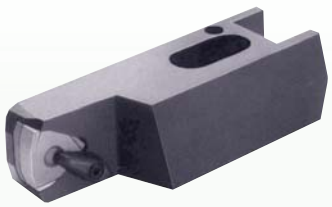


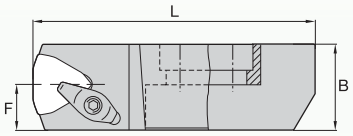

| Número de catálogo | | Dimensión técnica | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| diámetro | WDHE 80 | B | B1 | F | H | H1 | H2 | L | plaquitas intercambiables |
| **con tornillo de retención** | | | | | | | | | |
| 12–20 | **219.40**.810 | 52 | 20 | 28 | 34 | 47 | 38 | 113,6 | **NNU...220820** |
| 19–32 | ...811 | 52 | 20 | 28 | 34 | 47 | 38 | 107,6 | |
| 31–44 | ...813 | 52 | 20 | 28 | 34 | 47 | 38 | 101,6 | |
| 43–56 | ...814 | 52 | 20 | 28 | 34 | 47 | 38 | 95,6 | |
| 55–68 | ...815 | 52 | 20 | 28 | 34 | 47 | 38 | 89,6 | |
| 67–80 | ...816 | 52 | 20 | 28 | 34 | 47 | 38 | 83,6 | |
| **con amarre por retención** | | | | | | | | | |
| 8–20 | **219.40**.820 | 40 | 20 | 19 | 34 | 47 | 38 | 113,6 | **NNU...220820** |
| 19–32 | ...821 | 40 | 20 | 19 | 34 | 47 | 38 | 107,6 | |
| 31–44 | ...823 | 40 | 20 | 19 | 34 | 47 | 38 | 101,6 | |
| 43–56 | ...824 | 40 | 20 | 19 | 34 | 47 | 38 | 95,6 | |
| 55–68 | ...825 | 40 | 20 | 19 | 34 | 47 | 38 | 89,6 | |
| 67–80 | ...826 | 40 | 20 | 19 | 34 | 47 | 38 | 83,6 | |
| **con tornillo** | | | | | | | | | |
| 12–20 | **219.40**.830 | 40 | 20 | 19 | 34 | 47 | 38 | 113,6 | **NNUX...220820** |
| 19–32 | ...831 | 40 | 20 | 19 | 34 | 47 | 38 | 107,6 | |

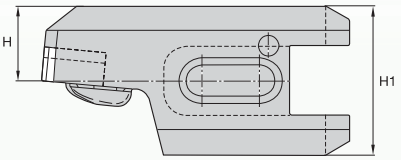
**Número de catálogo • Recambios**

| | amarre por retención | tornillo de amarre | tornillo de retención | tornillo de ajuste | manguito de tensión | apoyo |
|---|---|---|---|---|---|---|
| **219.40**.810 a...816 | — | **214.76**.708 | **214.75**.344 | **214.80**.459 | **214.75**.382 | **214.80**.034 |
| **219.40**.820 a...826 | **214.75**.340 | **214.85**.740 | — | — | ...382 | ...034 |
| **219.40**.830 y...831 | — | **214.80**.372 | — | — | — | **214.76**.787 |

*NOTA: productos disponibles previa solicitud.*





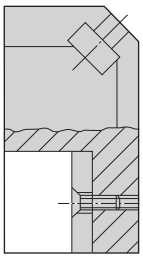



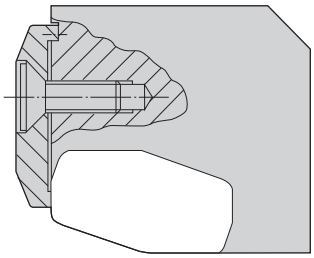

**Número de catálogo**

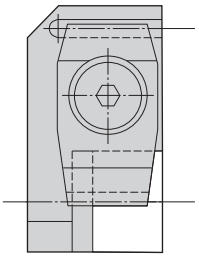
| diámetro | WDH 100 |
|---|---|
| 20–60 | **219.40**.100 |
| 60–105 | ...105 |

**Dimensión técnica**

| F | H | H1 | L | plaquitas intercambiables |
|---|---|---|---|---|
| 22 | 32,5 | 65 | 157 | **NNU...221020** |
| 22 | 32,5 | 65 | 134 | |





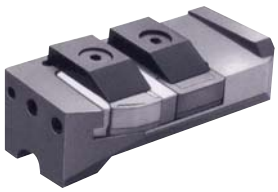


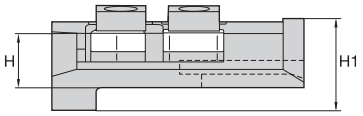
**Número de catálogo**

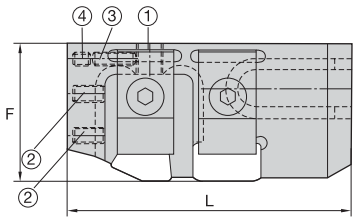
| WDH 360 |
|---|
| **219.40**.732 |

**Dimensión técnica**

| | plaquitas intercambiables |
|---|---|
| Detalles técnicos disponibles previa solicitud. | **ZNU...302020** |






**Número de catálogo**

| diámetro | S 80 |
|---|---|
| 20–60 | **219.40**.100 |
| 60–105 | ...105 |

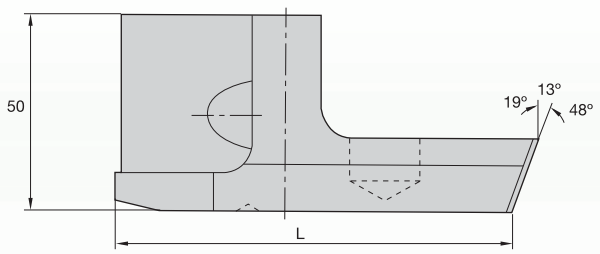
**Dimensión técnica**

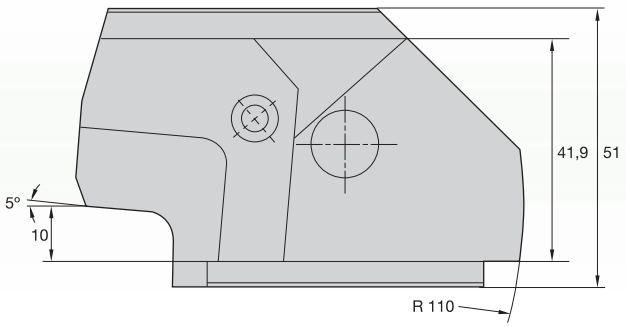
| F | H | H1 | L | plaquitas intercambiables |
|---|---|---|---|---|
| 72 | 28 | 47 | 128 | **NNU...221020** |
| 62 | 28 | 47 | 128 | |

**Número de catálogo • Recambios**

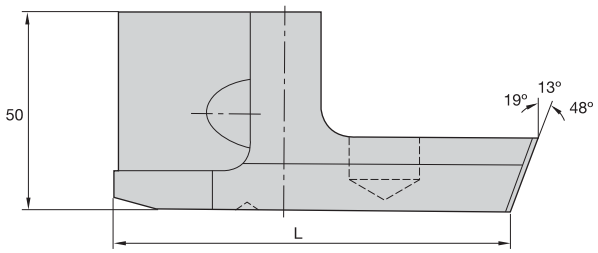
| | 1 | | 2 | | | 3 | 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | tornillo de ajuste | tornillo de amarre | tornillo de ajuste | tornillo de amarre | amarre por retención | tornillo de tensión | tornillo de ajuste | apoyo | manguito de tensión | apoyo | pieza de presión |
| WDH 100 | — | **214.85**.740 | — | — | **214.75**.340 | — | — | **214.80**.034 | **214.75**.263 | — | — |
| S 80 | **214.75**.407 | **214.75**.391 | **214.85**.515 | **214.75**.392 | ...351 | **214.75**.352 | **214.85**.863 | ...067 | (2x)...263 | **214.80**.066 | **214.75**.354 |

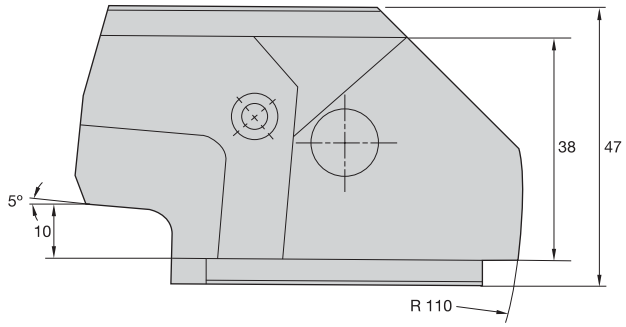
*NOTA: productos disponibles previa solicitud.*




| Número de catálogo | | Dimensión técnica | |
|---|---|---|---|
| diámetro | WDH 75 T | L | para portaplaquitas |
| 31–44 | **219.49**.010 | 94,63 | HNUX...120625 |
| 43–56 | ...011 | 88,63 | |
| 55–68 | ...012 | 82,63 | |
| 67–80 | ...013 | 76,63 | |

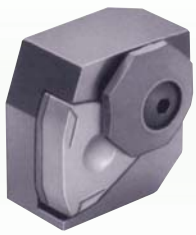


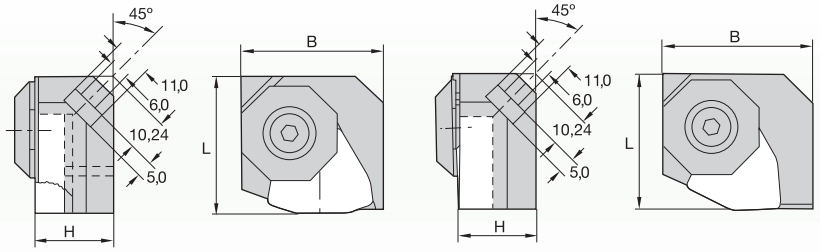



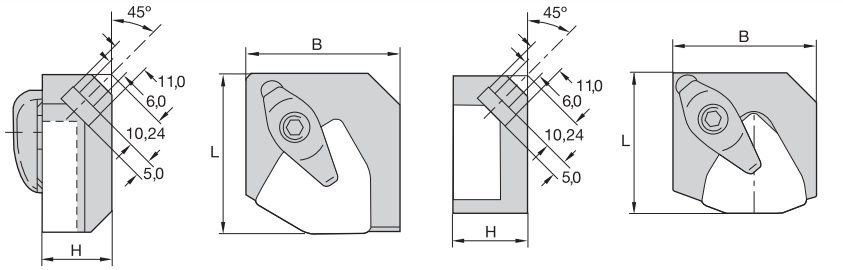

| Número de catálogo | | Dimensión técnica | |
|---|---|---|---|
| diámetro | WDH 75 T | L | para portaplaquitas |
| 31–44 | **219.49**.015 | 94,63 | WDH 75 WDHE 80 |
| 43–56 | ..016 | 88,63 | |
| 55–68 | ...017 | 82,63 | |
| 67–80 | ...018 | 76,63 | |

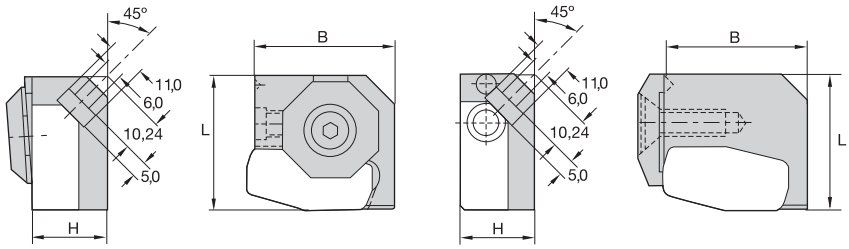
| Número de catálogo • Recambios | | |
|---|---|---|
| | tornillo de tensión | tornillo de amarre |
| **219.40**.562 | **214.77**.512 | **214.77**.511 |

*NOTA: productos disponibles previa solicitud.*







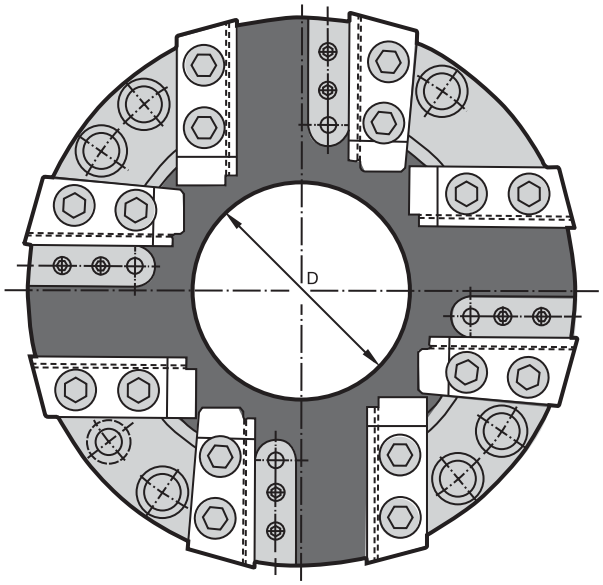


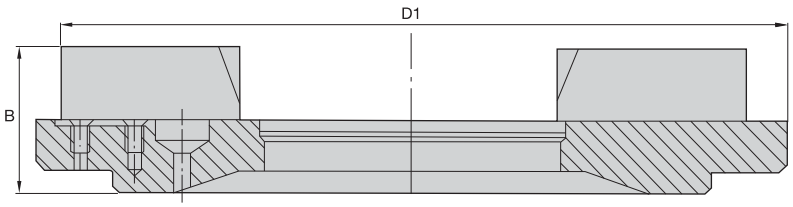

| Número de catálogo | Dimensión técnica | | | | |
|---|---|---|---|---|---|
| Portaplaquitas WDH | H | B | L | para porta básico | plaquitas intercambiables |
| **219.40**.716 | 22,0 | 42,0 | 39,0 | **WDH 75 T y WDHE 80** | NNUX...220820 |
| ...718 | 24,5 | 43,5 | 39,0 | | HNU...221025 |
| ...722 | 22,0 | 45,0 | 44,5 | | HNU...280930 |
| ...724 | 22,0 | 41,8 | 38,8 | | ZNUX...181215 |
| ...726 | 22,0 | 42,0 | 39,0 | | ZNUX...181215 |
| ...728 | 22,0 | 42,0 | 39,0 | | NNU...220820 |

**Número de catálogo • Recambios**

| portaplaquitas | tornillo de retención | amarre por retención | tornillo de amarre | apoyo | manguito de tensión | tornillo avellanado |
|---|---|---|---|---|---|---|
| **219.40**.716 | **214.75**.344 | — | **214.76**.708 | **214.80**.329 | **214.75**.382 | — |
| ...718 | ...344 | — | ...708 | — | — | — |
| ...722 | — | **214.85**.999 | **214.77**.005 | **214.77**.502 | — | — |
| ...724 | **214.75**.344 | — | **214.76**.711 | — | — | — |
| ...726 | — | **214.75**.340 | **214.85**.740 | **214.77**.513 | — | **214.80**.214 |
| ...728 | — | ...340 | ...740 | **214.76**.787 | — | — |

*NOTA: productos disponibles previa solicitud.*



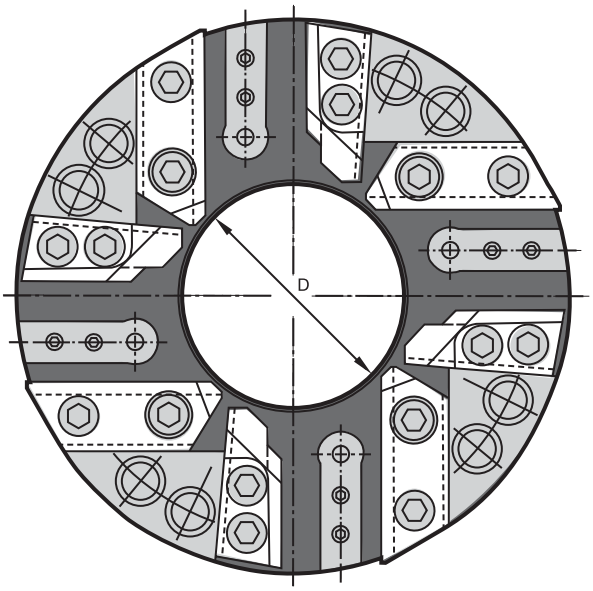



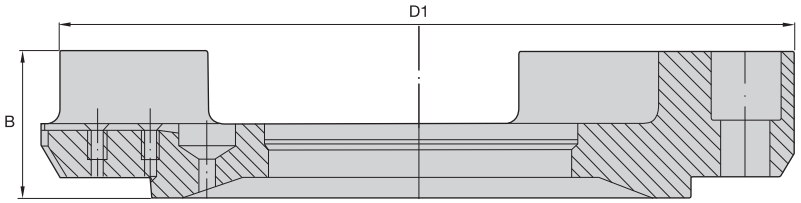

| Números de catálogo | Dimensión técnica | | | |
|---|---|---|---|---|
| | | | | para porta de |
| WDH 75 T | D | D1 | B | desbaste de barra |
| **219.46**.200 | 85 | 215 | 41 | WDH 75 T |

**Números de catálogo • Recambios**

| raíl | guía | arandela | tornillo | tornillo avellanado M 5x10 |
|---|---|---|---|---|
| **219.45**.012 | **219.45**.011 | **219.45**.009 | **219.45**.010 | **214.77**.006 |

*NOTA: productos disponibles previa solicitud.*




| Números de catálogo | Dimensión técnica | | | |
|---|---|---|---|---|
| | | | | para porta de |
| WDHE 80 | D | D1 | B | desbaste de barra |
| **219.46**.200 | 85 | 210 | 41 | WDHE 80 |

| Números de catálogo • Recambios | | | | |
|---|---|---|---|---|
| | | | | |
| raíl | guía | arandela | tornillo | tornillo avellanado M 5x10 |
| **219.45**.013 | **219.45**.014 | **219.45**.009 | **219.45**.010 | **214.77**.006 |

*NOTA: productos disponibles previa solicitud.*

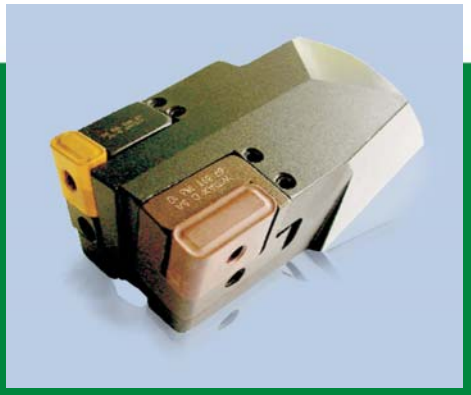
# Herramientas WIDIA™ para mecanizado de ruedas y raíles de ferrocarril

WIDIA ofrece una completa línea de herramientas para el mantenimiento de ruedas y ejes en los talleres ferroviarios. Todas las herramientas incorporan lo último en tecnología de herramientas para lograr la mayor evacuación de metal y el mayor nivel de productividad. Todas las herramientas han sido sometidas a prueba durante largos períodos de tiempo y bajo una amplia gama de condiciones de trabajo. Unas plaquitas de producción en serie estándar y una menor cantidad de herramientas reducen los costes operativos y de inventario. Se incluyen en esta gama las herramientas para el reacondicionamiento de conjuntos de ruedas montadas, mandrinado de ruedas, alineado de ruedas, torneado de ejes y pulido diario.

Las condiciones de mecanizado para estas herramientas varían según el tipo de servicio que se haya llevado a cabo con la rueda.

- Áreas de partes planas.
- Sobrecalentamiento de ruedas al rotar.
- Quemaduras accidentales.
- Hongo y bloqueos excesivos endurecidos por una presión inusual presión.
- Ruedas mal alineadas que provocan un desgaste excesivo en el lado de la brida.

Cada una de estas condiciones requieren una velocidad de mecanizado y una profundidad de corte diferentes. Incluso en estas condiciones difíciles, las herramientas WIDIA han producido unos resultados excelentes, mediante una reducción del tiempo de producción y de los costes de mantenimiento.



Reacondicionamiento de conjuntos de ruedas — Ventajas de las herramientas WIDIA™ de torno para ruedas:

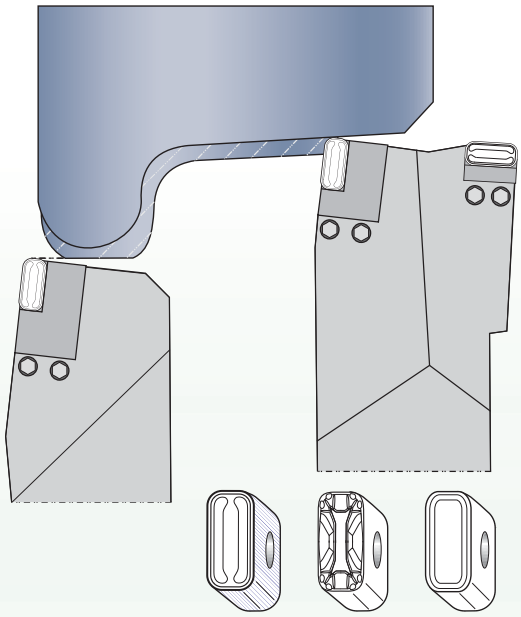
- Sin amarre superior que pueda desgastarse o interferir con el flujo de virutas. La plaquita se bloquea entre dos extremos del portaherramientas para impedir su movimiento bajo cargas de corte pesadas.
- Una unidad de bloqueo de metal endurecido que ofrece asiento a una plaquita positiva y una protección al soporte.
- Indexado de plaquitas rápido y sin problemas: limítese a desbloquear un tornillo para liberar la plaquita.
- Retirada rápida de la unidad de bloqueo de acero y de la plaquita para limpieza o sustitución.
- Diseño de unidad de bloqueo de metales pesados que asegura una vida mayor y reduce los costes operativos.
- Inventario con menos piezas.
- Los portaherramientas y unidades de bloqueo de acero, fabricados con aceros aleados tratados térmicamente, proporcionan apoyo para resistir los cortes de desbaste severos en ruedas endurecidas.

## Portaherramientas para el torneado de ruedas de ferrocarril

El grupo de productos WIDIA™ ofrece portaherramientas y plaquitas intercambiables para todos los tipos de tornos de rueda que se emplean en el sector. Hemos desarrollado estas herramientas en estrecha cooperación con los fabricantes de máquinas herramienta y los talleres ferroviarios.

Las condiciones de mecanizado para estas herramientas varían según el tipo de servicio que se haya llevado a cabo con la rueda. El perfil de la rueda está sujeto al desgaste al enfrentarse a una curva o durante el frenado. El desgaste del perfil también se debe a los patinazos, las ruedas mal alineadas, etc. Por tanto, se necesitan distintos parámetros de mecanizado para las distintas condiciones en que se encuentre la rueda. A pesar de unas condiciones de mecanizado difíciles, nuestros portaherramientas y nuestras plaquitas intercambiables han producido los mejores resultados en la reducción de tiempo de producción y de los costes de las herramientas.

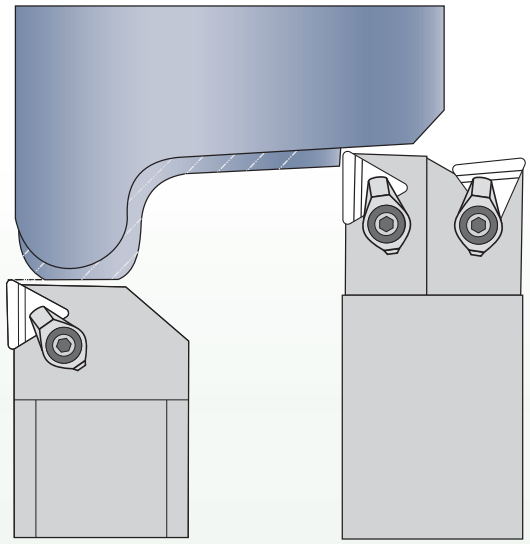
Los portaherramientas del grupo de productos WIDIA para el mecanizado de un conjunto de ruedas adoptan el resistente sistema de amarre LS. La plaquita cuenta con rompevirutas y está fijada al portaherramientas mediante una palanca y un tornillo de amarre. Para las operaciones de retorneado de ruedas en trabajos pesados, las plaquitas cuentan con un diseño de parte superior abierta, que aumenta la fuerza de la plaquita. Las plaquitas se montan sobre un porta (portaplaquita), que a su vez se monta sobre el portaherramientas. Como resultado, sólo es necesario sustituir los portaplaquitas (de bajo coste) en caso de que el alojamiento de la plaquita reciba algún daño.



Las plaquitas de parte superior abierta son neutrales y comunes para ambas direcciones de los portaherramientas, reduciendo los costes de inventario y del surtido. Otra característica de estandarización de este diseño es que se puede utilizar la misma combinación portaplaquita-plaquita en distintos portaherramientas para varias aplicaciones.

También ofrecemos portaherramientas en nuestro sistema KS para el torneado de conjuntos de ruedas. En este sistema de amarre, la plaqueta y el rompevirutas se amarran directamente al cuerpo del portaherramientas con la ayuda de un amarre superior. Se utilizan unos apoyos de metal duro de tungsteno para minimizar el daño recibido por el alojamiento de la plaquita de precisión en el portaherramientas. También se adopta el sistema KS para el ranurado de la parte superior e inferior de los neumáticos.

El retorneado del eje implica una compleja operación de copiado que requiere una plaquita de copiado y un pequeño ángulo incluido. La solución es montar la plaquita de copiado de 35° en un portaherramientas con un apoyo y amarrarla con un tornillo (sistema WIDIA-LR).



**Ventajas de los portaherramientas y las plaquitas WIDIA™:**

- Los cuerpos de los portaherramientas están fabricados con acero aleado tratado al calor, proporcionando un apoyo rígido a la plaquita para cortes pesados y en desbaste en ruedas endurecidas.
- Calidad de metal duro recubierto desarrollada especialmente y muy resistente al desgaste para el mecanizado de ruedas que permite un gran control del perfil. Esta calidad ha sido diseñada específicamente para el mecanizado de ruedas de ferrocarril con un sustrato de "sinterizado gradiente" ultramoderno para lograr un buen recubrimiento y tenacidad, mejorando así la resistencia al desgaste.
- Un programa de fabricación estandarizado para portaherramientas, plaquitas y recambios que proporciona una sencilla disponibilidad de estos elementos en poco tiempo.

Nuestro equipo de ventas y aplicaciones puede proporcionar más detalles sobre cómo aplicar unas plaquitas y unos portaherramientas específicos para lograr la máxima productividad. También revisarán y recomendarán un diseño de herramienta especial exclusivo para sus necesidades. Llame a la oficina WIDIA más cercana para obtener más detalles.

## Sistema de fijación P para modelos:

### Hegenscheidt 167 y HEC Hegenscheidt LW 140B-A

Portaherramientas compuesto

Portaherramientas cortador

Portaherramientas para planeado

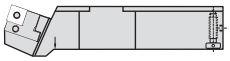
### Hegenscheidt 105 y HEC Hegenscheidt LUW 165

(bajo torno de suelo)

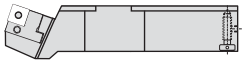
Portaherramientas compuesto

### HEC Hegenscheidt LUW 160B

(bajo torno de suelo)

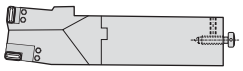


Portaherramientas compuesto



Portaherramientas cortador

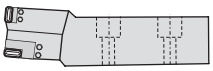
### Hegenscheidt 166 y HEC Hegenscheidt LW 110B, LW 140B, LW 110M, LW 140M



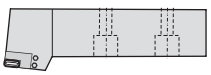
Portaherramientas compuesto

Portaherramientas cortador

### Rafamet UBB 112/2



Portaherramientas compuesto



Portaherramientas cortador

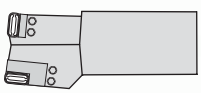
### Rafamet UGB 150

(bajo torno de suelo)

Portaherramientas compuesto

### Sculfort

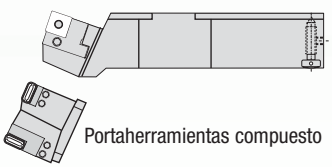
(bajo torno de suelo)



Portaherramientas compuesto

### Hegenscheidt 102

(bajo torno de suelo)



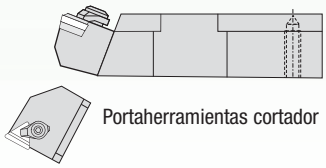
Portaherramientas compuesto

*NOTA: productos disponibles previa solicitud.*

## Sistema de fijación C para modelos:

### Hegenscheidt 102

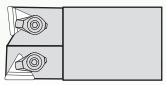
(bajo torno de suelo)



Portaherramientas cortador

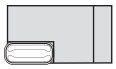
### Sculfort

(bajo torno de suelo)



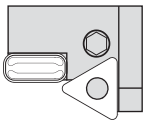
Portaherramientas compuesto

### Portaplaquitas para portaherramientas WIDIA-LS



Portaplaquita para torneado

Portaplaquita para planeado



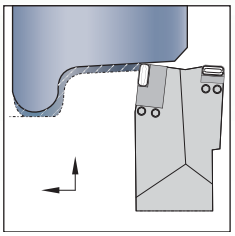
Portaplaquita para torneado

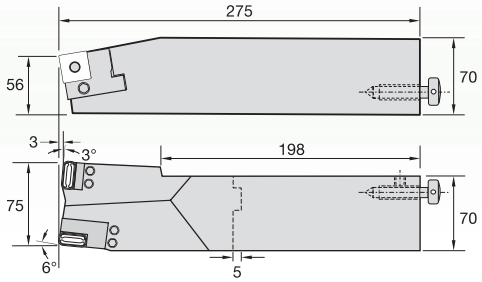
### Recomendaciones de herramientas

- Herramientas para el mecanizado de neumáticos de ruedas en los VTL CNC de Webster & Bennett *Consulte la página G40.*
- Herramientas para el mecanizado de cubos de ruedas en los VTL CNC de Webster & Bennett *Consulte la página G41.*
- Herramientas para el mecanizado de ruedas en VTL convencionales *Consulte la página G42.*
- Herramientas para el mecanizado de cubos de ruedas en VTL convencionales *Consulte la página G43.*
- Herramientas para el mecanizado de un eje de cojinete de rodillos en un torno CNC TAKISAWA® — TS 40 (para vagón ICF) *Consulte la página G44.*
- Herramientas para el mecanizado de un eje de cojinete de rodillos en un torno CNC TAKISAWA® — TS 40 (para vagón BEML) *Consulte la página G45.*
- Herramientas para el mecanizado de un eje de cojinete de rodillos en un torno CNC TAKISAWA® — TS 40 (para vagón remolque EMU) *Consulte la página G46.*
- Herramientas para el mecanizado de un eje de cojinete liso en un torno CNC — TS 40 *Consulte la página G47.*
- Herramientas para el retorneado y satinado diarios del eje en AJTB Hegenscheidt *Consulte la página G48.*

*NOTA: productos disponibles previa solicitud.*

## Hegenscheidt 167 L y HEC Hegenscheidt LW 140B-A

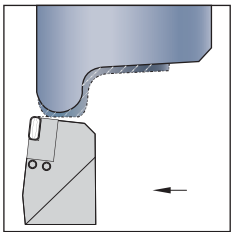


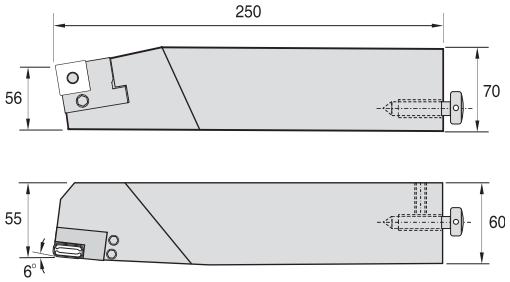



### Portaherramientas compuesto

**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. 1 | tornillo de seguridad | hex. 2 | tornillo de ajuste |
|---|---|---|---|---|---|---|---|---|
| **69.391.458.10** | 69.393.186.10 | 69.393.221.10 | LNUX301940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |
| **69.391.458.20** | 69.393.186.20 | 69.393.220.20 | LNUX301940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |
| **69.391.458.10** | 69.393.187.10 | — | LNUX191940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |
| **69.391.458.20** | 69.393.188.20 | — | LNUX191940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |






### Portaherramientas cortador

**Número de catálogo • Recambios**

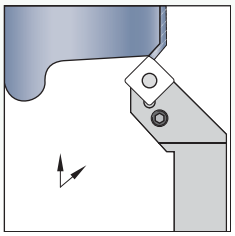
| portaherramientas | portaplaquita para torneado | | tornillo de retención | hex. 1 | tornillo de seguridad | hex. 2 | tornillo de ajuste |
|---|---|---|---|---|---|---|---|
| **69.391.476.10** | 69.393.186.10 | LNUX301940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |
| **69.391.476.20** | 69.393.186.20 | LNUX301940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |
| **69.391.476.10** | 69.393.187.10 | LNUX191940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |
| **69.391.476.20** | 69.393.188.20 | LNUX191940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |

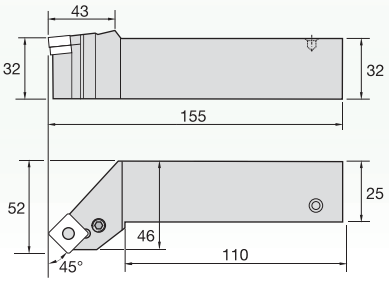
*(continuación)*

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas. Sin embargo, sí incluyen los tornillos necesarios para amarrar los portaplaquitas, los tornillos de seguridad y de ajuste y las llaves hexagonales. Productos disponibles previa solicitud.*

## Hegenscheidt 167 L y HEC Hegenscheidt LW 140B-A

*(continuación)*






### Portaherramientas para planeado

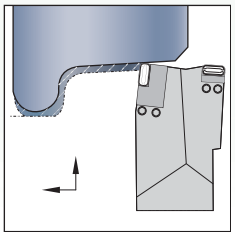
**Número de catálogo • Recambios**

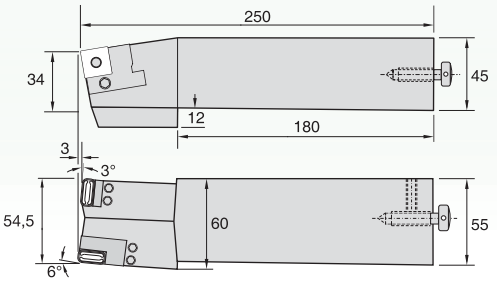
| portaherramientas | | palanca | apoyo | pasador de apoyo | punzón de apoyo | tornillo de amarre | hex. |
|---|---|---|---|---|---|---|---|
| **63.391.492.10** | SNMG1906 | 73.085.603 | 214.85.615 | 214.85.610 | 73.398.941 | 214.85.628 | 214.80.412 |
| **63.391.492.10** | SNMG1906 | 73.085.603 | 214.85.615 | 214.85.610 | 73.398.941 | 214.85.628 | 214.80.412 |

*NOTA: los portaherramientas incluyen todos los recambios debidamente montados menos las plaquitas, que deberán pedirse por separado.*

## Hegenscheidt 105 L y HEC Hegenscheidt LUW 165

**(bajo torno de suelo)**





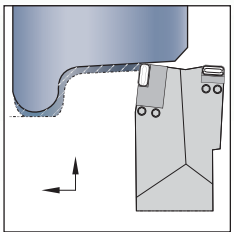

### Portaherramientas compuestos

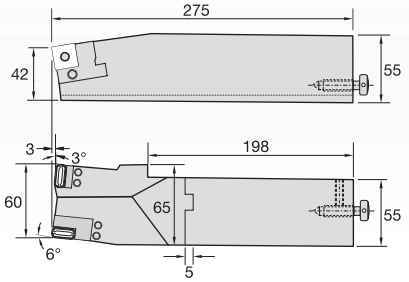
**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. | tornillo de ajuste |
|---|---|---|---|---|---|---|
| **69.391.431.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 | 73.398.577 |
| **69.391.431.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 | 73.398.577 |
| **69.391.431.10** | 69.393.187.10 | 69.393.190.10 | LNUX191940 | 73.085.863 | 73.398.965 | 73.398.577 |
| **69.391.431.20** | 69.393.188.20 | 69.393.189.20 | LNUX191940 | 73.085.863 | 73.398.965 | 73.398.577 |

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas. Sin embargo, sí incluyen los tornillos necesarios para amarrar los portaplaquitas, los tornillos de seguridad y de ajuste y las llaves hexagonales. Productos disponibles previa solicitud.*

## Hegenscheidt 166, HEC Hegenscheidt LW 110B, LW 140B, LW 110M, LW 140M

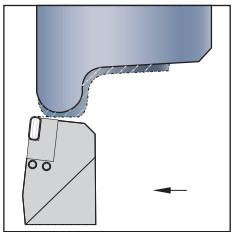


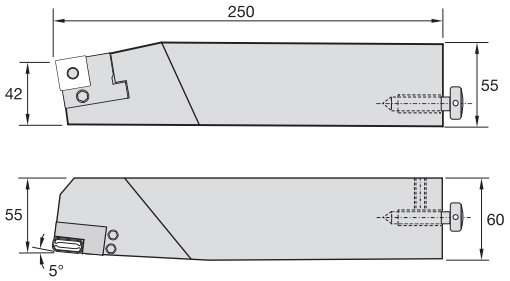



### Portaherramientas compuesto

**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. 1 | tornillo de seguridad | hex. 2 | tornillo de ajuste |
|---|---|---|---|---|---|---|---|---|
| **69.391.393.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |
| **69.391.393.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |
| **69.391.393.10** | 69.393.187.10 | 69.393.190.10 | LNUX191940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |
| **69.391.393.20** | 69.393.188.20 | 69.393.189.20 | LNUX191940 | 73.085.863 | 73.398.965 | 73.398.589 | 73.398.931 | 73.398.577 |





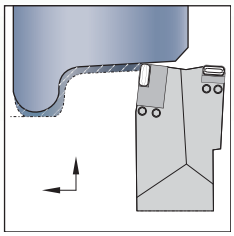

### Portaherramientas cortador

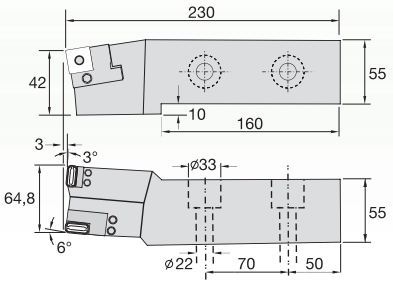
**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | | tornillo de retención | hex. 1 | tornillo de seguridad | hex. 2 | tornillo de ajuste |
|---|---|---|---|---|---|---|---|
| **69.391.334.10** | 69.393.186.10 | LNUX301940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |
| **69.391.334.20** | 69.393.186.20 | LNUX301940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |
| **69.391.334.10** | 69.393.187.10 | LNUX191940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |
| **69.391.334.20** | 69.393.188.20 | LNUX191940 | 73.085.863 | 73.398.965 | 73.498.517 | 73.398.931 | 73.398.577 |

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas. Sin embargo, sí incluyen los tornillos necesarios para amarrar los portaplaquitas, los tornillos de seguridad y de ajuste y las llaves hexagonales. Productos disponibles previa solicitud.*

## Rafamet UBB 112/2

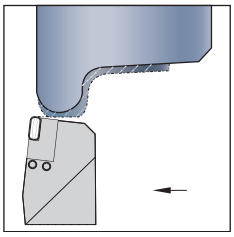


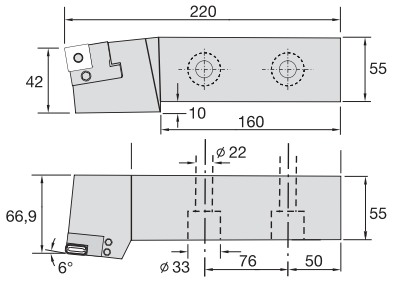



### Portaherramientas compuesto

**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. |
|---|---|---|---|---|---|
| **69.391.390.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.390.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.390.10** | 69.393.187.10 | 69.393.190.10 | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.390.20** | 69.393.188.20 | 69.393.189.20 | LNUX301940 | 73.085.863 | 73.398.965 |






### Portaherramientas cortador

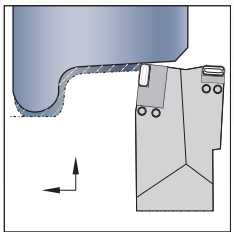
**Número de catálogo • Recambios**

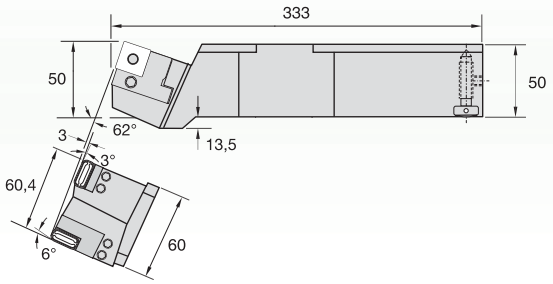
| portaherramientas | portaplaquita para torneado | | tornillo de retención | hex. |
|---|---|---|---|---|
| **69.391.389.10** | 69.393.186.10 | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.389.20** | 69.393.186.20 | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.389.10** | 69.393.187.10 | LNUX191940 | 73.085.863 | 73.398.965 |
| **69.391.389.20** | 69.393.188.20 | LNUX191940 | 73.085.863 | 73.398.965 |

*Para muchos tornos Rafamet, las dimensiones generales de los portaherramientas varían de un taller a otro. Fabricamos estos portaherramientas como peticiones especiales. Envíenos su consulta junto con el plano para llevar a cabo la acción necesaria.*

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas. Sin embargo, sí incluyen los tornillos necesarios para amarrar los portaplaquitas, los tornillos de seguridad y de ajuste y las llaves hexagonales. Productos disponibles previa solicitud.*

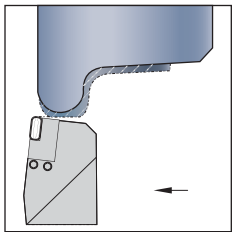
## HEC Hegenscheidt LUW 160B
**(bajo torno de suelo)**

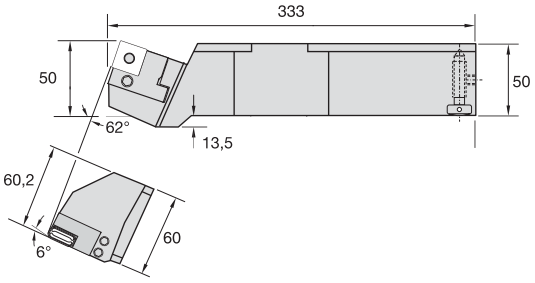





### Portaherramientas compuesto

| Número de catálogo • Recambios | | | | | |
|---|---|---|---|---|---|
| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. |
| **69.391.465.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.465.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.465.10** | 69.393.187.10 | 69.393.190.10 | LNUX191940 | 73.085.863 | 73.398.965 |
| **69.391.465.20** | 69.393.188.20 | 69.393.189.20 | LNUX191940 | 73.085.863 | 73.398.965 |



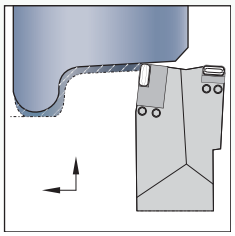


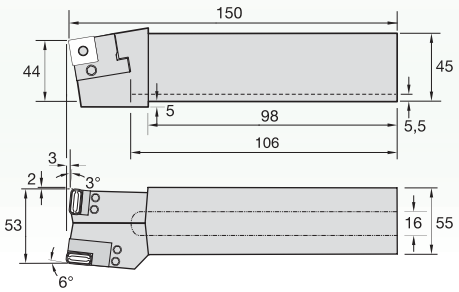

### Portaherramientas cortador

| Número de catálogo • Recambios | | | | |
|---|---|---|---|---|
| portaherramientas | portaplaquita para torneado | | tornillo de retención | hex. |
| **69.391.488.10** | 69.393.186.10 | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.488.20** | 69.393.186.20 | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.488.10** | 69.393.187.10 | LNUX191940 | 73.085.863 | 73.398.965 |
| **69.391.488.20** | 69.393.188.20 | LNUX191940 | 73.085.863 | 73.398.965 |

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas. Sin embargo, sí incluyen los tornillos necesarios para amarrar los portaplaquitas, los tornillos de seguridad y de ajuste y las llaves hexagonales. Productos disponibles previa solicitud.*

## Rafamet UGB 150
**(bajo torno de suelo)**





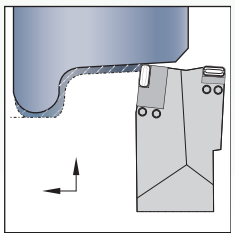

### Portaherramientas compuesto

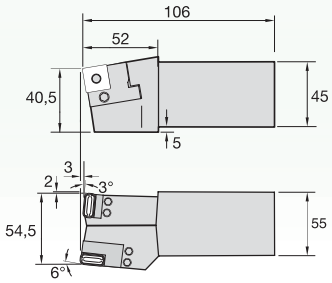
**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. |
|---|---|---|---|---|---|
| **69.391.391.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.391.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.391.10** | 69.393.187.10 | 69.393.190.10 | LNUX191940 | 73.085.863 | 73.398.965 |
| **69.391.391.20** | 69.393.188.20 | 69.393.189.20 | LNUX191940 | 73.085.863 | 73.398.965 |

*Para muchos tornos Rafamet, las dimensiones generales de los portaherramientas varían de un taller a otro.*
*Fabricamos estos portaherramientas como peticiones especiales. Envíenos su consulta junto con el plano para llevar a cabo la acción necesaria.*

## Sculfort
**(bajo torno de suelo)**





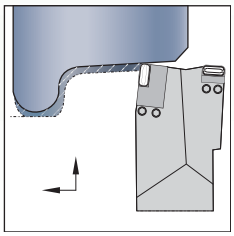

### Portaherramientas compuesto

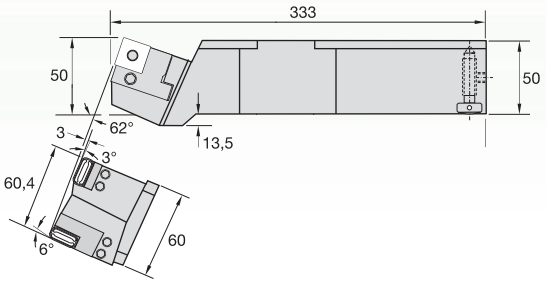
**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. |
|---|---|---|---|---|---|
| **69.391.392.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.392.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.392.10** | 69.393.187.10 | 69.393.190.10 | LNUX191940 | 73.085.863 | 73.398.965 |
| **69.391.392.20** | 69.393.188.20 | 69.393.189.20 | LNUX191940 | 73.085.863 | 73.398.965 |

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas. Sin embargo, sí incluyen los tornillos necesarios para amarrar los portaplaquitas, los tornillos de seguridad y de ajuste y las llaves hexagonales. Productos disponibles previa solicitud.*

## Hegenscheidt 102
**(bajo torno de suelo)**





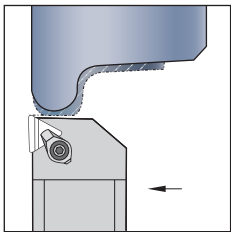

### Portaherramientas compuesto

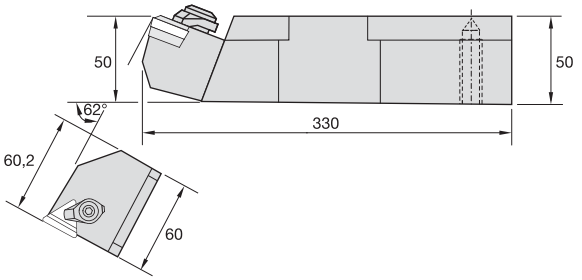
**Número de catálogo • Recambios**

| portaherramientas | portaplaquita para torneado | portaplaquita para planeado | | tornillo de retención | hex. |
|---|---|---|---|---|---|
| **69.391.465.10** | 69.393.186.10 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.465.20** | 69.393.186.20 | — | LNUX301940 | 73.085.863 | 73.398.965 |
| **69.391.465.10** | 69.393.187.10 | 69.393.190.10 | LNUX191940 | 73.085.863 | 73.398.965 |
| **69.391.465.20** | 69.393.188.20 | 69.393.189.20 | LNUX191940 | 73.085.863 | 73.398.965 |

*NOTA: los portaherramientas no incluyen los portaplaquitas ni las plaquitas.*

## KS — Hegenscheidt 102
**(bajo torno de suelo)**





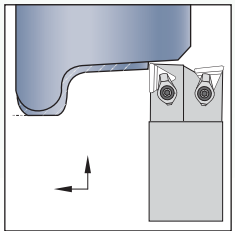

### Portaherramientas cortador

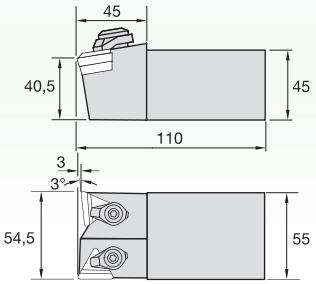
**Número de catálogo • Recambios**

| portaherramientas | | amarre | tornillo de amarre | apoyo | tornillo del apoyo | arandela | hex. |
|---|---|---|---|---|---|---|---|
| **63.388.005.10** | 44.315.983 | 73.085.999 | 73.080.215 | 73.332.001 | 73.080.245 | 73.085.971 | 214.80.414 |
| **63.388.005.20** | 44.315.983 | 73.085.999 | 73.080.215 | 73.332.001 | 73.080.245 | 73.085.971 | 214.80.414 |

*NOTA: el rompevirutas empleado en el porta anterior es 73.398.272.*
*Productos disponibles previa solicitud.*

## Sculfort
**(bajo torno de suelo)**





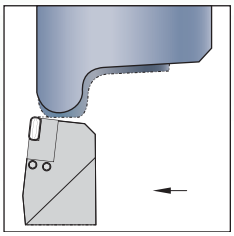

### Portaherramientas compuesto

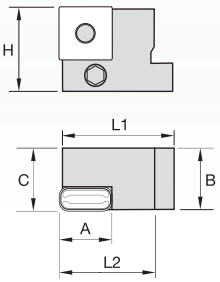
**Número de catálogo • Recambios**

| portaherramientas | | amarre | tornillo de amarre | apoyo | tornillo del apoyo | arandela | hex. |
|---|---|---|---|---|---|---|---|
| **69.388.001.10** | 44.315.986 | 73.085.999 | 73.080.215 | 73.398.353 | 73.080.245 | 73.085.971 | 214.80.414 |
| **69.388.001.20** | 44.315.986 | 73.085.999 | 73.080.215 | 73.398.353 | 73.080.245 | 73.085.971 | 214.80.414 |

*NOTA: los rompevirutas empleados en el porta anterior son 73.398.246 y 73.398.247.*
*Productos disponibles previa solicitud.*

## Portaplaquitas

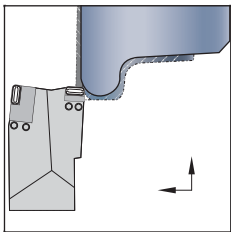


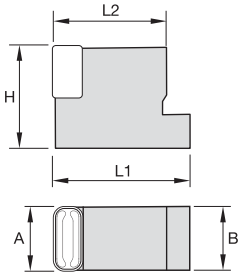



### Portaplaquita para torneado

**Número de catálogo • Recambios**

| portaplaquitas | H | B | L1 | L2 | C | A | | palanca | tornillo de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|---|
| **69.393.186.10** | 32 | 22,6 | 42,2 | 35 | 23 | 30,00 | LNUX301940 | 214.85.667 | 214.85.627 | 73.398.965 |
| **69.393.186.20** | 32 | 22,6 | 42,2 | 35 | 23 | 30,00 | LNUX301940 | 214.85.667 | 214.85.627 | 73.398.965 |
| **69.393.187.10** | 32 | 22,6 | 42,2 | 35 | 23 | 19,05 | LNUX191940 | 214.85.667 | 214.85.627 | 73.398.965 |
| **69.393.188.20** | 32 | 22,6 | 42,2 | 35 | 23 | 19,05 | LNUX191940 | 214.85.667 | 214.85.627 | 73.398.965 |





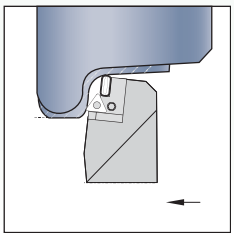

### Portaplaquita para planeado

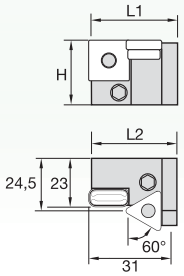
**Número de catálogo • Recambios**

| portaplaquitas | H | B | L1 | L2 | A | | palanca | tornillo de amarre | hex. |
|---|---|---|---|---|---|---|---|---|---|
| **69.393.220.10** | 32 | 34,6 | 30,2 | 23 | 30,00 | LNUX301940 | 214.85.667 | 214.85.627 | 73.398.965 |
| **69.393.221.20** | 32 | 34,6 | 30,2 | 23 | 30,00 | LNUX301940 | 214.85.667 | 214.85.627 | 73.398.965 |
| **69.393.189.10** | 32 | 18,6 | 42,2 | 35 | 19,05 | LNUX191940 | 214.85.667 | 214.85.627 | 73.398.965 |
| **69.393.190.20** | 32 | 18,6 | 42,2 | 35 | 19,05 | LNUX191940 | 214.85.667 | 214.85.627 | 73.398.965 |

*NOTA: los portaherramientas no incluyen las plaquitas, que deberán pedirse por separado.*
*Productos disponibles previa solicitud.*

## Portaplaquitas





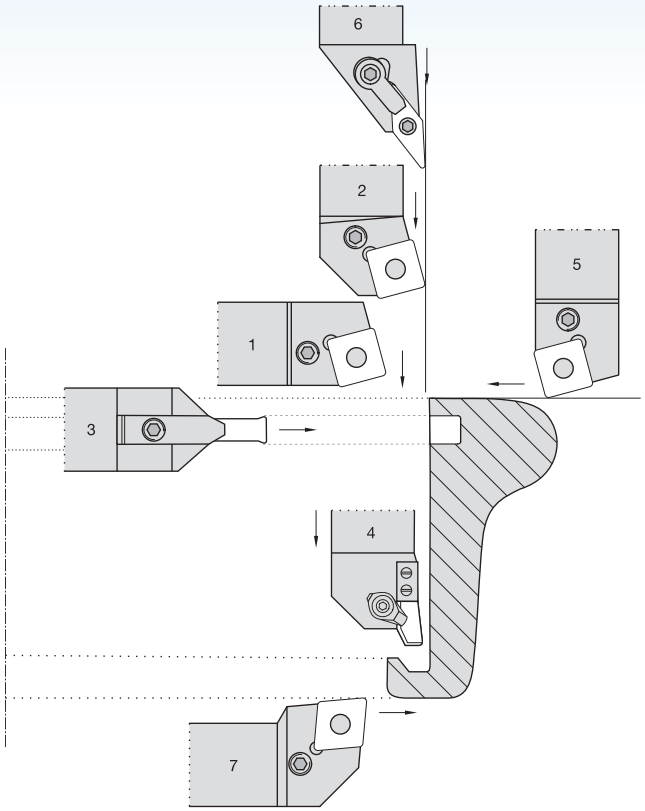

### Portaplaquita para torneado

**Número de catálogo • Recambios**

| portaplaquitas | H | L1 | L2 | | | palanca | tornillo de amarre | hex. | apoyo | pasador de apoyo | punzón de apoyo |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **69.393.167.10** | 32 | 42,2 | 35 | LNUX191940 | TNMM220416 | 214.85.667 | 214.85.627 | 73.398.965 | — | — | — |
| **69.393.167.20** | 32 | 42,2 | 35 | LNUX191940 | TNMM220416 | 214.85.601 | 214.85.626 | 214.80.411 | 214.85.620 | 214.85.608 | 73.398.917 |

*NOTA: 69.393.167.10 y 69.393.167.20 son a derechas.*
*Los portaplaquitas no incluyen las plaquitas, que deberán pedirse por separado.*
*Productos disponibles previa solicitud.*

## en los VTL CNC de Webster & Bennett

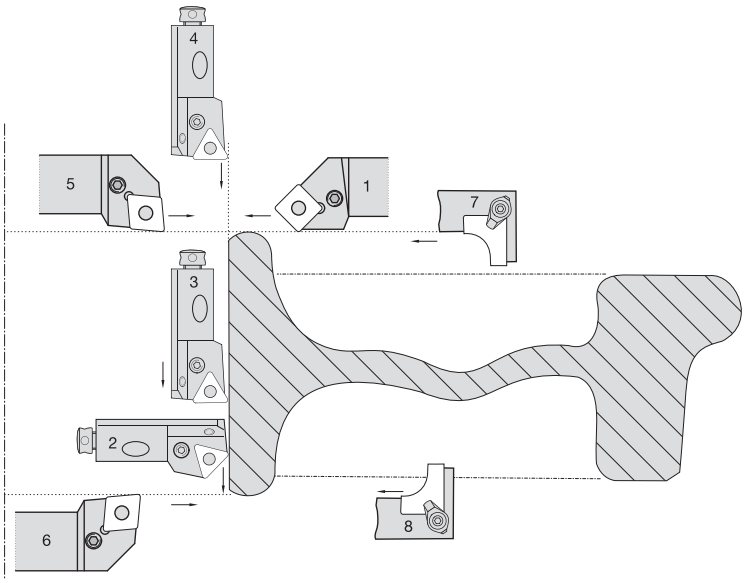



**Número de catálogo • Recambios**

| portaherramientas | mano | número de herramienta | H | B | L | plaquita | apoyo/ yunque | tornillo/ pasador de apoyo | palanca/ amarre | tornillo de amarre | punzón de apoyo/arandela /muelle | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **69.391.734.20** | L | 1 y 5 | 40 | 40 | 220 | | | | | | | |
| **69.391.785.10** | R | 2 | 40 | 50 | 300 | SNMG.25.07.16 | 214.85.616 | 214.85.611 | 214.85.604 | 73.398.545 | 73.398.918 | 214.80.413 |
| **69.327.477** | N | 3 | 32 | 32 | 250 | 44.325.368 | 73.334.757 | 73.080.245 | 73.344.758 | 73.498.697 | 73.498.950 | 214.80.414 |
| **69.497.834.10** | R | 4 | 40 | 40 | 200 | 44.415.588 | 73.331.120 | 73.498.549 | 73.085.999 | 73.080.215 | 73.085.971 | 214.80.414 |
| **69.395.129.10** | R | 6 | 40 | 40 | 200 | VCMT.16.T3.12 | 73.332.177 | 214.80.083 | 73.331.361 | 73.498.544 | 73.398.615 | 73.398.999<br>214.80.411 |
| **69.391.413.10** | R | 7 | 25 | 25 | 150 | CNMG.12.04.12 | 214.85.622 | 214.85.608 | 214.85.601 | 214.85.626 | 73.398.917 | 214.80.41 |

*NOTA: productos disponibles previa solicitud.*

## en los VTL CNC de Webster & Bennett



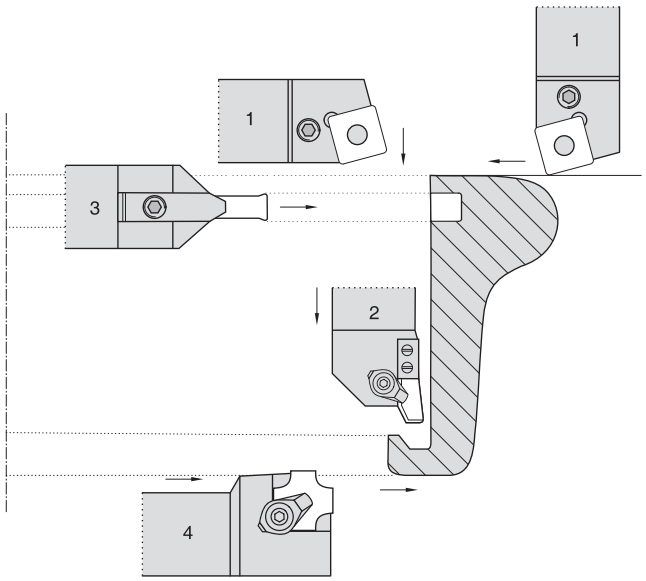

**Número de catálogo • Recambios**

| portaherramientas | mano | número de herramienta | H | B | L | plaquita | apoyo | pasador de apoyo | palanca/ amarre | tornillo de amarre | punzón de apoyo/ arandela | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **69.391.735.10** | R | 1 | 40 | 40 | 230 | SNMG.25.07.16 | 214.85.616 | 214.85.611 | 214.85.604 | 73.398.545 | 73.398.918 | 214.80.413 |
| **69.391.474.20** | L | 2 | 25 | 20 | 70 | | | | | | | |
| **69.391.461.10** | R | 3 y 4 | 25 | 20 | 70 | TNMG.22.04.12 | 214.85.620 | 214.85.608 | 214.85.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| **69.391.736.20** | L | 5 | 20 | 20 | 120 | | | | | | | |
| **69.391.736.10** | R | 6 | 20 | 20 | 120 | CNMG.12.04.12 | 214.85.622 | 214.85.608 | 214.85.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| **69.497.825.20** | L | 7 | 25 | 20 | 140 | | | | | | | |
| **69.497.825.10** | R | 8 | 25 | 20 | 140 | 44.415.646 | — | — | 73.085.869 | 73.080.210 | 73.080.248 | 214.80.412 |

*NOTA: para los números de herramienta 2, 3 y 4, utilice el tornillo de ajuste radial 73.085.895 y el tornillo de ajuste axial 73.398.585.*

*NOTA: productos disponibles previa solicitud.*

## en VTL convencionales

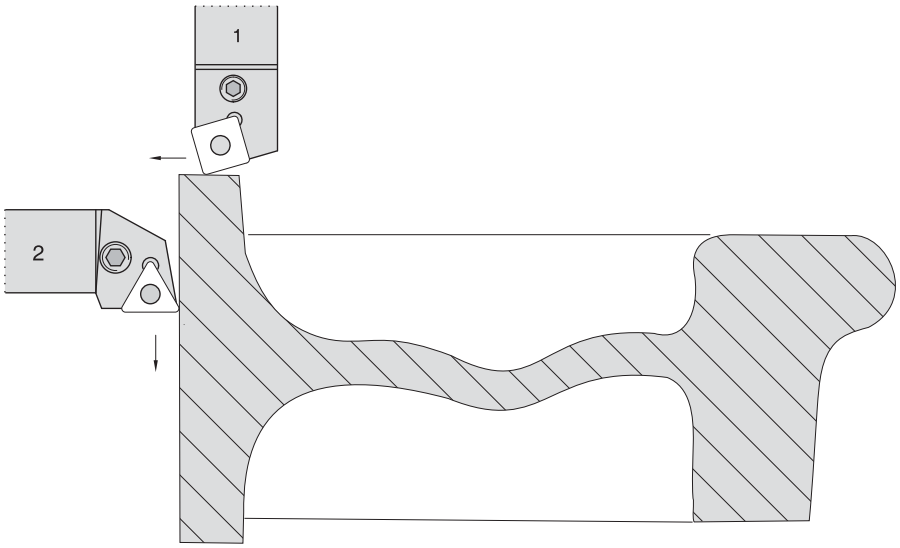



**Número de catálogo • Recambios**

| portaherramientas | mano | número de herramienta | H | B | L | plaquita | apoyo/ yunque | tornillo/ pasador de apoyo | palanca/ amarre | tornillo de amarre | punzón de apoyo/arandela/ muelle | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **70.67.3232** | L | 1 | 32 | 32 | 170 | SNMG.19.06.12 | 214.85.615 | 214.85.610 | 214.85.603 | 214.85.628 | 73.398.941 | 214.80.412 |
| **70.67.4040** | L | 1A | 40 | 40 | 250 | SNMG.25.07.16 | 214.85.616 | 214.85.611 | 214.85.604 | 73.398.545 | 73.398.918 | 214.80.413 |
| **69.497.757.10** | R | 2 | 32 | 40 | 180 | 44.415.588 | 73.331.120 | 73.498.549 | 73.085.999 | 73.080.215 | 73.085.971 | 214.80.414 |
| **69.497.834.10** | R | 2A | 40 | 40 | 200 | | | | | | | |
| **69.327.477** | N | 3 | 32 | 32 | 250 | 44.325.368 | 73.334.757 | 73.080.245 | 73.334.758 | 73.498.697 | 73.498.950 | 214.80.412 |
| **69.327.478** | N | 3A | 40 | 40 | 250 | | | | | | | |
| **69.397.973.10** | R | 4 | 32 | 32 | 150 | 44.315.690 | 73.332.078 | 73.080.245 | 73.085.999 | 73.080.215 | 73.085.971 | 214.80.414 |

*NOTA: productos disponibles previa solicitud.*

## en VTL convencionales




**Número de catálogo • Recambios**

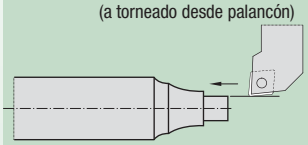
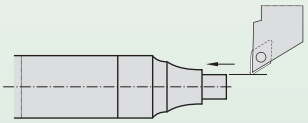
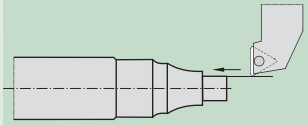
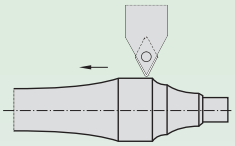
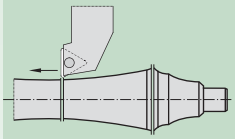
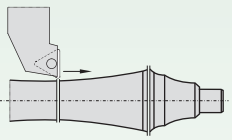
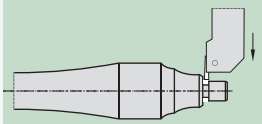
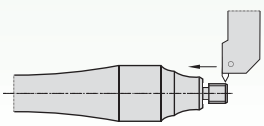
| portaherramientas | mano | número de herramienta | H | B | L | plaquita | apoyo | pasador de apoyo | palanca | tornillo de amarre | punzón de apoyo | hex. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **70.67.3232** | L | 1 | 32 | 32 | 170 | SNMG.19.06.12 | 214.85.615 | 214.85.610 | 214.85.603 | 214.85.628 | 73.398.941 | 214.80.413 |
| **70.67.4040** | L | 1 | 40 | 40 | 250 | SNMG.25.07.16 | 214.85.616 | 214.85.611 | 214.85.604 | 73.398.545 | 73.398.918 | 214.80.413 |
| **69.391.958.20** | L | 2 | 25 | 25 | 150 | TNMG.22.08-26 | 214.85.620 | 214.85.608 | 214.85.601 | 214.85.626 | 73.398.917 | 214.80.411 |

*NOTA: para los números de herramienta 2, 3 y 4, utilice el tornillo de ajuste radial 73.085.895 y el tornillo de ajuste axial 73.398.585.*

*NOTA: productos disponibles previa solicitud.*

## Para vagón ICF en un torno CNC TAKISAWA® — TS 40

**Número de catálogo • Recambios**

| | | portaherramientas | plaquita | apoyo | pasador de apoyo | palanca/ amarre | tornillo de amarre | punzón de apoyo/arandela | hex. |
|---|---|---|---|---|---|---|---|---|---|
| 1(a) | Desbaste (a torneado desde palancón)  | **PCLN R 3232 P19** | CNMG.19.06.12 | 214.85.623 | 214.85.610 | 73.085.603 | 214.85.628 | 73.398.941 | 214.80.412 |
| 1(b) | Desbaste (a torneado desde eje forjado)  | **PDJN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| 2 | Acabado  | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| 3 | Desbaste de cuerpo  | **PDNN R 3225 P15** | DNNG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| 4 | Acabado de cuerpo  | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| 5 | Acabado de cuerpo  | **PTGN L 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| 6 | Ranurado exterior  | **69 327 377 10** Mango: 32 x 32 x 170 | 44.325.340 | — | — | 73.085.865 | 73.085.860 | 73.080.242 | 214.80.412 |
| 7 | Roscado exterior  | **69 327 336 10** Mango: 32 x 32 x 170 | 44.315.034 | — | — | 73.085.865 | 73.085.860 | 73.080.242 | 214.80.412 |

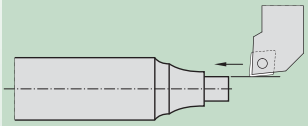
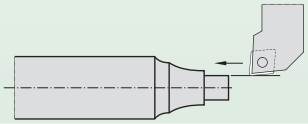
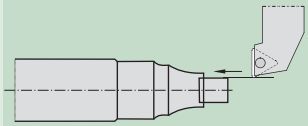
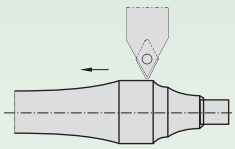
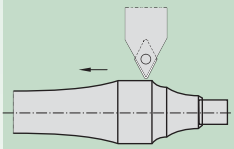
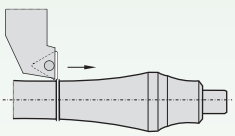
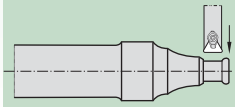
## Para vagón BEML en un torno CNC TAKISAWA® — TS 40

**Número de catálogo • Recambios**

| | | portaherramientas | plaquita | apoyo | pasador de apoyo | palanca | tornillo de amarre | punzón de apoyo | hex. |
|---|---|---|---|---|---|---|---|---|---|
| 1(a) | Desbaste (a torneado desde palancón) | **PCLN R 3232 P19** | CNMG.19.06.12 | 214.85.623 | 214.85.610 | 73.085.603 | 214.85.628 | 73.398.941 | 214.80.412 |
| 1(b) | Desbaste (a torneado desde eje forjado) | **PDJN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| 2 | Acabado | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| 3 | Desbaste de cuerpo | **PDNN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| 4 | Acabado de cuerpo | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| 5 | Acabado de cuerpo | **PTGN L 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |

## Para vagón remolque EMU en torno CNC TAKISAWA® — TS 40

**Número de catálogo • Recambios**

| | | portaherramientas | plaquita | apoyo | tornillo/ pasador de apoyo | palanca/ amarre | tornillo de amarre | punzón de apoyo/arandela | hex. |
|---|---|---|---|---|---|---|---|---|---|
| **1(a)** | Desbaste (a torneado desde palancón) | **PCLN R 3232 P19** | CNMG.19.06.12 | 214.85.623 | 214.85.610 | 73.085.603 | 214.85.628 | 73.398.941 | 214.80.412 |
| |  | | | | | | | | |
| **1(b)** | Desbaste (a torneado desde eje forjado) | **PDJN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| |  | | | | | | | | |
| **2** | Acabado | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| |  | | | | | | | | |
| **3** | Desbaste de cuerpo | **PDNN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| |  | | | | | | | | |
| **4** | Acabado de cuerpo | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| |  | | | | | | | | |
| **5** | Acabado de cuerpo | **PTGN L 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| |  | | | | | | | | |
| **6** | Ranurado | **276 STP 3218** | TPUN.22.04.12 | 73.080.320 | 73.080.245 | 73.085.869 | 73.085.211 | 73.080.248 | 214.80.412 |
| |  | | | | | | | | |

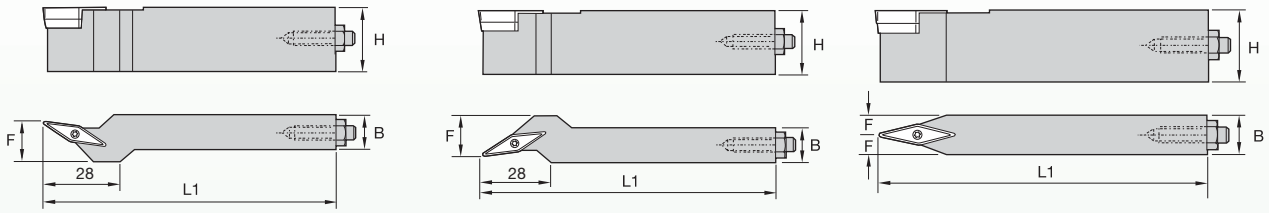
*NOTA: la herramienta de ranurado 276 STP 3218 utilizará los rompevirutas 73.085.804 y 73.085.805.*

## En un torno CNC TAKISAWA® — TS 40

**Número de catálogo • Recambios**

| | | portaherramientas | plaquita | apoyo | pasador de apoyo | palanca | tornillo de amarre | punzón de apoyo | hex. |
|---|---|---|---|---|---|---|---|---|---|
| **1(a)** | Desbaste (a torneado desde palancón) | **PCLN R 3232 P19** | CNMG.19.06.12 | 214.85.623 | 214.85.610 | 73.085.603 | 214.85.628 | 73.398.941 | 214.80.412 |
| **1(b)** | Desbaste (a torneado desde eje forjado) | **PDJN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| **2** | Desbaste | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |
| **3** | Acabado | **PDNN R 3225 P15** | DNMG.15.06.12 | 73.332.094 | 214.85.608 | 73.085.645 | 214.85.627 | 73.398.917 | 214.80.411 |
| **4** | Acabado | **PTGN R 3232 P22** | TNMG.22.04.08-26 | 214.85.620 | 214.85.608 | 73.085.601 | 214.85.626 | 73.398.917 | 214.80.411 |

## En AJTB Hegenscheidt

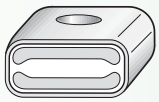



**Número de catálogo • Recambios**

| portaherramientas | N.º SI. | H | B | L1 | F | | apoyo | tornillo del apoyo | tornillo de la plaquita | hex. 1 | hex. 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **69.395.143** | 1 | 32 | 13 | 90 | 11 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.149** | 1 | 32 | 13 | 90 | 11 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.154** | 2 | 32 | 13 | 67 | 15 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.144** | 2 | 32 | 13 | 71 | 15 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.153** | 2 | 32 | 13 | 90 | 15 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.150** | 2 | 32 | 13 | 67 | 15 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.151** | 2 | 32 | 13 | 71 | 15 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.152** | 2 | 32 | 13 | 90 | 15 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.178** | 3 | 32 | 13 | 67 | 15 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.179** | 3 | 32 | 13 | 71 | 15 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.180** | 3 | 32 | 13 | 90 | 15 | VCMT16T312 | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.169** | 3 | 32 | 13 | 67 | 15 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.170** | 3 | 32 | 13 | 71 | 15 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |
| **69.395.171** | 3 | 32 | 13 | 90 | 15 | VBMT160412-T | 73.332.177 | 214.80.083 | 214.80.388 | 73.398.999 | 214.76.709 |

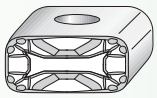
*NOTA: los portaherramientas no incluyen las plaquitas, que deberán pedirse por separado.*
*Productos disponibles previa solicitud.*

## LNUX



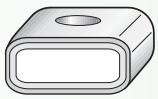
| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **LNUX191940** | 19,05 | 19,05 | 4,00 | — | — | 6,35 | 10 |
| **LNUX301940** | 30,00 | 19,05 | 4,00 | — | — | 6,35 | 12 |
| **LNUX381240** | 38,00 | 22,00 | 4,00 | — | — | 6,35 | 12 |

## LNUX-13



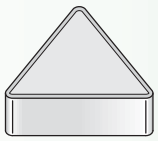
| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **LNUX191940-13** | 19,05 | 19,05 | 4,00 | — | — | 6,35 | 10 |
| **LNUX301940-13** | 30,00 | 19,05 | 4,00 | — | — | 6,35 | 12 |

## LNUX-16



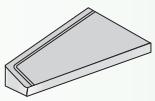
| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **LNUX191940-16** | 19,05 | 19,05 | 4,00 | — | — | 6,35 | 10 |
| **LNUX301940-16** | 30,00 | 19,05 | 4,00 | — | — | 6,35 | 12 |

## 4431598



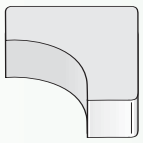
| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **44315983** | — | 10,00 | 4,00 | 19,05 | 24,56 | — | — |
| **44315986** | — | 6,00 | 5,00 | 16,20 | 19,31 | — | — |

## 4441558



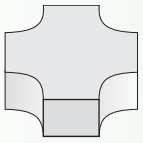
| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **44415558** | 24,00 | 11,50 | 1,20 | — | — | — | — |

## 44415646



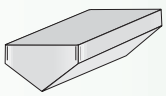
| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **44415646** | 19,05 | 6,35 | 10,00 | — | — | — | — |

## 44415690



| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **44415690** | 28,00 | 6,35 | 10,00 | — | — | — | — |

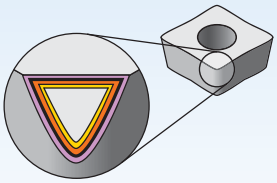
## 44415690



| Número de catálogo ISO | L | S | r | d | M | D1 | t |
|---|---|---|---|---|---|---|---|
| **44415690** | 28,00 | 6,35 | 10,00 | — | — | — | — |

L = Longitud total
S = Grosor de plaquita
r = Radio
d = I.C.D.
M = I.C.
D1 = Diámetro de tornillo u orificio de pasador
t = Grosor de plaquitas LNUX
("t" es exclusivo para plaquitas LNUX)

*Productos disponibles previa solicitud.*



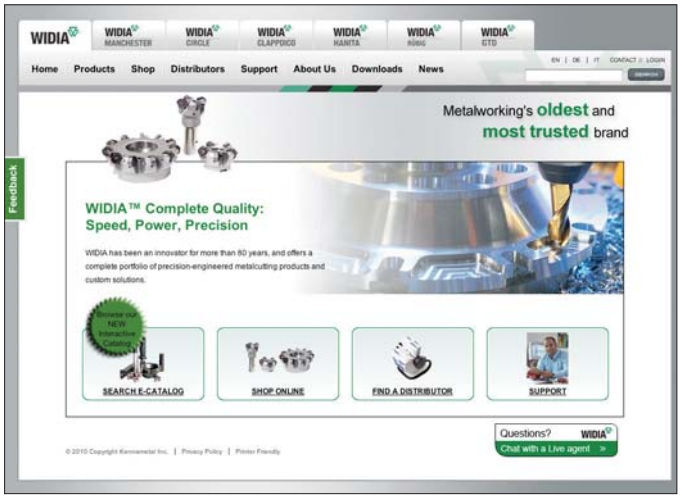
**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para acabado y desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TN2000 | HC-P20 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Un sustrato enriquecido con cobalto y con recubrimiento de CVD posee la tenacidad en masa necesaria con un recubrimiento MTCVD multicapa que proporciona la resistencia al desgaste y a los cráteres que se requiere en el mecanizado de aceros. TN2000 es una calidad óptima y la primera opción para el mecanizado mínimo de acero. TN2000 ofrece la resistencia a impactos de virutas necesaria, proporcionando una mayor vida a la herramienta. | P | | | | | | | | | |
| TN4000 | HC-P35 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Un sustrato metálico duro con recubrimiento de CVD con mayor contenido en cobalto ofrece una buena tenacidad, lo necesario para aplicaciones de desbaste. El sustrato posee una capa superior enriquecida con cobalto para ofrecer al filo de corte la fuerza adicional necesaria en aplicaciones de desbaste. TN4000 es la primera opción para aplicaciones de desbaste y puede soportar tanto cortes interrumpidos como grandes profundidades de corte. | P | | | | | | | | |
| | | | M | | | | | | | | |
| ¡NOVEDAD! TN5120 | HC-K20 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$. Mecanizado ligero y medio. Para fundiciones. | K | | | | | | | | |
| ¡NOVEDAD! TN7115 | HC-P15 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para aceros. | P | | | | | | | | |
| ¡NOVEDAD! TN7125 | HC-P25 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buenas propiedades de tenacidad. Mecanizado medio y pesado. Para aceros. | P | | | | | | | | |
| | | | M | | | | | | | | |
| ATM | HW-M20 | Metal duro sin recubrir. Sustrato especial con elementos en la aleación para proporcionar una tenacidad y una dureza adicionales. Especialmente apta para el mecanizado de ruedas de vías férreas. | P | | | | | | | | |
| | | | M | | | | | | | | |
| TTS | HW-P35 | Calidad universal sin recubrir para el mecanizado de acero. Recomendada para torneado de acabado y desbaste de materiales de astillamiento largos con corte transversal de virutas grandes a velocidades de corte medias. También de utilidad para ranurado y roscado. | P | | | | | | | | |
| TTR | HW-P35 | Metal duro sin recubrir. Mecanizado ligero y medio. Para aceros y fundición nodular. Debe aplicarse con bajas velocidades de corte; también es efectivo en condiciones desfavorables. | P | | | | | | | | |
| | | | M | | | | | | | | |

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

## *Productos WIDIA*

Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.

# Herramientas WIDIA™ para mecanizado pesado

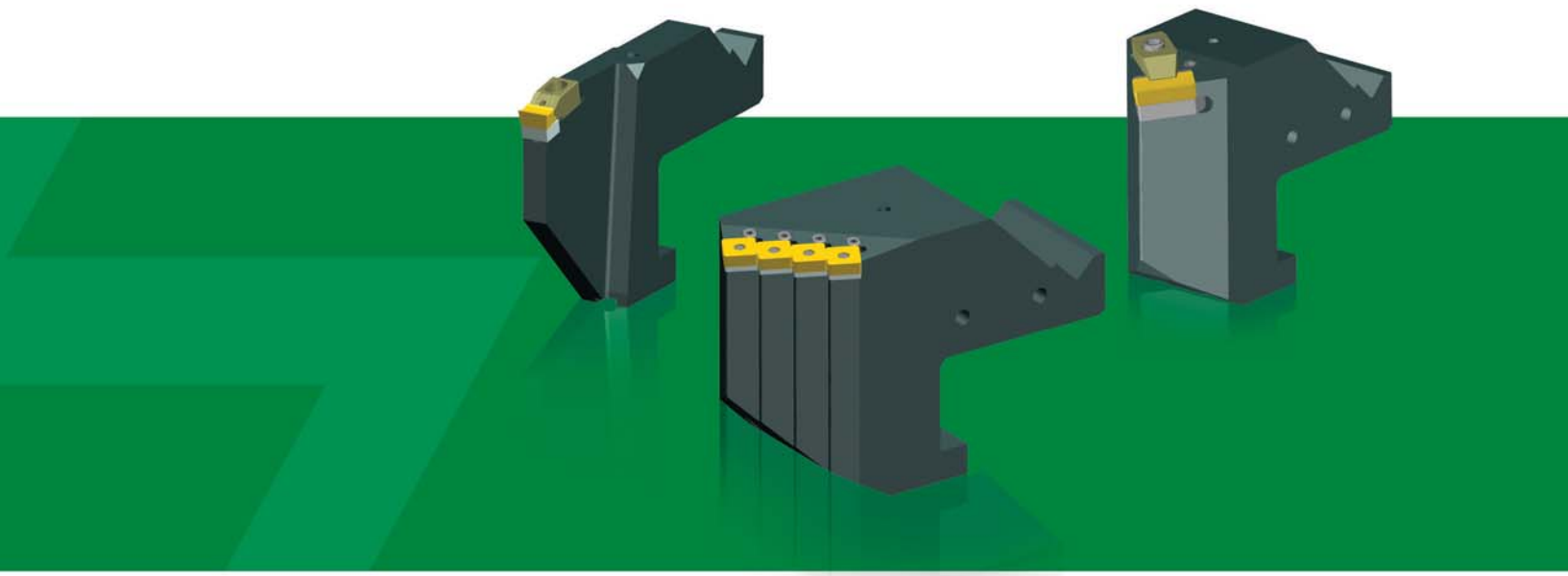
Las soluciones de herramientas de WIDIA para el mecanizado pesado poseen en todo el mundo un historial de éxitos demostrados en estas aplicaciones extremadamente exigentes. Los clientes que busquen la mayor retirada de material que sea posible y una mejora de la productividad pueden confiar en que WIDIA les proporcionará la herramienta, las plaquitas y las calidades correctas para su pieza de trabajo, su máquina herramienta y sus aplicaciones.

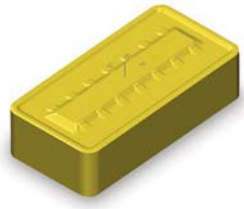
WIDIA, su socio para el mecanizado ligero, ofrece:

- Experiencia
- Confianza
- Fiabilidad
- Control de virutas
- Resultados

Deje que WIDIA ponga sus conocimientos de mecanizado pesado a su servicio.

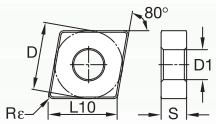
WIDIA™ ofrece una extensa gama de portaherramientas, montajes y plaquitas para el sector de torneado pesado. Esto incluye portaherramientas y plaquitas para desbastado, planeado, perfilado, ranurado y acabado. Profundidad de corte de hasta 100,0 mm.





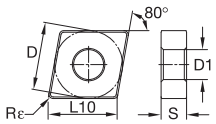
La combinación de nuevas geometrías -HD y -SR con nuevas calidades como TN6515 y TN7125 son soluciones demostradas en el sector de torneado pesado, que proporcionan un control de virutas excelente con una gran profundidad de cortes y altas tasas de avance.

## CNMM-8



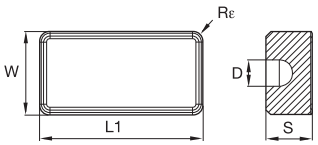

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **CNMM1204088** | 12,70 | 12,90 | 4,76 | 0,8 | 5,16 |
| **CNMM1204128** | 12,70 | 12,90 | 4,76 | 1,2 | 5,16 |
| **CNMM1606128** | 15,88 | 16,12 | 6,35 | 1,2 | 6,35 |
| **CNMM1606168** | 15,88 | 16,12 | 6,35 | 1,6 | 6,35 |
| **CNMM1906128** | 19,05 | 19,34 | 6,35 | 1,2 | 7,93 |
| **CNMM1906168** | 19,05 | 19,34 | 6,35 | 1,6 | 7,93 |
| **CNMM1906248** | 19,05 | 19,34 | 6,35 | 2,4 | 7,93 |
| **CNMM2509248** | 25,40 | 25,79 | 9,53 | 2,4 | 9,12 |

## CNMM-SR



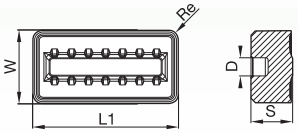

| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| **CNMM190616SR** | 19,05 | 19,34 | 6,35 | 1,60 | 7,93 |
| **CNMM190624SR** | 19,05 | 19,34 | 6,35 | 2,40 | 7,93 |
| **CNMM250916SR** | 25,40 | 25,79 | 9,53 | 1,60 | 9,12 |
| **CNMM250924SR** | 25,40 | 25,79 | 9,53 | 2,40 | 9,12 |
| **CNMM250924SRL** | 25,40 | 25,79 | 9,53 | 2,40 | 9,12 |

## LNMR...




| Número de catálogo ISO | D | L1 | S | Rε | W |
|---|---|---|---|---|---|
| **LNMR351432** | 6,35 | 35,00 | 14,50 | 3,20 | 25,40 |
| **LNMR501432** | 6,35 | 50,80 | 14,50 | 3,20 | 25,40 |

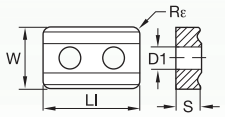
## LNMR-HD




| Número de catálogo ISO | D | L1 | S | Rε | W |
|---|---|---|---|---|---|
| **LNMR501432HD** | 6,35 | 50,80 | 14,50 | 3,20 | 25,40 |

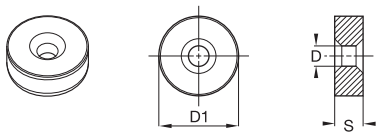
*NOTA: productos disponibles previa solicitud.*

## LNUX...



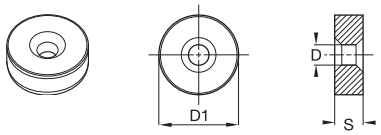

| Número de catálogo ISO | D1 | L1 | S | Rε | W |
|---|---|---|---|---|---|
| LNUX400924EN95 | 9,12 | 40,00 | 9,53 | 2,40 | 25,40 |

## RNGC...



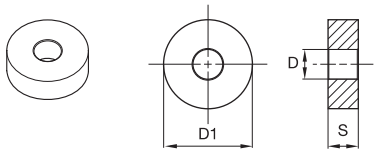

| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNGC501800 | 12,70 | 50,00 | 18,00 |
| RNGC501800T | 12,70 | 50,00 | 18,00 |

## RNMC...



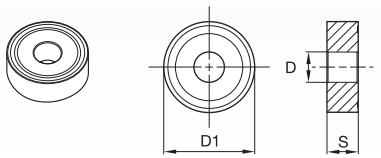

| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMC501800 | 12,70 | 50,00 | 18,00 |

## RNMA...




| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMA250900 | 9,12 | 25,40 | 9,52 |
| RNMA250900T | 9,12 | 25,40 | 9,52 |

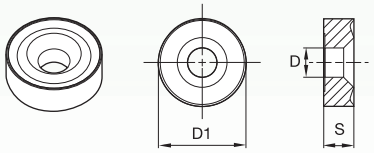
## RNMG...




| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMG250900 | 9,12 | 25,40 | 9,52 |

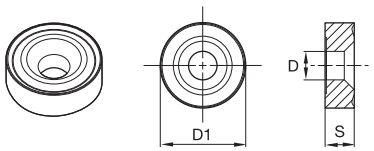
*NOTA: productos disponibles previa solicitud.*

### RNMH...



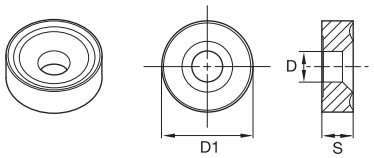

| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMH281000 | 8,80 | 28,50 | 10,50 |

### RNMH-11



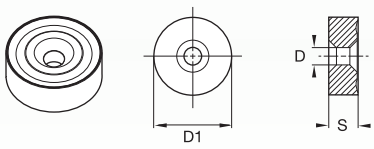

| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMH38120011 | 12,70 | 38,10 | 12,70 |

### RNMH-13




| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMH38120013 | 12,70 | 38,10 | 12,70 |

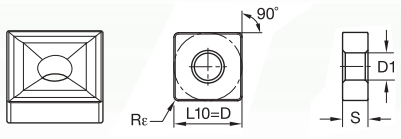
### RNMH-M0




| Número de catálogo ISO | D | D1 | S |
|---|---|---|---|
| RNMH5018M0 | 12,70 | 50,00 | 18,00 |

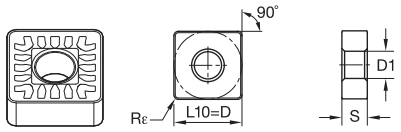
*NOTA: productos disponibles previa solicitud.*

## SNMM-8



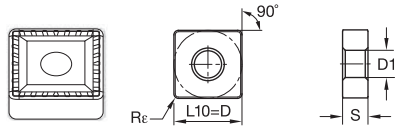

| | Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|---|
| 8 | SNMM1204128 | 12,70 | 12,70 | 4,76 | 1,20 | 5,16 |
| | SNMM1506128 | 15,88 | 15,88 | 6,35 | 1,20 | 6,35 |
| | SNMM1906128 | 19,05 | 19,05 | 6,35 | 1,20 | 7,93 |
| | SNMM1906168 | 19,05 | 19,05 | 6,35 | 1,60 | 7,93 |
| | SNMM1906248 | 19,05 | 19,05 | 6,35 | 2,40 | 7,93 |
| | SNMM2507248 | 25,40 | 25,40 | 7,94 | 2,40 | 9,12 |
| B | SNMM2507248B | 25,40 | 25,40 | 7,94 | 2,40 | 9,12 |

## SNMM-SR



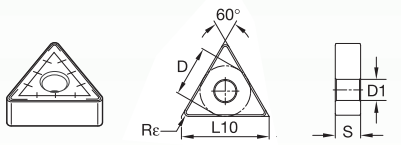

| | Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|---|
| SR | SNMM190616SR | 19,05 | 19,05 | 6,35 | 1,60 | 7,93 |
| | SNMM190624SR | 19,05 | 19,05 | 6,35 | 2,40 | 7,93 |
| | SNMM250916SR | 25,40 | 25,40 | 9,53 | 1,60 | 9,12 |
| | SNMM250924SR | 25,40 | 25,40 | 9,53 | 1,60 | 9,12 |
| | SNMM250724SR | 25,40 | 25,40 | 7,94 | 2,40 | 9,12 |
| SRL | SNMM250724SRL | 25,40 | 25,40 | 7,94 | 2,40 | 9,12 |
| | SNMM250924TSR | 25,40 | 25,40 | 9,53 | 2,40 | 9,12 |

## SNMX...




| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| SNMX381224 | 38,10 | 38,10 | 12,10 | 2,40 | 9,50 |

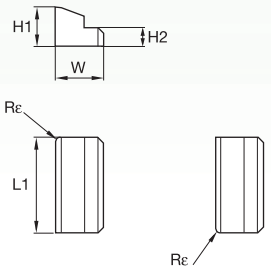
## TNMM-8




| Número de catálogo ISO | D | L10 | S | Rε | D1 |
|---|---|---|---|---|---|
| TNMM1604128 | 9,53 | 16,50 | 4,76 | 1,20 | 3,81 |
| TNMM2204088 | 12,70 | 22,00 | 4,76 | 0,80 | 5,16 |
| TNMM2204128 | 12,70 | 22,00 | 4,76 | 1,20 | 5,16 |
| TNMM2204168 | 12,70 | 22,00 | 4,76 | 1,60 | 5,16 |
| TNMM2706128 | 15,88 | 27,50 | 6,35 | 1,20 | 6,35 |
| TNMM2706248 | 15,88 | 27,50 | 6,35 | 2,40 | 6,35 |

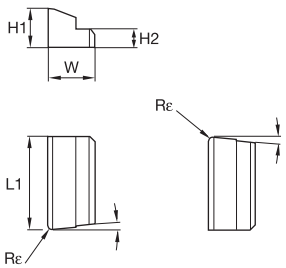
*NOTA: productos disponibles previa solicitud.*

## SVN71/72...RL



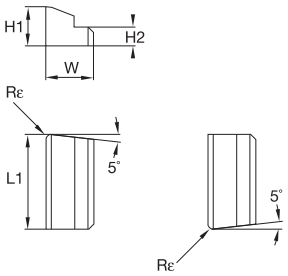

| Número de catálogo ISO | L1 | W | H1 | H2 | Rε |
|---|---|---|---|---|---|
| SVN71/72…R/L | 25,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN71/72…R/L | 30,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN71/72…R/L | 35,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN71/72…R/L | 40,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN71/72…R/L | 50,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN71/72…R/L | 60,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN71/72…R/L | 70,00 | 18,00 | 15,30 | 7,20 | 2,00 |

## SVN77...RL



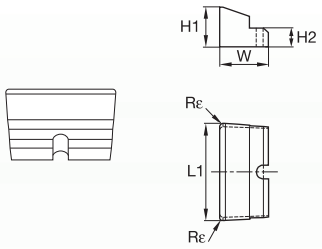

| Número de catálogo ISO | L1 | W | H1 | H2 | Rε |
|---|---|---|---|---|---|
| SVN77…R/L | 25,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN77…R/L | 30,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN77…R/L | 35,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN77…R/L | 40,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN77…R/L | 50,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN77…R/L | 60,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN77…R/L | 70,00 | 18,00 | 15,30 | 7,20 | 2,00 |

## SVN80...RL




| Número de catálogo ISO | L1 | W | H1 | H2 | Rε |
|---|---|---|---|---|---|
| SVN80…R/L | 25,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN80…R/L | 30,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN80…R/L | 35,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN80…R/L | 40,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN80…R/L | 50,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN80…R/L | 60,00 | 18,00 | 15,30 | 7,20 | 2,00 |
| SVN80…R/L | 70,00 | 18,00 | 15,30 | 7,20 | 2,00 |

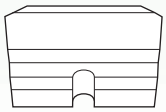
## SVN...F1

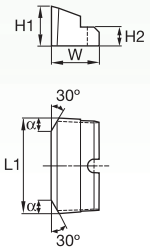



| Número de catálogo ISO | L1 | W | H1 | H2 | Rε |
|---|---|---|---|---|---|
| SVN76…F1 | 20,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 22,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 25,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 30,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 35,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 40,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 45,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 50,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 55,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 60,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 65,00 | 18,00 | 15,30 | 7,20 | 1,20 |
| SVN76…F1 | 70,00 | 18,00 | 15,30 | 7,20 | 1,20 |

*NOTA: productos disponibles previa solicitud.*

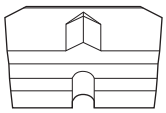
## SVN...F2

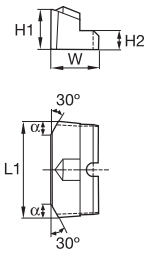





| Número de catálogo ISO | L1 | W | H1 | H2 | a |
|---|---|---|---|---|---|
| SVN76…F2 | 20,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F2 | 22,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F2 | 25,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F2 | 30,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 35,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 40,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 45,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 50,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 55,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 60,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 65,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F2 | 70,00 | 18,00 | 15,30 | 7,20 | 6,00 |

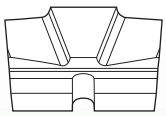
## SVN...F3

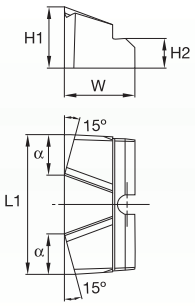





| Número de catálogo ISO | L1 | W | H1 | H2 | a |
|---|---|---|---|---|---|
| SVN76…F3 | 20,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F3 | 22,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F3 | 25,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F3 | 30,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 35,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 40,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 45,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 50,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 55,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 60,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 65,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F3 | 70,00 | 18,00 | 15,30 | 7,20 | 6,00 |

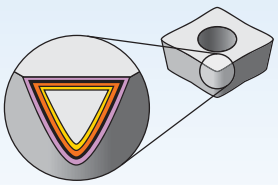
## SVN...F4






| Número de catálogo ISO | L1 | W | H1 | H2 | a |
|---|---|---|---|---|---|
| SVN76…F4 | 20,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F4 | 22,00 | 18,00 | 15,30 | 7,20 | 5,00 |
| SVN76…F4 | 25,00 | 18,00 | 15,30 | 7,20 | 6,00 |
| SVN76…F4 | 30,00 | 18,00 | 15,30 | 7,20 | 7,50 |
| SVN76…F4 | 35,00 | 18,00 | 15,30 | 7,20 | 8,50 |
| SVN76…F4 | 40,00 | 18,00 | 15,30 | 7,20 | 10,00 |
| SVN76…F4 | 45,00 | 18,00 | 15,30 | 7,20 | 11,00 |
| SVN76…F4 | 50,00 | 18,00 | 15,30 | 7,20 | 12,50 |

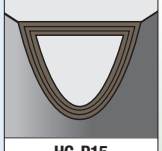
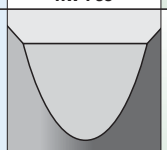
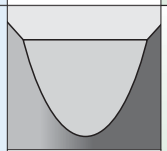
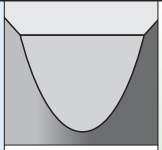
*NOTA: productos disponibles previa solicitud.*



**Los recubrimientos proporcionan una capacidad de alta velocidad y están diseñados para acabado y desbaste ligero.**

| | |
|---|---|
| P | Acero |
| M | Acero inoxidable |
| K | Fundición |
| N | Materiales no férreos |
| S | Aleaciones de alta temperatura |
| H | Materiales endurecidos |

Calidad

| Recubrimiento | | Descripción de la calidad | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ¡NOVEDAD! TN5120 | HC-K20 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$. Mecanizado ligero y medio. Para fundiciones. | | | | K | K | K | | | |
| TN6515 |  HC-P15 | Metal duro recubierto. Multicapa de PVD — TiAlN. Mecanizado medio y pesado. Para aceros y fundición nodular. | | | P | P | P | | | | |
| | | | | | K | K | K | | | | |
| ¡NOVEDAD! TN7115 | HC-P15 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para aceros. | | | P | P | P | | | | |
| ¡NOVEDAD! TN7125 | HC-P25 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-TiN. Buenas propiedades de tenacidad. Mecanizado medio y pesado. Para aceros. | | | | P | P | P | | | |
| | | | | | | M | M | M | | | |
| TN8025 | HW-P35 | Metal duro recubierto. MT-CVD/CVD — TiN-TiCN-$Al_2O_3$-ZrCN. Buen equilibrio de propiedades de resistencia al desgaste y tenacidad. Mecanizado ligero y medio. Para la serie AISI 300 de acero inoxidable austenítico. | | | | | | | | | |
| | | | | | | M | M | M | | | |
| THM |  HW-K15 | Metal duro sin recubrir. Equilibrio extraordinariamente bueno de dureza, resistencia al desgaste, estabilidad del filo y tenacidad. Mecanizado ligero y medio. Para fundición, todos los metales no férreos y materiales no metálicos. Útil en condiciones desfavorables. | | | K | K | K | | | | |
| | | | | | N | N | N | | | | |
| | | | | | S | S | S | | | | |
| | | | | | H | H | H | | | | |
| TTM |  HW-P25 | Metal duro sin recubrir. Mecanizado medio. Para aceros y fundición nodular. | | | | P | P | P | | | |
| | | | | | | M | M | M | | | |
| TTR |  HW-P35 | Metal duro sin recubrir. Mecanizado ligero y medio. Para aceros y fundición nodular. Debe usarse en bajas velocidades de corte. Efectivo en condiciones desfavorables. | | | | | | P | P | P | |
| | | | | | | | | M | M | M | |

# WIN WITH WIDIA™

## Herramientas WIDIA™ La mejor opción para cualquier aplicación

WIDIA ofrece una amplia línea de herramientas para desbaste de barra, mecanizado de rueda y mecanizado pesado que proporciona a los clientes todo lo que necesitan para realizar un buen trabajo.

### Herramientas WIDIA para desbaste de barra

- Las herramientas de desbaste de barra de WIDIA, ideales en aplicaciones con altos avances, permiten mecanizados económicos para la producción de superficies cilíndricas en barras en bruto.
- Acabados superficiales de gran calidad, precisión dimensional y eliminación especialmente eficiente de impurezas, roturas, acumulaciones de arena y otras mezclas.

### Herramientas WIDIA para mecanizado de ruedas y vías de ferrocarril

- Completa línea de herramientas para el mantenimiento de ruedas y ejes en los talleres ferroviarios.
- Incorporan lo último en tecnología de herramientas para lograr la mayor evacuación de metal y el mayor nivel de productividad.

### Herramientas WIDIA para mecanizado pesado

- Esta línea de herramientas para mecanizado pesado, con un historial demostrado de éxitos en aplicaciones extremadamente complicadas en todo el mundo, proporciona las mayores velocidades de evacuación y una mejora de la productividad.
- Múltiples geometrías y calidades disponibles, que permiten un rendimiento superior y un excelente control de virutas en profundidades de corte de hasta 100,0 mm.

Para obtener más información sobre nuestras innovaciones, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

WIDIA

# Soluciones a medida

**Introducción a las soluciones a medida** . . . . . **H2**
**Soluciones para torneado a medida** . . . . . **H4**
**Soluciones a medida para herramientas con punta de PCD** . . . . . **H6**
**Herramientas WIDIA-CIRCLE™ para orificio pequeño** . . . . . **H8**
**Servicios y asistencia** . . . . . **H10**

# Rápida respuesta y un rendimiento excelente cuando más lo necesite.

El grupo de productos WIDIA™ proporciona unos servicios excepcionales de ingeniería de diseño y aplicaciones. Nuestro prestigioso equipo de ingeniería avanzada está disponible para ayudarle, tanto si necesita fabricar herramientas según un diseño específico, una pieza acabada o un plano, como si lo que busca es asistencia en el desarrollo del proceso o a la hora de optimizar una aplicación.

Nuestros departamentos de ingeniería están equipados con células de producción específicas ubicadas en fábricas especializadas de todo el mundo. Disponemos de instalaciones de fabricación con certificación ISO y equipos CNC de última generación, capacidad de simulación y procesos de inspección y de fabricación asistida por ordenador. Todo ello nos permite garantizar al cliente el acceso a productos de la máxima calidad que cumplen con las especificaciones necesarias y ofrecen repetibilidad para futuros procesos de producción.

*Servicios de soluciones a medida:*

- Diseños especiales
- Geometrías complejas
- Herramientas de moldear
- Estándares modificados
- Ingeniería y optimización de aplicaciones
- Diseño de herramientas
- Desarrollo de proyectos

*Póngase en contacto con su distribuidor local autorizado para obtener más información.*

# EL PODER DE LAS SOLUCIONES A MEDIDA

## Plaquitas y herramientas de torneado con **precisión superabrasiva**

WIDIA-Clapp DiCo™ ofrece el poder de las soluciones a medida al fresado intercambiable, torneado y taladrado, estableciendo aún más profundamente nuestra capacidad de ofrecer herramientas de corte de materiales muy abrasivos para todas las aplicaciones.

- El programa de soluciones a medida de rápido seguimiento (FTCS - Fast Track Custom Solutions Programme) ofrece soluciones personalizadas inmediatas de plaquitas para satisfacer sus necesidades específicas.
- También disponible una amplia gama de plaquitas de torneado PCD y CBN estándar.
- Representantes de ventas locales y autorizados de WIDIA™, a su disposición para una atención personal e inmediata.

Para obtener más información sobre nuestras innovaciones, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

WIDIA™

# Soluciones para torneado y mandrinado a medida

*Nos especializamos en el diseño y fabricación de las herramientas necesarias para sus necesidades.*

## *Programas de valor añadido*

WIDIA-CLAPP DiCO™ ofrece varios programas de valor añadido que reducen los costes de fabricación de nuestros clientes por unidad.

## *Servicio de restauración*

Un servicio de restauración completo para restaurar herramientas perecederas y duraderas devolviéndolas a su capacidad de rendimiento original, por sólo una fracción del coste de unas herramientas nuevas. Los servicios incluyen el rectificado, reajuste o reinstalación de puntas de herramientas perecederas y restauración de fresas usadas.

## *Servicio de restauración a domicilio*

Se proporciona un servicio a domicilio tanto para la recogida de herramientas usadas como la entrega de todas las herramientas restauradas a todos nuestros clientes. Nuestros técnicos visitarán sus instalaciones a petición para entregar los productos restaurados y en línea con sus requisitos de producción, con un gasto mínimo de inventario.

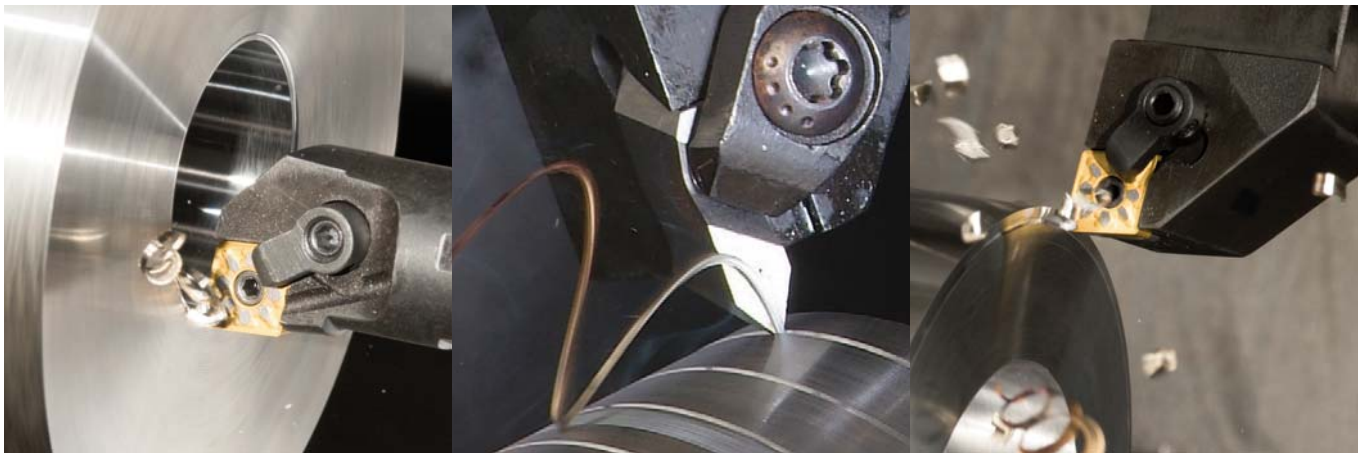
## *Programas de inventario al momento*

Dispone de programas de almacenamiento de inventario específicos para herramientas y clientes, gestionados de forma eficiente mediante una comunicación semanal de balances de inventario y datos de uso.

## *Gestión de mercancías*

Un programa de gestión de suministros de herramientas de PCD y CBN combina nuestra experiencia en fabricación de herramientas, gestión de inventarios, aplicaciones técnicas y mejoras de los procesos.





# Nuestra completa gama de productos. Su satisfacción total.

Desde torneado, taladrado y fresado intercambiable a fresado con fresas de mangos de metal duro integral, taladrado con brocas de metal duro integral y roscado: ahora las herramientas más potentes del sector llevan con orgullo la marca WIDIA™. Al adquirir productos WIDIA, no sólo está comprando velocidad, potencia y precisión, sino que invierte en calidad y una satisfacción total.

La gama más amplia de productos diseñados con precisión y servicios de soluciones a medida que hay disponible en la actualidad están acompañados de una red internacional especializada de socios distribuidores autorizados; esto le proporcionará las herramientas que necesita... y la potencia que sólo se consigue con las marcas WIDIA. Para obtener información sobre los productos o programar una demostración in situ, visite www.widia.com.

WIDIA™
www.widia.com

Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

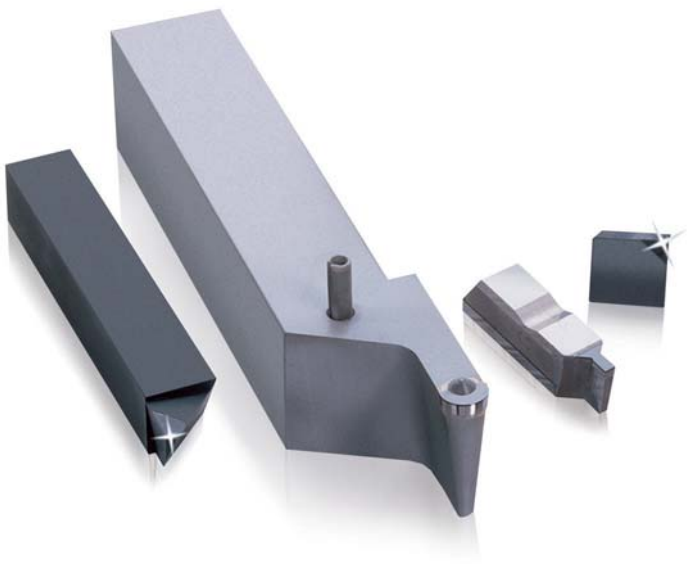
# Soluciones a medida para herramientas con punta de PCD

*¡Aumente la vida útil de la herramienta hasta 300 veces por pieza y herramienta con las soluciones de PCD!*

Nuestras herramientas con punta de PCD son ideales para el mecanizado de aleaciones de magnesio y aluminio, cobre y bronce, así como fibra de vidrio y plásticos reforzados con fibra de carbono, con velocidades de corte entre 250 y 3.000 m/min.

La utilización de herramientas con punta de diamante policristalino (PCD) se ha extendido rápidamente en los últimos 10 años en diversos sectores industriales. Estas herramientas sustituyen ya a las herramientas tradicionales de metal duro y acero de alta velocidad (HSS-E). El ahorro de costes que conlleva el uso de herramientas de PCD para el mecanizado de materiales no férreos se puede clasificar en cinco áreas clave:





- Una mayor vida de la herramienta, lo cual permite un mayor uso de la máquina y un aumento de la producción en general.
- Fuerte resistencia al desgaste abrasivo, incluso con velocidades de corte extremadamente altas.
- Mayor productividad mediante mayores tasas de evacuación del metal.
- Acabados superficiales superiores.
- Control preciso de las tolerancias.

En la mayoría de los casos en los que se ha comparado el rendimiento de las herramientas de PCD con el de los modelos de metal duro, los clientes han observado un aumento significativo de la vida de la herramienta, de hasta 300 veces por pieza y herramienta. Este importante aumento de la vida de la herramienta disminuye, a su vez, el tiempo muerto de la máquina, con lo que se aumenta el rendimiento de la producción y se reducen los costes generales de fabricación por unidad.

*Funciones globales y servicio local*

# Las herramientas de PCD han ejercido un fuerte impacto en los mercados tecnológicos

*Automoción*

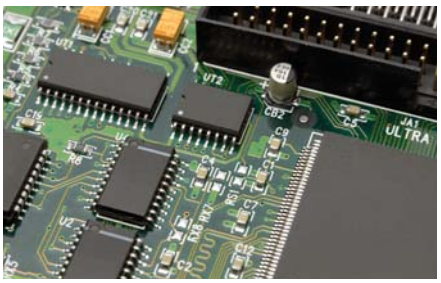
Un segmento industrial que emplea herramientas de PCD y CBN en el mecanizado de materiales de aluminio, metales en polvo, acero endurecido y fundición.

*Telecomunicaciones*

Un sector de rápido crecimiento que incorpora el uso de PCD en el mecanizado de materiales plásticos, tableros de fibra y materiales de bronce, latón y zinc.

*Electrónica*

Un sector creciente y competitivo que incorpora el uso de la tecnología PCD en el mecanizado de materiales plásticos y de aluminio, vidrio y cobre.



*Sector aeroespacial*

Un sector que ha comenzado a descubrir el potencial económico de las herramientas de PCD y CBN para el mecanizado de materiales específicos como fenólicos, compuestos de grafito y aluminios.

*Póngase en contacto con su distribuidor local autorizado para obtener más información.*

# Herramientas WIDIA-CIRCLE™ para orificio pequeño

Durante más de 50 años, WIDIA-CIRCLE ha tenido el orgullo de fabricar las barras de mandrinado de orificio pequeño más fiables y de mayor calidad que existen en el mercado de herramientas intercambiables.

Aunque nuestra amplia línea de productos estándar abarca la mayoría de aplicaciones de mecanizado, somos conscientes de que cada cliente es un mundo y, en ocasiones, puede ser necesaria una herramienta “especial” para llevar a cabo un trabajo específico.

En casos así, consulte la hoja de soluciones a medida (páginas C130 y C131), donde encontrará información detallada sobre pedidos especiales. Utilice este formulario para solicitar modificaciones a cualquiera de nuestros productos para que cumplan sus especificaciones.

Si sus requisitos especiales no entran en las categorías suministradas, póngase en contacto con nosotros directamente para comentar sus necesidades. Nuestro experimentado y fiable equipo de técnicos e ingenieros siempre está disponible para recomendarle la solución más viable. Una vez hayamos discutido con detalle su aplicación de mecanizado particular, es posible que una de nuestras múltiples herramientas estándar pueda ayudarle con el trabajo en cuestión de la manera más económica.

Le agradecemos que confíe en WIDIA-CIRCLE para todas sus necesidades de herramientas intercambiables.

*Funciones globales y servicio local*

WIDIA CIRCLE

# WIN WITH WIDIA™

## Serie WIDIA-CIRCLE™ de herramientas para orificio pequeño

La línea WIDIA™ de herramientas de mandrinado de orificio pequeño es una opción excelente y económica para una amplia gama de aplicaciones. Nuestras barras de metal duro integral proporcionan una versatilidad de mecanizado y resistencia a la ruptura. Las plaquitas intercambiables están disponibles tanto en mangos de acero como de metal duro.

**Serie A/B**

- Un sistema de bloqueo exclusivo que permite cambios de plaquita rápidos y precisos.

**Quadralock™**

- Ranuras en V y pernos de límite para una mayor indexabilidad.

**Barras de micromandrinado**

- Acción de corte libre, mejores acabados superficiales y mayor evacuación de virutas.

**Barras de metal duro integral**

- Las herramientas y portaherramientas precisos y de cambio rápido son ideales para las aplicaciones de mecanizado de piezas pequeñas.

Win with WIDIA™

Para obtener más información sobre nuestras innovaciones, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

# Servicio y asistencia excepcionales que diferencian a los productos de WIDIA™ de los del resto del mercado

*Además del rendimiento excelente que proporcionan unas herramientas de máxima calidad, el grupo de productos WIDIA también ofrece servicios de programas y asistencia con la mayor calidad.*

- Los distribuidores con los que trabajamos consideran nuestros equipos regionales de atención al cliente como los mejores del sector. Estos equipos están formados por profesionales con la experiencia y la formación necesarias para ayudar a los clientes con pedidos, ofertas y envíos y también con el procesamiento de las peticiones de soluciones a medida. Además, saben contactar con las personas más adecuadas según las necesidades.

- Nuestros equipos exclusivos de asistencia técnica sobre aplicaciones específicas (CAS) se encuentran disponibles en distintas partes del mundo 24 horas al día, 7 día a la semana. Desde aquí podrá obtener ayuda a la hora de seleccionar la herramienta más adecuada, acceder a información técnica, conocer los parámetros recomendados y consultar las conversiones de artículos de la competencia con respecto a los productos WIDIA.

- Nuestros equipos de ingeniería avanzada, especializados en grupos de productos concretos (fresas de mango, brocas, escariadores, etc.), ayudan a nuestros clientes a optimizar la productividad de las aplicaciones y a desarrollar diseños complejos de herramientas.

- Por su parte, nuestros especialistas locales en aplicaciones de campo son expertos técnicos que trabajan en colaboración con nuestros distribuidores para ayudar a los clientes con la selección de herramientas, la formación, las pruebas de rendimiento y la elaboración de informes sobre productividad.

- Ofrecemos servicios de reacondicionamiento que proporcionan un rendimiento de la herramienta similar al de un modelo sin estrenar, a un nivel único en el mercado.

- Nuestros servicios de reciclaje convierten el metal duro inservible en dinero.

…Y estas son sólo algunas de las ventajas.

El grupo de productos WIDIA sabe que la fidelidad de los clientes se gana con algo más que unos productos de calidad excelente. Estamos firmemente comprometidos con una oferta de servicios de programas y asistencia de primera calidad para mejorar y desarrollar su negocio.

# WIN WITH WIDIA™

WIDIA™

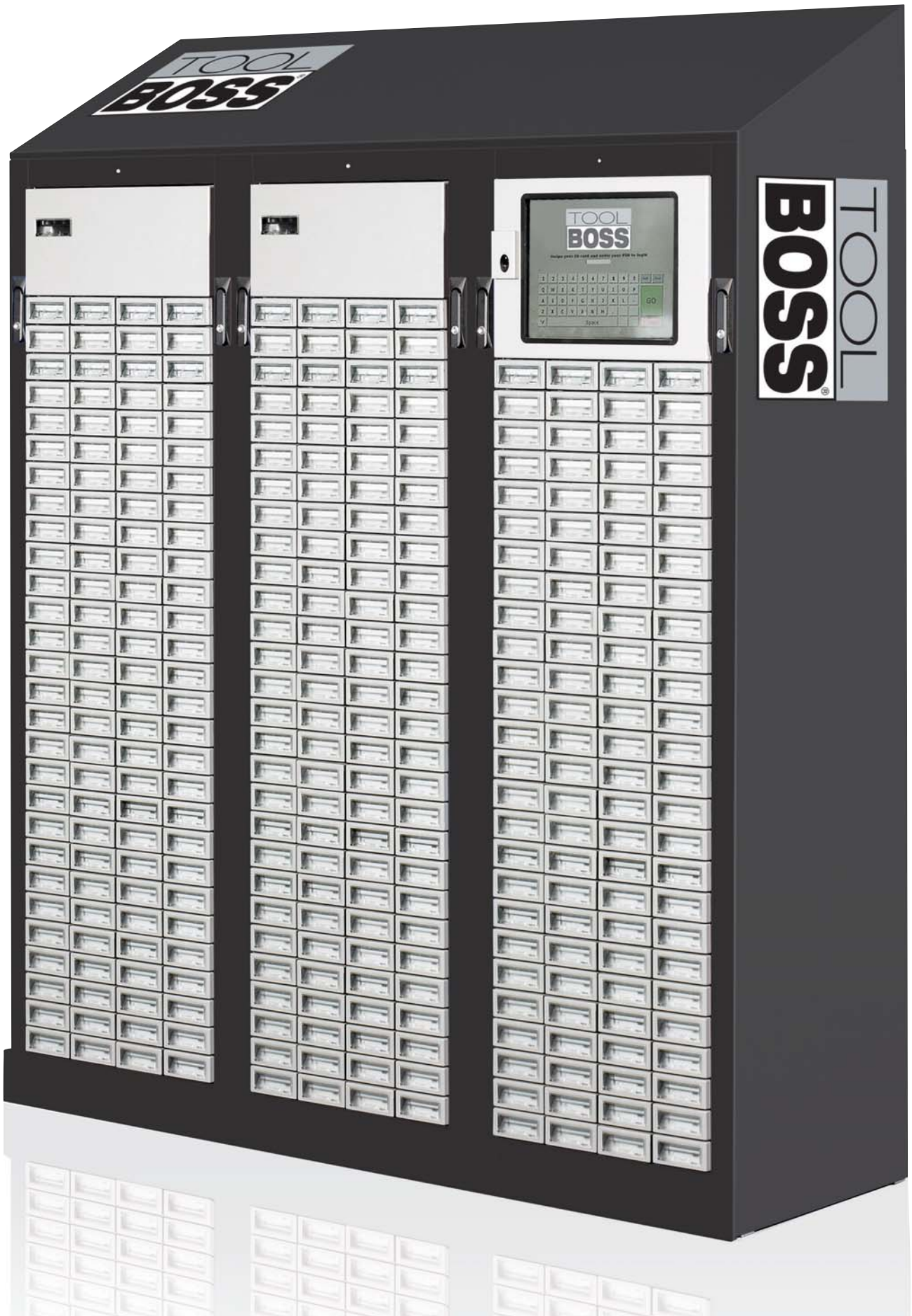
## **Servicio y asistencia** de primera calidad

Con WIDIA™, lo obtendrá todo: productos superiores, un rendimiento fiable y unos servicios de programas y asistencia sin igual.

- Unos equipos altamente cualificados de servicio al cliente y asistencia técnica (CAS) ayudan a los clientes con su gran experiencia en los productos y el mercado.
- Unos equipos de ingeniería avanzada se especializan en grupos de productos específicos para ayudar a los clientes a optimizar la productividad de las aplicaciones.
- Unos especialistas en aplicaciones de campo trabajan directamente con los distribuidores para recomendar las mejores herramientas y proporcionar formación y asistencia.

WIDIA™

Para obtener más información sobre nuestras innovaciones, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.


TOOL
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# Servicio y asistencia

**WIDIA™ ToolBOSS™** . . . . . **I2–I3**
**Software de gestión de herramientas avanzada** . . . . . **I4–I5**
**Reciclado de herramientas WIDIA** . . . . . **I6**
**Reacondicionamiento de herramientas WIDIA** . . . . . **I7**
**Asistencia técnica sobre aplicaciones** . . . . . **I8–I9**

*“Nuestros ingenieros de aplicaciones ayudan a más de 5.000 fabricantes profesionales todos los meses en la selección de herramientas, el procesamiento de piezas y la resolución de problemas de aplicaciones.”*

# **WIDIA™ ToolBOSS™** Soluciones seguras y de alta capacidad.

El armario de 28 NIVELES proporciona una mayor capacidad que el armario ToolBOSS de WIDIA de 20 NIVELES, con el mismo tamaño. Con muchas características únicas, el armario ToolBOSS de WIDIA de 28 NIVELES es lo último en inventario seguro.

Combinado con nuestro potente software de gestión ToolBOSS de WIDIA, el armario de 28 NIVELES proporciona una solución polivalente y de alta capacidad para tratar los retos impredecibles de logística y gestión de la cadena de suministros.

**Opciones de cajones**
Existen actualmente 19 tamaños distintos de cajones disponibles para acomodar una gran variedad de artículos.

**Compatibilidad**
Totalmente compatible con todas las unidades ToolBOSS de WIDIA existentes.

**Diagnóstico**
Puerto de diagnóstico con bandeja integrada, lo cual mejora la asistencia remota al sistema, el diagnóstico y la reparación.

**Eficacia**
Se pueden seleccionar varios cajones en una transacción, minimizando el tiempo necesario para gestionar grandes volúmenes de existencias.

- Inventario de herramientas de corte.
- Inventario disponible las 24 horas.
- Reconfiguración única.
- Disminución del gasto en herramientas.
- Reducción de costes administrativos.
- Responsabilidad.
- Reducción del coste por ubicación.

**Puerto futuro**
Interfaz USB, así como un puerto de expansión DCS, para utilizar con RFID y otros equipos auxiliares.

**Acceso de alta velocidad**
La rápida búsqueda y selección de los artículos a través del software se refuerza con un completo sistema LED de identificación que guía a los usuarios directamente al cajón correcto.

**Seguimiento**
El software proporciona un completo seguimiento de auditoría que le permite averiguar quién utilizó un componente almacenado en el sistema, además de cuándo, dónde y por qué.

**Capacidad de ampliación**
Ampliable a 10 unidades por sistema que proporcionan hasta 1.121 ubicaciones seguras.

# Maximice el tiempo de operación. Aumente la producción.

ATMS es una potente y eficaz solución de software para la gestión y el control de todos los tipos de herramientas. Es un paquete variado que ofrece una completa gestión de herramientas con control de inventario, compras y un seguimiento de auditoría exhaustivo.

atms

## SOFTWARE AVANZADO DE GESTIÓN DE HERRAMIENTAS

**Informes estándar y a medida**
Un amplio conjunto de informes estándar y a medida pensados para el usuario.

**Solicitudes y compras**
La función de compra permite realizar y enviar electrónicamente solicitudes interiores a un sistema empresarial.

**Control de reajustes**
Controla todo el ciclo de reajustes, incluyendo los departamentos de reajustes interiores y exteriores.

**Gestión de inspecciones**
Realiza un seguimiento y clasificación de datos para identificar las necesidades de mantenimiento de herramientas.

### Aumente su productividad:

- Elimine los tiempos muertos de la falta de existencias.
- Alcance una reducción de hasta el 66% en el tiempo de puesta en marcha.

### Aumente su rentabilidad:

- Reduzca el inventario manual en un 55% en seis meses.
- Rebaje drásticamente el consumo de herramientas hasta un 30%.
- Reduzca los costes de adquisición en un 90%.

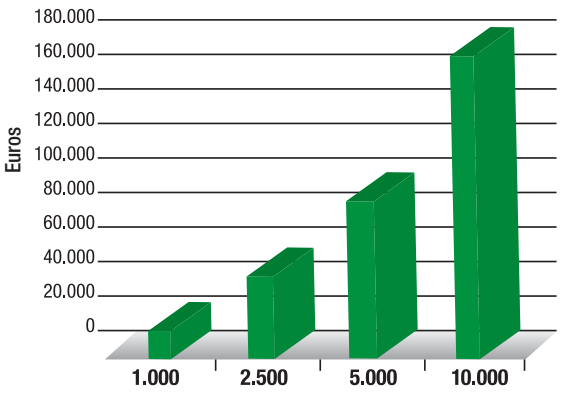
**Puntos de emisión sin límite**
Acceso a todos los informes, pedidos y gestión de datos por ubicación y punto de emisión.

**Consolidación de máquinas expendedoras y control de pedidos**
Optimiza la consolidación del proceso de datos para una cantidad ilimitada de máquinas expendedoras vinculadas.

Para obtener más información sobre ATMS, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

# Obtenga dinero en efectivo o un abono por su metal duro usado

**Su rentabilidad potencial anual***




**Libras de residuos de metal duro por año***

**La rentabilidad real puede variar en función del valor actual de mercado para materiales de metal duro reciclados.*

## ¿Por qué reciclar?

### ¡Es lo correcto!

Es fácil para su empresa ser respetuosa con el medio ambiente con nuestro programa de reciclaje de metal duro.

Al enviarnos sus herramientas de metal duro usadas, ayudará a preservar y proteger el medio ambiente y asegurará que estos productos se reciclen de forma responsable.

### ¡Es rentable!

No sólo WIDIA™ hace que su empresa sea respetuosa con el medio ambiente, sino que ofrecemos un incentivo adicional: es rentable.

Gracias a nuestro programa de reciclaje de metal duro, podrá obtener todo el valor de su inversión en herramientas de corte de metal, mejorar la rentabilidad y reducir el gasto general en herramientas. Cuando nos envíe su metal duro usado, le recompensaremos en metálico o le concederemos un abono. *(Oferta de abono válida únicamente para EE.UU.)*

### ¡Es FÁCIL!

Nuestro programa de reciclaje está disponible a través de Internet y es fácil de utilizar. Puede solicitar un presupuesto, acordar el envío de su metal duro usado y comprobar el estado de su envío.

Para obtener más información, por favor, póngase en contacto con su distribuidor autorizado.

## Cajas verdes para empresas verdes

El programa Green Box™ es una forma segura y eficaz de enviar las herramientas de metal duro gastadas a un centro de reciclaje autorizado.

El metal duro usado y cualificado incluye herramientas de corte de metal mezcladas con o sin recubrimiento y sin virutas, aceite ni contaminación de acero. El material no debe tener soldaduras.

# Cualquiera puede reafilar sus herramientas. Sólo nosotros las reacondicionamos de verdad.

## ¿Por qué reacondicionar?

Nuestros servicios de reacondicionamiento ayudan a optimizar el valor de las herramientas de corte de metal durante toda su vida útil proporcionándoles rápidamente unas características de rendimiento como las de unos productos nuevos, para que las herramientas que necesite estén siempre a mano y como nuevas.

Reacondicionamos:

- Brocas de metal duro integral
- Escariadores
- Machos de metal duro integral
- Fresas de mango de metal duro integral
- Herramientas de PCD/CBN

El reacondicionamiento es una forma asequible de lograr que la inversión en herramientas dure más y que el rendimiento de las brocas y fresas de mango sea excelente en todo momento.

Al enviar las brocas y fresas de mango gastadas para su reacondicionamiento, dispondrá de:

- Geometría específica.
- Recubrimientos certificados.
- Calidad superior.
- Rendimiento igual que nuevo.
- Respuesta rápida.
- Asistencia técnica sobre aplicaciones durante todo el ciclo de vida de la herramienta.

Las herramientas se pueden reacondicionar, generalmente, hasta cinco veces.

Para utilizar los servicios de reacondicionamiento de WIDIA™, siga estos sencillos pasos:

1. Póngase en contacto con el centro de atención al cliente más cercano para recibir instrucciones.
2. Prepare las herramientas en una caja resistente.
3. Busque el centro de reacondicionamiento más cercano:
   - América del Norte
   - Sudamérica
   - Europa
   - Asia

   Envíe las herramientas con las instrucciones del servicio de atención al cliente.
4. El centro de reacondicionamiento le devolverá las herramientas reacondicionadas.

Para empezar, póngase en contacto con su distribuidor local autorizado de WIDIA.

# Asistencia técnica sobre aplicaciones

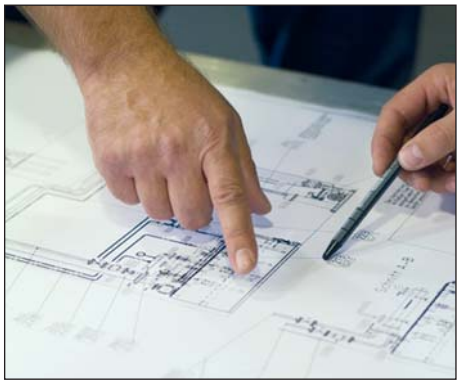
*Obtenga respuestas rápidas y fiables a sus problemas más difíciles de mecanizado.*

*Nuestro equipo de asistencia técnica sobre aplicaciones específicas (CAS) es el recurso de asistencia más importante de la industria metalúrgica para las soluciones de aplicación de herramientas y resolución de problemas.*

- La mejor tecnología y las mejores herramientas de asistencia de aplicación de su clase.
- Fácil acceso a experiencia en mecanizado comprobada.
- Excelencia en el nivel de servicios.

*Excelencia en el nivel de servicios:*

- Respuesta telefónica rápida.
- Soluciones técnicas rápidas.
- Gestión eficaz de los casos.



*Servicios que suministramos:*

- Parámetros de operación.
- Optimización de procesos.
- Asistencia de hardware.
- Selección de herramientas.
- Solución de problemas.

*Tecnología y herramientas de primera calidad:*

- Base de datos de los materiales.
- Calculadoras de aplicaciones.
- Expertos en el rendimiento de las herramientas.

# Asistencia técnica sobre aplicaciones

*Fácil acceso a experiencia en mecanizado comprobada.*

Los ingenieros de asistencia técnica sobre aplicaciones específicas de WIDIA™ ayudan a los clientes y a los grupos de ingeniería de todo el mundo con recomendaciones de expertos sobre la selección y aplicación para toda la variedad de herramientas WIDIA.

*Cómodas opciones de acceso:*

| País de origen | Idioma | Teléfono | Fax | Correo electrónico |
|---|---|---|---|---|
| Australia | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Austria | Alemán | 0800 291630* | 0800 291631* | eu.techsupport@widia.com |
| Bélgica | Inglés/Francés | 0800 80410* | 0800 80411* | eu.techsupport@widia.com |
| China | Inglés | 400 889 2136 | 001-724-539-6830 | ap.techsupport@widia.com |
| Dinamarca | Inglés | 808 89295* | 808 89297* | na.techsupport@widia.com |
| Finlandia | Inglés | 0800 919413* | 0800 919415* | na.techsupport@widia.com |
| Francia | Francés | 080 5540 379* | 080 5540 029* | eu.techsupport@widia.com |
| Alemania | Alemán | 0800 1015774* | 0800 0007531* | eu.techsupport@widia.com |
| India | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Israel | Inglés | 1809 449907 | 1809 439845 | na.techsupport@widia.com |
| Italia | Italiano | 800 916568* | 800 917749* | eu.techsupport@widia.com |
| Japón | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Corea del Sur | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Malasia | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Países Bajos | Inglés | 0800 0201131* | 0800 0201135* | na.techsupport@widia.com |
| Nueva Zelanda | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Noruega | Inglés | 800 10081 | 800 10001 | na.techsupport@widia.com |
| Polonia | Polaco | 00800 4411943 | 00800 4411940 | eu.techsupport@widia.com |
| Singapur | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Sudáfrica | Inglés | 0800 981644* | 0800 981645* | na.techsupport@widia.com |
| Suecia | Inglés | 020798794 | 020790477 | na.techsupport@widia.com |
| Taiwán | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Tailandia | Inglés | 001-724-539-6921 | 001-724-539-6830 | ap.techsupport@widia.com |
| Reino Unido | Inglés | 0800 028 2996* | 0800 028 5721* | na.techsupport@widia.com |
| EE.UU. | Inglés | 888-539-5145* | 724-539-6830* | na.techsupport@widia.com |

** Número gratuito.*

A35-100

# Información técnica


**Datos de aplicaciones de portaherramientas** . . . . . **J2**

**Ángulos de aproximación** . . . . . **J3**

**Selección de portaherramientas** . . . . . **J4–J5**

**Selección de plaquitas** . . . . . **J6–J7**

**Rugosidad de superficie** . . . . . **J8–J10**

**Dimensiones y tolerancias** . . . . . **J12, J17**

**Dimensiones de montaje para cartuchos** . . . . . **J13**

**Solución de problemas** . . . . . **J14–J15**

**Referencia cruzada de durezas** . . . . . **J16–J17**

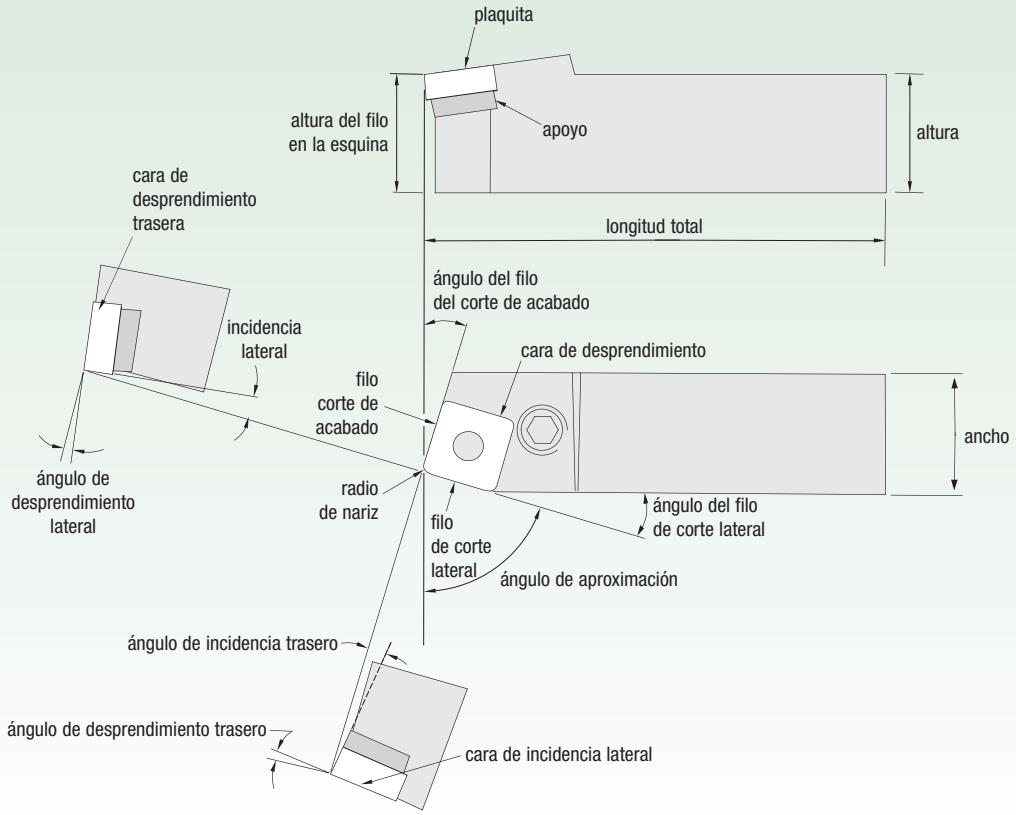
**Ecuaciones** . . . . . **J18**

**Referencia cruzada** . . . . . **J18**

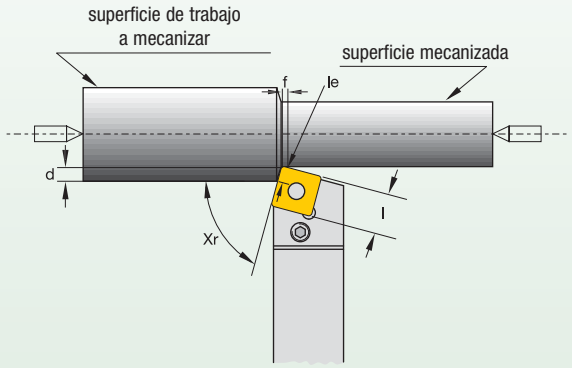
**Tabla de equivalencias decimales** . . . . . **J19**

**Información técnica de materiales** . . . . . **J20–J25**

**Información general sobre materiales** . . . . . **J26**

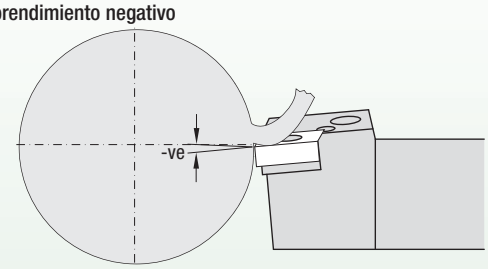



## Nomenclatura en función de la pieza de trabajo

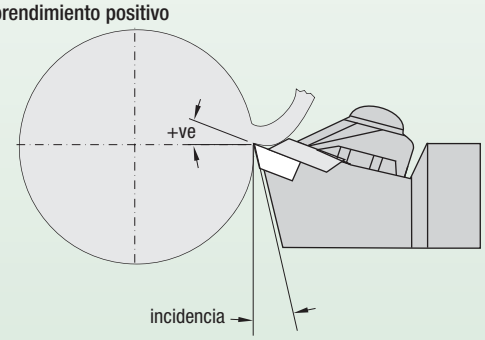



## Orientación de la plaquita en relación con la pieza de trabajo

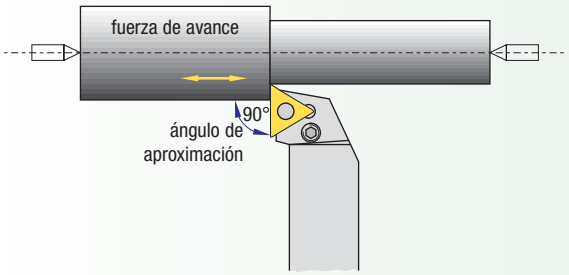
**Desprendimiento negativo**



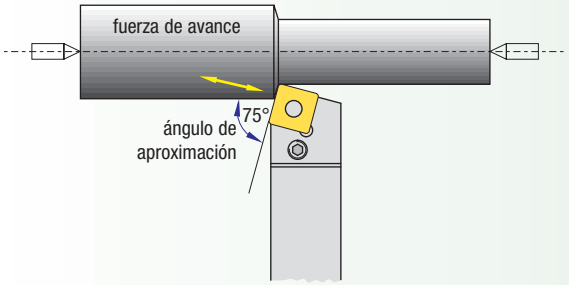

**Desprendimiento positivo**



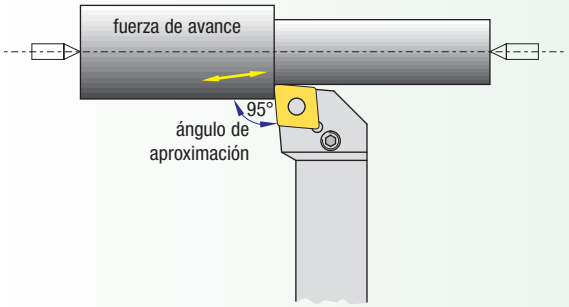

| | | | |
|---|---|---|---|
| d = | Profundidad de corte | Xr= | Ángulo de aproximación |
| le = | Diámetro | f = | Avance |
| | | l = | Longitud del filo de corte de la plaquita |



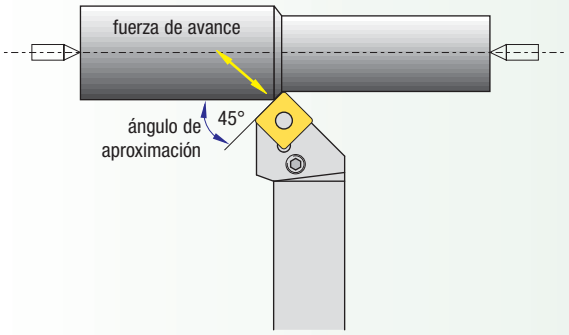

Generalmente, se prefieren los portaherramientas con un ángulo de aproximación a 90° para el mecanizado de trabajos delgados en pieza de trabajo sujetas entre centros.



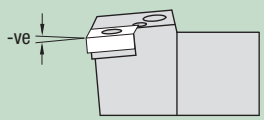
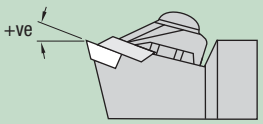
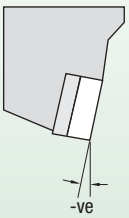
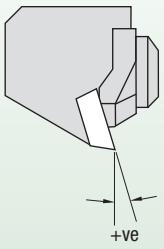

Se prefieren los portaherramientas con un ángulo de aproximación a 75° para el mecanizado de componentes tipo cilindro y funcionamiento con escasas interrupciones.




Se prefieren los portaherramientas con un ángulo de aproximación a 95° para las operaciones polivalentes, como el torneado de diámetro exterior y de la cara.

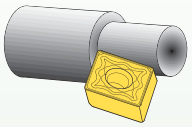


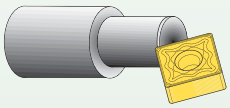

Se prefieren los portaherramientas con un ángulo de aproximación a 45° para el canizado en desbaste y para las operaciones de biselado con muchas interrupciones.

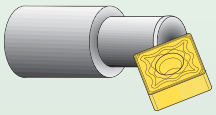
| característica | desprendimiento negativo | desprendimiento positivo |
|---|---|---|
| desprendimiento trasero | • Desplaza las virutas hacia la superficie mecanizada.<br>  | • Desplaza las virutas desde la superficie mecanizada.<br>  |
| desprendimiento lateral | • Desplaza las virutas hacia la escuadra del trabajo.<br>  | • Desplaza las virutas desde la escuadra del trabajo.<br>  |
| ventajas | • El filo de corte es más resistente.<br>• Puede sostener fuerzas de corte mayores.<br>• Ideal para mecanizar cortes interrumpidos.<br>• Cuenta con un mayor número de filos de corte. | • Acción de corte libre.<br>• Genera menos calor.<br>• Consume menos potencia.<br>• Aleja las virutas del trabajo. |
| desventajas | • Comprime el metal.<br>• Consume más potencia.<br>• Dirige las virutas hacia el trabajo.<br>• Genera más calor durante el corte. | • Tiene menos filos de corte.<br>• El filo de corte no es resistente. |

## Polivalencia de la plaquita de diamante a 80°

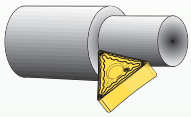
### SNMG

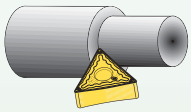

75° torneado

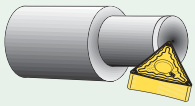

75° planeado

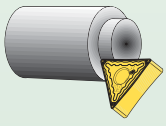

45° biselado

### TNMG

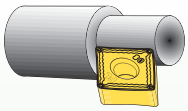

90° torneado

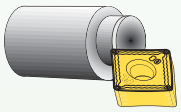

93° torneado

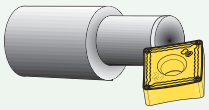

60° biselado

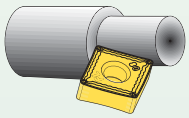

90° planeado

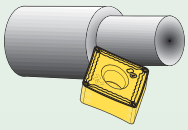
### CNMG

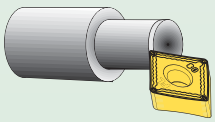

95° torneado


95° planeado


75° planeado


75° torneado


90° torneado


90° planeado

### Ventajas del diamante a 80°:

- CNMG presenta una fuerza mayor para una máxima evacuación de material.
- CNMG está disponible en todos los tipos de geometrías.
- Una plaquita puede abarcar una gran variedad de trabajos.
- CNMG tiene una aplicación polivalente.

La selección de la plaquita se basa principalmente en las características de la plaquita y en los requisitos de la aplicación. Deben tomarse en cuenta los aspectos del rendimiento y las consideraciones del coste en el proceso de selección, junto con la calidad del material de corte.

## Forma de la plaquita

En general, se prefieren las plaquitas con ángulos en esquina mayores frente a los ángulos más pequeños, siguiendo este orden:
S (90°) – C y W (80°) – T (60°) – D (55°) – V (35°).

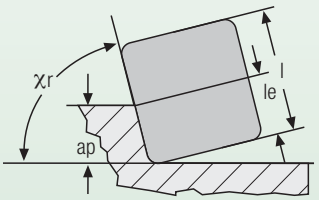
Cuando sea posible, se preferirá la forma trigona W (80°) a la plaquita en C, que cuenta con más filos de corte disponibles. Las plaquitas redondeadas con forma de R constituyen una alternativa a las plaquitas en S y también son indicadas para usar en el torneado de forma.

Las plaquitas de desprendimiento negativo, que se pueden usar en ambos lados, son más rentables que las plaquitas de desprendimiento negativo de un lado. Las plaquitas de desprendimiento positivo ofrecen ventajas para el funcionamiento del torneado de diámetro interior y para piezas con pared fina o materiales de trabajo blandos.

## Longitud del filo de corte

El tamaño de una plaquita intercambiable depende de la profundidad de corte máxima (ap), el ángulo del filo de corte $\chi r$ y de la forma y geometría de la plaquita.

Con ángulos de filo de corte de 75–105°, la longitud efectiva del filo de corte es casi igual a la profundidad de corte máxima. En el planeado exterior, en especial en el torneado de forma (copiado), el ángulo del filo de corte se reduce. Debido al grosor inferior del corte, es posible usar mayores longitudes de filo de corte que lo establecido.




$$le = \frac{ap}{\sin \chi r}$$

ap = Profundidad de corte

le = Longitud efectiva del filo de corte (ancho del corte)

l = Longitud del filo de corte de la plaquita

$\chi r$ = Ángulo de ataque del filo de corte

## Longitudes efectivas máximas de los filos de corte:

| geometría | S | C | T | D | V | W | R |
|---|---|---|---|---|---|---|---|
| -2, -22 | 0,3 l | 0,3 l | 0,2 l | 0,2 l | — | — | — |
| -4, -41, -48, -AP | 0,5 l | 0,5 l | 0,3 l | 0,3 l | — | 0,4 l | — |
| -MT..., -49, -5, -65, -8 | 0,7 l | 0,7 l | 0,5 l | 0,5 l | 0,2 l | 0,5 l | 0,4 d |

Longitud del filo de corte/longitud efectiva

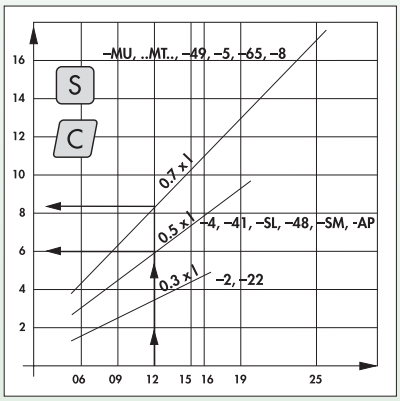
### Radio de esquina

La esquina de la plaquita determina la fuerza del punto de corte, el avance máximo admisible y el acabado superficial de la pieza de trabajo. Seleccione el radio de esquina más grande posible.

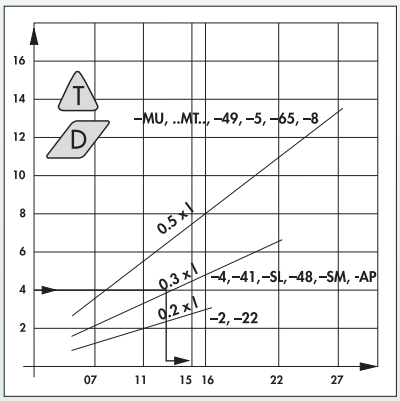
### Desbaste

En función del avance, se recomiendan los siguientes radios mínimos para el torneado en desbaste.

Radio r ≥ 1,6 x avance f para las formas de la plaquita C y S
Radio r ≥ 2,5 x avance f para las formas de la plaquita D y T




Longitud del filo de corte l (mm)




Longitud del filo de corte l (mm)

## Avances máximos recomendados

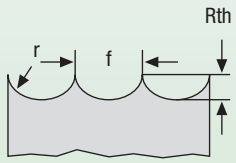
Los avances máximos recomendados se basan en ángulos de filo de corte de 75–105°. Es posible usar valores de avance superiores en condiciones favorables. En condiciones no rígidas, deben aplicarse valores inferiores o seleccionar radios más pequeños, especialmente en caso de vibración. Se recomiendan generalmente los radios más anchos para la fundición, el acero fundido y los cortes interrumpidos.

## Acabado

En operaciones de acabado, el acabado superficial y la precisión de la pieza son las dos demandas más exigentes de los clientes. Para determinar aproximadamente el acabado superficial esperado en el torneado con avances > 0,1 mm, se puede usar la fórmula siguiente para la altura de rugosidad teórica Rth.

Si la altura de rugosidad teórica Rth se asume aproximadamente igual a Rz, la media de rugosidad Ra se puede deducir, por lo que la relación con Rz no es fija. La relación de conversión Rz:Ra = 4:1 es generalmente la indicada.

$$Rth\ [\mu m] = \frac{125 \times f^2}{r}$$




## Avance máximo (mm) para el radio r

| forma de la plaquita | 0,4 | 0,8 | 1,2 | 1,6 | 2,4 |
|---|---|---|---|---|---|
| C S | 0,25 | 0,5 | 0,8 | 1,0 | 1,6 |
| D T | 0,16 | 0,32 | 0,5 | 0,63 | 1,0 |

## Altura de rugosidad teórica Rth [μm] para el avance f

| radio | 0,10 | 0,12 | 0,16 | 0,20 | 0,25 | 0,32 |
|---|---|---|---|---|---|---|
| **0,4** | 3,2 | 4,5 | 8,0 | 12,5 | 20,0 | — |
| **0,8** | 1,6 | 2,2 | 4,0 | 6,3 | 10,0 | 16,0 |
| **1,2** | — | 1,5 | 2,8 | 4,2 | 6,3 | 10,7 |
| **1,6** | — | — | 2,0 | 3,2 | 5,0 | 8,0 |

## Valores de referencia aproximada para la relación Rz a Ra

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Rz [μm]** | 1,6 | 2,5 | 4,0 | 6,3 | 10,0 | 16,0 | 16,0 |
| **Ra [μm]** | 0,4 | 0,6 | 1,0 | 1,6 | 2,5 | 4,0 | 6,3 |

Se obtienen unas buenas superficies con:
- Mayores velocidades de corte.
- Plaquitas con filos de corte agudos.
- Ángulos de desprendimiento positivo y geometría del rompevirutas positiva.
- Uso de cermets.
- Instalaciones de mecanizado rígidas.
- Uso de materiales fácilmente mecanizables.
- Uso de fluido de corte.

Características de la superficie:

AA ≙ Ra medio aritmético

CLA ≙ Ra medio centrado

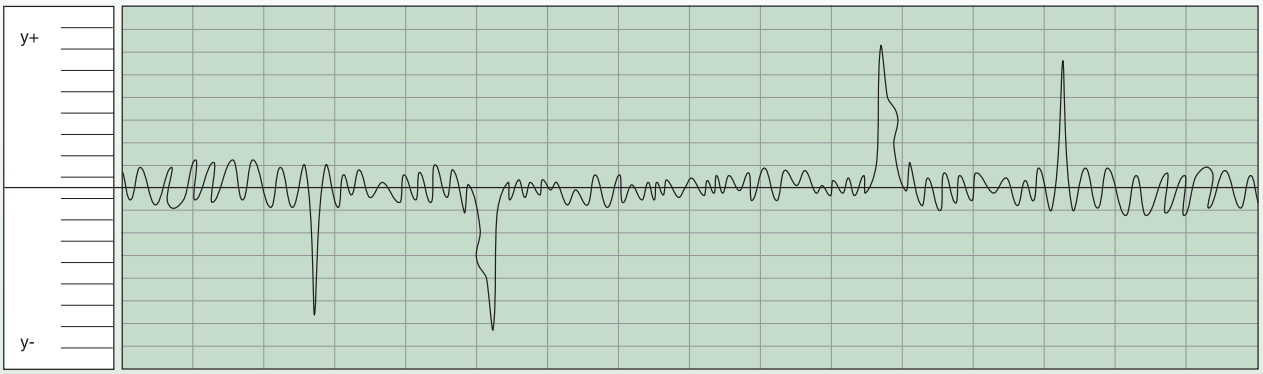
RMS ≙ escuadra promedia de la base 1,1 x AA

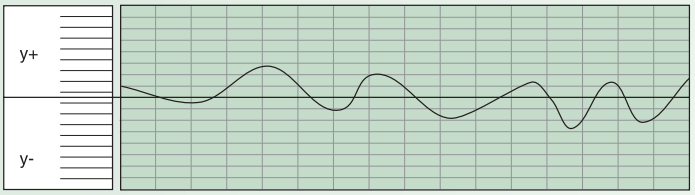
1 μin = 0,025 mm

1 mm = 40 μin

Las irregularidades que forman el desahogo superficial y que se definen de forma convencional dentro del área en la que se eliminan las desviaciones de la forma y ondulado. Las irregularidades de la rugosidad superficial, como las marcas de avance transversal y las irregularidades que contienen resultan de la acción inherente al proceso de producción.

### Textura principal (rugosidad)



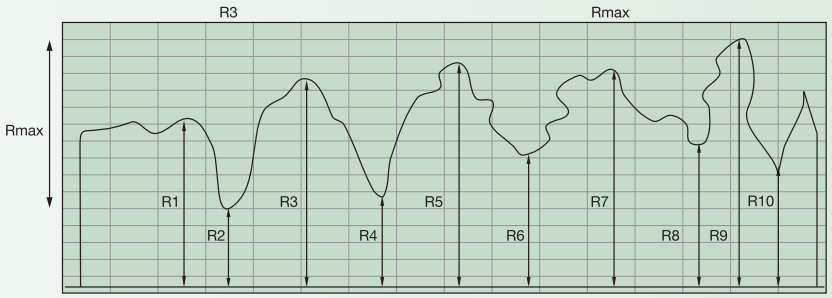




### Textura secundaria (ondulado)

El componente de la rugosidad superficial sobre el que la rugosidad se superpone. El ondulado se produce debido a: deformaciones de la máquina o de la pieza, vibraciones, biselado o tratamiento térmico de las fatigas de la curvatura.

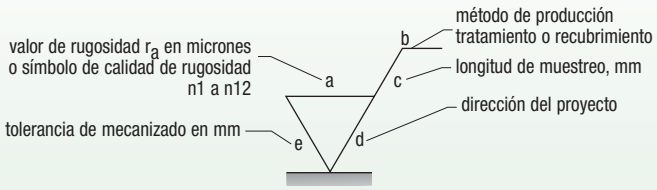
Rmax = Distancia entre dos líneas paralelas a la línea promedia, tocando el perfil en los puntos más bajo y alto dentro de la longitud de muestreo.

Rz = Diferencia media entre los 5 picos más altos y los 5 valles más profundos dentro de la longitud de muestreo medida desde una línea paralela a la línea promedia, sin cruzar el perfil.



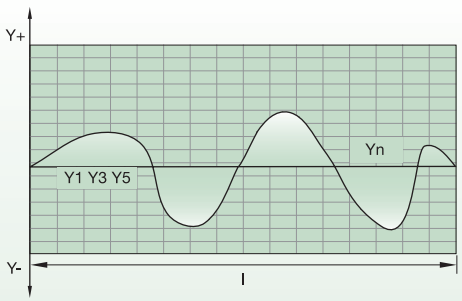

$$Rz = (R1 + R3 + R5 + R7 + R9) - (R2 + R4 + R6 + R8 + R10) / 5$$

## Símbolo de mecanizado



### Símbolos para indicar la rugosidad superficial

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **anterior método** | | | | | | | | | | | | | |
| **método actual (en µm y calidades)** | 0,012 | 0,025 N1 | 0,05 N2 | 0,10 N3 | 0,20 N4 | 0,40 N5 | 0,80 N6 | 1,6 N7 | 3,2 N8 | 6,3 N9 | 12,5 N10 | 25 N11 | 50 N12 |




Ra = Valor medio de las ordenadas (Y1, Y2…Yn) desde la línea promedia.

$Ra = 1/l \int_0^l |y| dx$

$Ra = \frac{\sum_1^n |yi|}{n}$

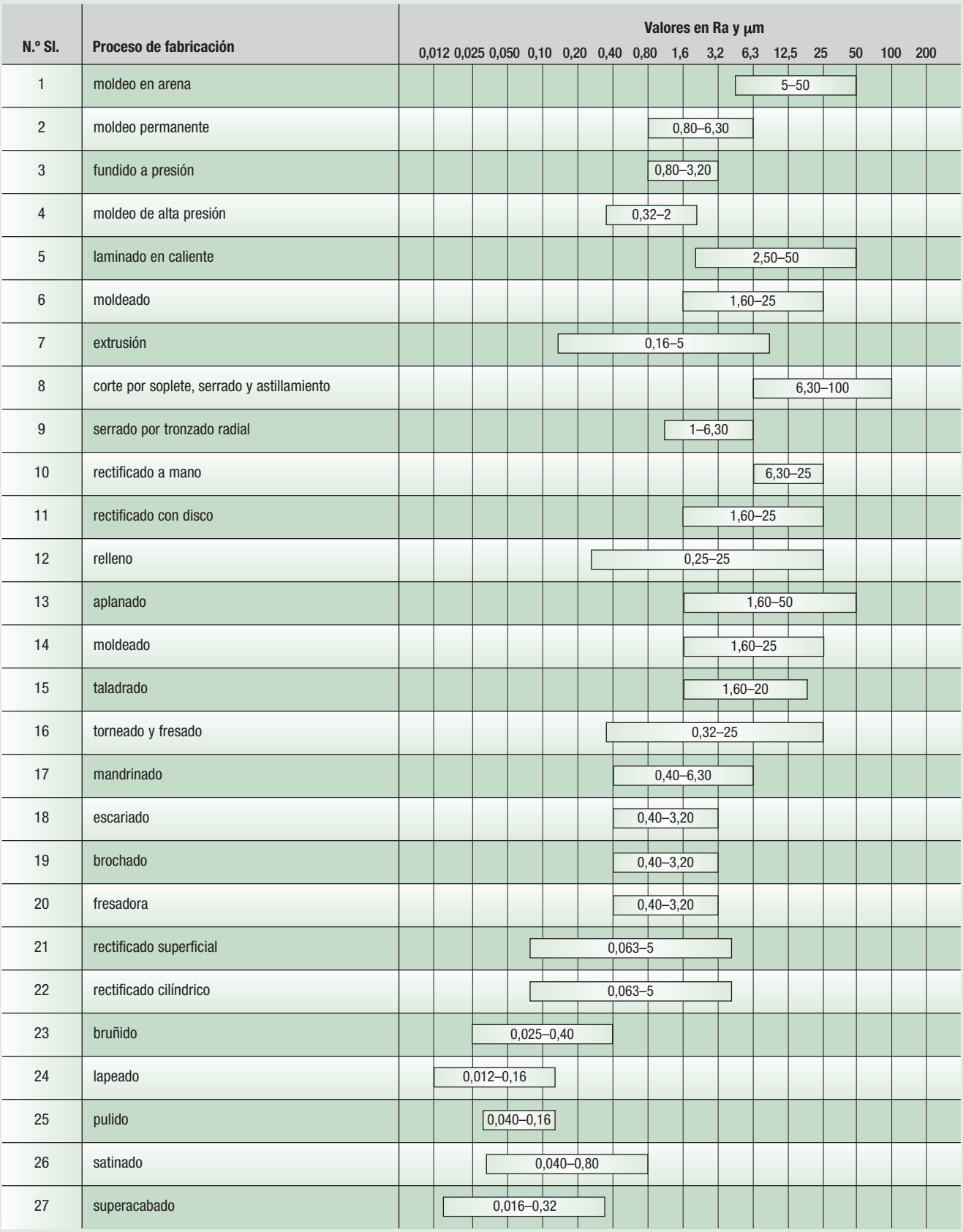
La tabla sólo ofrece valores aproximativos.

$1\mu m = 0{,}001\ mm = 39\mu^2$
$1\mu^2 = 0{,}0000254\ mm$

Calidad FOMOSJ superficial (OS 3073)

### Rugosidad superficial

| Rt/max µm | CLA µm | CLA µ² | RMS µm | RMS µ² | UDSSR clase | CCCP µm Rt |
|---|---|---|---|---|---|---|
| 0,06 | 0,02 | 0,75 | 0,02 | 0,08 | 14 | 0,06–0,12 |
| 0,10 | 0,03 | 1,20 | 0,04 | 1,30 | 13 | 0,06–0,12 |
| 0,20 | 0,06 | 2,50 | 0,08 | 2,80 | 12 | 0,12–0,25 |
| 0,30 | 0,09 | 3,70 | 0,10 | 4,20 | 11 | 0,25–0,50 |
| 0,40 | 0,13 | 5,00 | 0,14 | 5,60 | — | — |
| 0,50 | 0,16 | 6,70 | 0,18 | 6,90 | — | — |
| 0,60 | 0,19 | 7,50 | 0,21 | 8,30 | 10 | 0,50–0,80 |
| 0,70 | 0,20 | 8,70 | 0,25 | 9,70 | — | — |
| 0,80 | 0,25 | 10,00 | 0,28 | 11,10 | — | — |
| 0,90 | 0,28 | 11,20 | 0,32 | 12,50 | — | — |
| 1,00 | 0,31 | 12,50 | 0,35 | 14,00 | — | — |
| 1,20 | 0,38 | 15,80 | 0,42 | 16,70 | 9 | 0,80–1,60 |
| 1,50 | 0,47 | 18,80 | 0,53 | 20,90 | — | — |
| 1,80 | 0,57 | 22,60 | 0,64 | 25,50 | — | — |
| 2,00 | 0,64 | 25,10 | 0,78 | 27,90 | 8 | 1,60–3,20 |
| 2,40 | 0,73 | 30,10 | 0,85 | 33,40 | — | — |
| 2,80 | 0,89 | 35,20 | 0,99 | 39,00 | — | — |
| 3,00 | 0,95 | 37,60 | 1,06 | 41,90 | — | — |
| 3,50 | 1,11 | 43,90 | 1,24 | 48,80 | — | — |
| 4,00 | 1,27 | 50,20 | 1,41 | 55,80 | 7 | 3,20–6,30 |
| 5,00 | 1,59 | 62,70 | 1,77 | 69,70 | — | — |
| 6,00 | 1,91 | 75,50 | 2,12 | 83,60 | — | — |
| 7,00 | 2,22 | 87,50 | 2,48 | 92,60 | — | — |
| 8,00 | 2,54 | 100,00 | 2,83 | 111,70 | 6 | 6,30–10,00 |
| 10,00 | 3,16 | 125,50 | 3,54 | 140,00 | — | — |
| 20,00 | 6,40 | 251,00 | 7,60 | 279,00 | 5 | 10,00–20,00 |
| 40,00 | 12,70 | 205,00 | 14,10 | 558,00 | 4 | 20,00–40,00 |
| 60,00 | 19,10 | 755,00 | 21,20 | 836,00 | 3 | 40,00–63,00 |
| 125,00 | 39,50 | 1560,00 | 43,50 | 750,00 | 2 | 63,00–125,00 |
| 200,00 | 64,00 | 2510,00 | 78,00 | 2790,00 | 1 | 125,00–200,00 |



| N.º SI. | Proceso de fabricación | Valores en Ra y µm |
|---|---|---|
| 1 | moldeo en arena | 5–50 |
| 2 | moldeo permanente | 0,80–6,30 |
| 3 | fundido a presión | 0,80–3,20 |
| 4 | moldeo de alta presión | 0,32–2 |
| 5 | laminado en caliente | 2,50–50 |
| 6 | moldeado | 1,60–25 |
| 7 | extrusión | 0,16–5 |
| 8 | corte por soplete, serrado y astillamiento | 6,30–100 |
| 9 | serrado por tronzado radial | 1–6,30 |
| 10 | rectificado a mano | 6,30–25 |
| 11 | rectificado con disco | 1,60–25 |
| 12 | relleno | 0,25–25 |
| 13 | aplanado | 1,60–50 |
| 14 | moldeado | 1,60–25 |
| 15 | taladrado | 1,60–20 |
| 16 | torneado y fresado | 0,32–25 |
| 17 | mandrinado | 0,40–6,30 |
| 18 | escariado | 0,40–3,20 |
| 19 | brochado | 0,40–3,20 |
| 20 | fresadora | 0,40–3,20 |
| 21 | rectificado superficial | 0,063–5 |
| 22 | rectificado cilíndrico | 0,063–5 |
| 23 | bruñido | 0,025–0,40 |
| 24 | lapeado | 0,012–0,16 |
| 25 | pulido | 0,040–0,16 |
| 26 | satinado | 0,040–0,80 |
| 27 | superacabado | 0,016–0,32 |

# Nuestra completa gama de productos. Su satisfacción total.

Desde torneado, taladrado y fresado intercambiable a fresado con fresas de mangos de metal duro integral, taladrado con brocas de metal duro integral y roscado: ahora las herramientas más potentes del sector llevan con orgullo la marca WIDIA™. Al adquirir productos WIDIA, no sólo está comprando velocidad, potencia y precisión, sino que invierte en calidad y una satisfacción total.

La gama más amplia de productos diseñados con precisión y servicios de soluciones a medida que hay disponible en la actualidad están acompañados de una red internacional especializada de socios distribuidores autorizados; esto le proporcionará las herramientas que necesita... y la potencia que sólo se consigue con las marcas WIDIA. Para obtener información sobre los productos o programar una demostración in situ, visite www.widia.com.

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Para obtener más información, póngase en contacto con su distribuidor local autorizado o visite **www.widia.com**.

## Torneado exterior, torneado interior

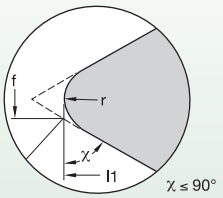
En la forma, las dimensiones y las designaciones, los portaherramientas WIDIA™ para plaquitas intercambiables se ajustan a las normas internacionales. Las dimensiones f y l1 están relacionadas con los puntos de corte del calibre de plaquita del círculo inscrito d y del radio de esquina r.

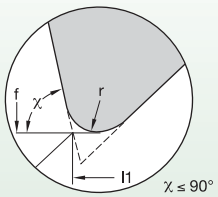
Cuando se seleccionan plaquitas con radios de esquina más pequeños o más anchos, cambian las dimensiones determinadas por el radio de esquina. Para obtener los valores de corrección para el torneado externo, consulte DIN 4984, parte 1; para el torneado interior, DIN 8025, parte 1.

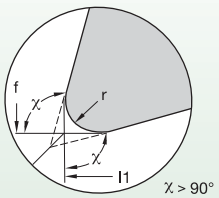
| círculo inscrito | 4,76–7,94 | 9,52–12,7 | 15,88–19,05 | 25,4 |
|---|---|---|---|---|
| radio del círculo r | 0,4 | 0,8 | 1,2 | 2,4 |

## Tolerancias estándar, torneado externo

Altura del filo de corte h = js 13
Altura del mango h = h 13
Ancho del mango b = h 13
Longitud del porta l1 = k 16
Dimensión f = + 0,5 mm
(± 0,25 para los portas simétricos)
Ángulos de aproximación χ = ± 1°
para χ = 90° + 2°

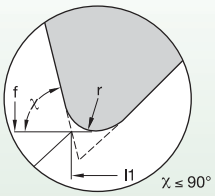


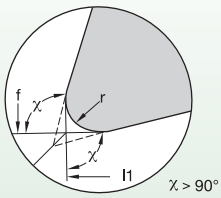




## Tolerancias estándar, torneado interior

Diámetro del mango d1 = g 7
Longitud del porta l1 = k 16
Dimensión f = -0,25 mm
Ángulos de aproximación χ = ± 1°
para χ = 90° + 2°



## Dimensiones de montaje para cartuchos
## DIN 4985 e ISO 5611

### Tornillo de sujeción y arandela

| tamaño del cartucho | h1 | D min | d | e | l' | g | s | t min | Zmax | tornillo de sujeción | arandela |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 06 | 6 | 20 | 17 | 12 | 23 | M 3,5 x 0,60 | 3,5 | 10 | 0,3 | MS2173 | CSW 035 040 |
| 08 | 8 | 25 | 22 | 17 | 30 | M 4,0 x 0,70 | 4,5 | 10 | 0,3 | MS2175 | CSW 040 050 |
| 10 | 10 | 40 | 37 | 20 | 47 | M 6,0 x 1,00 | 5,0 | 14 | 0,4 | 191.405 | CSW 060 050 |
| 12 | 12 | 50 | 47 | 20 | 52 | M 6,0 x 1,00 | 6,0 | 14 | 0,4 | 191.406 | CSW 060 050 |
| 16 | 16 | 60 | 57 | 25 | 59 | M 8,0 x 1,25 | — | 15 | 0,6 | 191.407 | CSW 060 080 |
| 20 | 20 | 70 | 67 | 30 | 66 | M 8,0 x 1,25 | — | 15 | 0,6 | 191.407 | CSW 060 080 |

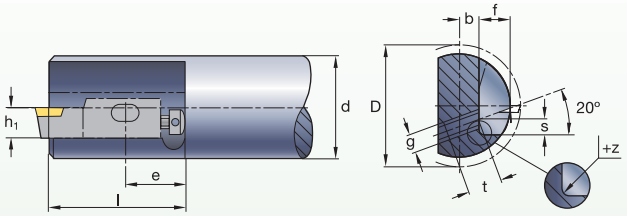
[1] para forma de porta K, S y W l.

### Tamaños de portas

**06,08 CA**
Rango de ajuste
± 0,80 mm

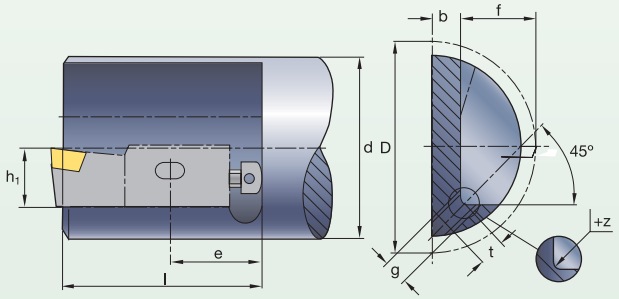
**10,12 CA**
Rango de ajuste
± 1,00 mm

$$b = \frac{D}{2} - f$$




**16,20 CA**
Rango de ajuste
± 1,00 mm

$$b = \frac{D}{2} - f$$



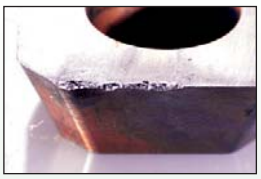
## Introducción

Debe llevarse a cabo una solución de problemas siguiendo un método secuencial para identificar y resolver los problemas de mecanizado. Estos problemas pueden consistir en fallo prematuro del filo de la plaquita, la apariencia de la pieza, ruido o vibración de la máquina y la apariencia de la herramienta. Una solución de problemas eficaz requiere que identifiquemos correctamente el problema para llevar posteriormente a cabo la corrección necesaria paso a paso. Las cuatro áreas clave de preocupación son:

1. material de la herramienta de corte (calidad)
2. máquina
3. pieza de trabajo
4. configuración

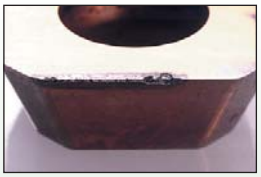
Esta sección analiza las posibles causas y acciones correctivas recomendadas para cada una de las cuatro áreas enumeradas. Recuerde, si se sigue más de un paso a la vez, puede que nunca se descubra la verdadera causa del problema. Lleve siempre a cabo una única medida correctora cada vez.

**1. Astillamiento:** A ojos no expertos, parece un desgaste de flanco normal. Los desgastes del bisel del flanco normales siguen un patrón de desgaste fino y suave, mientras que el desgaste provocado por astillamiento muestra una superficie desigual y de diente de sierra. Si no se detecta el astillamiento con suficiente antelación, puede que se perciba como una entalladura de profundidad de corte.



| causa | solución |
|---|---|
| calidad | Utilizar una calidad más resistente. |
| preparación de filo | Utilizar el mayor bisel en T o agujero posible. |
| recrecimiento del filo | Aumentar la velocidad. |
| vibración | Comprobar la rigidez del sistema: las piezas deben estar fijadas adecuadamente. Corregir cuñas/cojinetes desgastados. Comprobar los posibles montajes incorrectos de herramienta. |
| avance | Avance reducido. |
| recorte de virutas | Utilizar una neblina o un refrigerante para evacuar las virutas. |

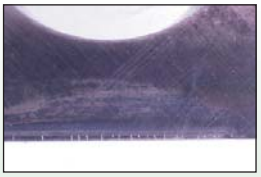
**2. Ranurado profundidad de corte:** Aparece cuando se produce un astillamiento o un desgaste localizado en la línea de profundidad de corte en la cara de desprendimiento y en el flanco de la plaquita. La entalladura se produce principalmente debido al estado del material de la pieza de trabajo. Las condiciones de material que tienden a una entalladura de la profundidad de corte incluyen una pieza de trabajo abrasiva con superficie con cascarilla, propiedades abrasivas de aleaciones de alta temperatura como INCONEL®, una capa externa endurecida resultante de una mecanización anterior, o un material tratado al calor por encima de 55 HRC.



| causa | solución |
|---|---|
| calidad | Utilizar una mayor calidad de resistencia al desgaste del metal duro. |
| avance | Avance reducido. |
| velocidad | Reducir la velocidad. |
| preparación de filo | Utilizar plaquitas con bisel en T o con agujero. |
| programación | Variar la profundidad de corte en materiales muy abrasivos. |

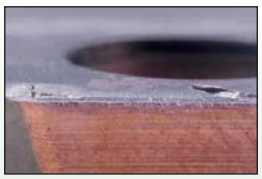
**3. Grietas térmicas:** estas grietas se producen perpendicularmente al filo de corte de la plaquita debido a las variaciones extremas de temperatura.

Estas variaciones de temperatura crean unas tensiones térmicas en la plaquita, lo cual puede provocar grietas térmicas. A ojos no expertos, las grietas térmicas avanzadas pueden parecer un astillamiento.



| causa | solución |
|---|---|
| velocidad y avance | Reducir la velocidad y probablemente el avance. |
| refrigerante | Cerrar el refrigerante. |
| calidad | Usar calidad recubierta. |

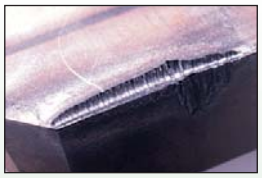
**4. Recrecimiento del filo:** Esto involucra la adhesión de capas de material de la pieza de trabajo a la superficie superior de la plaquita. Las piezas endurecidas del material adherido se sueltan periódicamente, dejando una depresión irregular a lo largo del filo de corte. Esto provoca daños a la pieza y la plaquita. Las fuerzas de corte también aumentarán debido al recrecimiento del filo.



| causa | solución |
|---|---|
| velocidad | Aumentar la velocidad de corte. |
| avance | Aumentar el avance. |
| refrigerante | Utilizar refrigerante para caudal o neblina para evitar que se peguen virutas a la plaquita durante el mecanizado de acero inoxidable y aleaciones de aluminio. |
| preparación de filo | Utilizar unas plaquitas de PVD con inclinación positiva y filo más agudo; emplear plaquitas pulidas para materiales no férreos. |

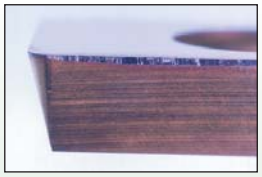
**5. Desgaste del cráter:** Se produce una depresión regular y relativamente suave en la superficie de desprendimiento de la plaquita. El desgaste del cráter se produce de dos maneras:

1. El material que se adhiere a la superficie superior de la plaquita se desprende, llevándose consigo fragmentos de la superficie superior de la plaquita.
2. Se acumula el calor por fricción del flujo de virutas en la superficie superior de la plaquita. Con el tiempo, esta acumulación de calor ablanda la plaquita tras el filo de corte y le arranca partículas minúsculas hasta formar un cráter.



| causa | solución |
|---|---|
| calidad | Utilizar una calidad más resistente al desgaste. |
| velocidad | Reducir la velocidad de corte. |
| preparación de filo | Utilizar un bisel en T más pequeño o aumentar el avance para conseguir un margen adecuado para el bisel en T. |

**6. Desgaste del flanco:** el desgaste del flanco uniforme es el método de fallo de plaquita preferido, ya que puede predecirse. El desgaste de flanco excesivo aumenta las fuerzas de corte y contribuye a un pobre acabado superficial.



NOTA: las plaquitas deben cambiarse durante el desbaste (se alcanza un desgaste de flanco de 0,38–0,50 mm) y el acabado (un desgaste de flanco de 0,25–0,38 mm o menos).

| causa | solución |
|---|---|
| velocidad | Debe reducirse la velocidad sin cambiar el avance. |
| avance | Aumentar el avance. |
| calidad | Utilizar una calidad más resistente al desgaste. Cambiar a una calidad con recubrimiento si la calidad que está usando sin recubrir. |
| geometría de plaquita | Inspeccionar la plaquita para determinar si se está utilizando el tipo apropiado. |

**7. Múltiples factores:** si se producen a la vez un desgaste, un astillamiento, unas grietas térmicas y una rotura, el operario de la máquina deberá realizar una revisión a fondo, sin limitarse a los ajustes normales de avance, velocidad y profundidad de corte, para descubrir la raíz del problema.

| causa | solución |
|---|---|
| avance | Reducir la velocidad de avance para aliviar las fuerzas de corte. |
| plaquita/calidad | En la medida de lo posible, utilizar un radio de nariz más grande.<br>Utilizar una plaquita con bisel en T.<br>Utilizar una calidad de metal duro más resistente. |

## Referencia cruzada de durezas

| Brinell | | Vickers | Rockwell | | | Shore | resistencia a la tensión |
|---|---|---|---|---|---|---|---|
| bola de acero | bola de metal duro | | 60 kg | 100 kg | 150 kg | | |
| HB | HB | HV | HRA | HRB | HRC | Sh | N/mm² |
| — | — | 940 | 85,6 | — | 68,0 | 97 | — |
| — | — | 920 | 85,3 | — | 67,5 | 96 | — |
| — | — | 900 | 85,0 | — | 67,0 | 95 | — |
| — | (767) | 880 | 84,7 | — | 66,4 | 93 | — |
| — | (757) | 860 | 84,4 | — | 65,9 | 92 | — |
| — | (745) | 840 | 84,1 | — | 65,3 | 91 | — |
| — | (733) | 820 | 83,8 | — | 64,7 | 90 | — |
| — | (722) | 800 | 83,4 | — | 64,0 | 88 | — |
| — | (712) | — | — | — | — | — | — |
| — | (710) | 780 | 83,0 | — | 63,3 | 87 | — |
| — | (698) | 760 | 82,6 | — | 62,5 | 86 | — |
| — | (684) | 740 | 82,2 | — | 61,8 | — | — |
| — | (682) | 737 | 82,2 | — | 61,7 | 84 | — |
| — | (670) | 720 | 81,8 | — | 61,0 | 83 | — |
| — | (656) | 700 | 81,3 | — | 60,1 | — | — |
| — | (653) | 697 | 81,2 | — | 60,0 | 81 | — |
| — | (647) | 690 | 81,1 | — | 59,7 | — | — |
| — | (638) | 680 | 80,8 | — | 59,2 | 80 | — |
| — | 630 | 670 | 80,6 | — | 58,8 | — | — |
| — | 627 | 667 | 80,5 | — | 58,7 | 79 | — |
| — | — | 677 | 80,7 | — | 59,1 | — | — |
| — | 601 | 640 | 79,8 | — | 57,3 | 77 | — |
| — | — | 640 | 79,8 | — | 57,3 | — | — |
| — | 578 | 615 | 79,1 | — | 56 | 75 | — |
| — | — | 607 | 78,8 | — | 55,6 | — | — |
| — | 555 | 591 | 78,4 | — | 54,7 | 73 | 2095 |
| — | — | 579 | 78 | — | 54 | — | 2010 |
| — | 534 | 569 | 77,8 | — | 53,5 | 71 | 1981 |
| — | — | 553 | 77,1 | — | 52,5 | — | 1912 |
| — | 514 | 547 | 76,9 | — | 52,1 | 70 | 1893 |
| (495) | — | 539 | 76,7 | — | 51,6 | — | 1854 |
| — | — | 530 | 76,4 | — | 51,1 | — | 1824 |
| — | 495 | 528 | 76,3 | — | 51,0 | 68 | 1824 |
| (477) | — | 516 | 75,9 | — | 50,3 | — | 1775 |
| — | — | 508 | 75,6 | — | 49,6 | — | 1736 |
| — | 477 | 508 | 75,6 | — | 49,6 | 66 | 1736 |
| (461) | — | 495 | 75,1 | — | 48,8 | — | 1687 |
| — | — | 491 | 74,9 | — | 48,5 | — | 1667 |
| — | 461 | 491 | 74,9 | — | 48,5 | 65 | 1667 |
| 444 | — | 474 | 74,3 | — | 47,2 | — | 1589 |
| — | — | 472 | 74,2 | — | 47,1 | — | 1589 |
| — | 444 | 472 | 74,2 | — | 47,1 | 63 | 1589 |
| 429 | 429 | 455 | 73,4 | — | 45,7 | 61 | 1510 |
| 415 | 415 | 440 | 72,8 | — | 44,5 | 59 | 1461 |
| 401 | 401 | 425 | 72,0 | — | 43,1 | 58 | 1392 |
| 388 | 388 | 410 | 71,4 | — | 41,8 | 56 | 1334 |
| 375 | 375 | 396 | 70,6 | — | 40,4 | 54 | 1265 |
| 363 | 363 | 383 | 70,0 | — | 39,1 | 52 | 1216 |
| 352 | 352 | 372 | 69,3 | (110,0) | 37,9 | 51 | 1177 |
| 341 | 341 | 360 | 68,7 | (109,0) | 36,6 | 50 | 1128 |
| 331 | 331 | 350 | 68,1 | (108,5) | 35,5 | 48 | 1098 |
| 321 | 321 | 339 | 67,5 | (108,0) | 34,3 | 47 | 1059 |
| 311 | 311 | 328 | 66,9 | (107,5) | 33,1 | 46 | 1030 |
| 302 | 302 | 319 | 66,3 | (107,0) | 32,1 | 45 | 1010 |
| 293 | 293 | 309 | 65,7 | (106,0) | 30,9 | 43 | 971 |
| 285 | 285 | 301 | 65,3 | (105,5) | 29,9 | — | 951 |
| 277 | 277 | 292 | 64,6 | (104,5) | 28,8 | 41 | 922 |
| 269 | 269 | 284 | 64,1 | (104,0) | 27,6 | 40 | 892 |
| 262 | 262 | 276 | 63,6 | (103,0) | 26,6 | 39 | 873 |
| 255 | 255 | 269 | 63,0 | (102,0) | 25,4 | 38 | 843 |
| 248 | 248 | 261 | 62,5 | (101,0) | 24,2 | 37 | 824 |
| 241 | 241 | 253 | 61,8 | 100,0 | 22,8 | 36 | 804 |

*NOTA: los valores en ( ) no son comunes*

*(continuación)*

## Referencia cruzada de durezas *(continuación)*

| Brinell | | Vickers | Rockwell | | | Shore | resistencia a la tensión |
|---|---|---|---|---|---|---|---|
| bola de acero | bola de metal duro | | 60 kg | 100 kg | 150 kg | | |
| HB | HB | HV | HRA | HRB | HRC | Sh | N/mm² |
| 235 | 235 | 247 | 61,4 | 99,0 | 21,7 | 35 | 785 |
| 229 | 229 | 241 | 60,8 | 98,2 | 20,5 | 34 | 765 |
| 223 | 223 | 234 | — | 97,3 | (18,8) | — | — |
| 217 | 217 | 228 | — | 96,4 | (17,5) | 33 | 726 |
| 212 | 212 | 222 | — | 95,5 | (16,0) | — | 706 |
| 207 | 207 | 218 | — | 94,6 | (15,2) | 32 | 686 |
| 201 | 201 | 212 | — | 93,8 | (13,8) | 31 | 677 |
| 197 | 197 | 207 | — | 92,8 | (12,7) | 30 | 657 |
| 192 | 192 | 202 | — | 91,9 | (11,5) | 29 | 637 |
| 187 | 187 | 196 | — | 90,7 | (10,0) | — | 618 |
| 183 | 183 | 192 | — | 90,0 | (9,0) | 28 | 618 |
| 179 | 179 | 188 | — | 89,0 | (8,0) | 27 | 598 |
| 174 | 174 | 182 | — | 87,8 | (6,4) | — | 588 |
| 170 | 170 | 178 | — | 86,8 | (5,4) | 26 | 569 |
| 167 | 167 | 175 | — | 86,0 | (4,4) | — | 559 |
| 163 | 163 | 171 | — | 85,0 | 3,3 | 25 | 549 |
| 156 | 156 | 163 | — | 82,9 | (0,9) | — | 520 |
| 149 | 149 | 156 | — | 80,8 | — | 23 | 500 |
| 143 | 143 | 150 | — | 78,7 | — | 22 | 490 |
| 137 | 137 | 143 | — | 76,4 | — | 21 | 461 |
| 131 | 131 | 137 | — | 74 | — | — | 451 |
| 126 | 126 | 132 | — | 72 | — | 20 | 431 |
| 121 | 121 | 127 | — | 69,8 | — | 19 | 412 |
| 116 | 116 | 122 | — | 67,6 | — | 18 | 402 |
| 111 | 111 | 117 | — | 65,7 | — | 15 | 382 |

*NOTA: los valores en ( ) no son comunes*

## Dimensiones y tolerancias

| problema | causa | posible solución |
|---|---|---|
| superficie dureza | Le afecta la configuración y el estado del punto de corte, las condiciones de corte y la rigidez de la configuración del mecanizado. | • Aumentar la velocidad de corte.<br>• Reducir el avance.<br>• Aumentar el radio.<br>• Utilizar cermets al cortar acero, siempre que sea posible.<br>• Evitar vibraciones.<br>• Utilizar fluido de corte. |
| vibración | Las grietas o los daños superficiales debidos a un flujo de virutas poco favorable requieren medidas especiales. | • Variar ligeramente el avance.<br>• Cambiar el ángulo de aproximación.<br>• Seleccionar otra geometría del rompevirutas.<br>• Comprobar la rigidez de la herramienta y el sistema de sujeción. |
| deformación | La precisión dimensional y de la forma se ven afectadas por la condición de la configuración general de la máquina, la pieza y la herramienta. | • Seleccionar la calidad con la resistencia al desgaste adecuada.<br>• Comprobar los parámetros de corte, incluyendo la tolerancia de mecanizado.<br>• Comprobar la rigidez de la herramienta y la sujeción de la pieza.<br>• Mantener las fuerzas de corte bajas.<br>• Evitar un desequilibrio. |
| vibraciones, inestabilidad | Las vibraciones de la pieza de trabajo suelen producirse con piezas de pared fina y configuraciones poco rígidas. El desequilibrio y las fuerzas de corte excesivas también provocan problemas. | • Seleccionar un mayor ángulo de aproximación para la herramienta.<br>• Utilizar geometrías positivas.<br>• Utilizar radios más pequeños.<br>• Cambiar la frecuencia de torneado (rpm).<br>• Reducir la sección de virutas. |
| rebabas | No siempre se pueden evitar las rebabas al cortar piezas de trabajo de acero. Por tanto, deben planearse las operaciones de biselado siempre que sea posible. | • Seleccionar plaquitas con geometría positiva.<br>• Utilizar los filos de corte más afilados (p. ej. cermets).<br>• Reducir el ángulo de aproximación.<br>• Comprobar la secuencia de las operaciones. |

## Ecuaciones

| símbolo | unidad | ecuaciones | comentarios | validez |
|---|---|---|---|---|
| n | 1/min. | $n = (vc \times 1000) / (D \times \pi)$ | | D, F, B1 |
| vc | m/min | $vc = (D \times \pi \times n) / 1000$ | torneado cilíndrico | D, B |
| | | $vc = (d1 \times \pi \times n) / 1000$ | | F |
| tc | min. | $tc = \pi \times (Da^2 - Di^2) / (4 \times f \times vc \times 1000)$ | torneado frontal vc = constante | D |
| | | $tc = (Da - Di) / (f \times n)$ | torneado frontal | D |
| | | $tc = lc / vf$ | | D, F, B |
| | | $tc = lc / (f \times n)$ | torneado cilíndrico | D, B |
| | | $tc = lc / (fZ \times Z \times n)$ | | F |
| vf | mm/min | $vf = f \times n$ | | D, B |
| | | $vf = fZ \times Z \times n$ | | F |
| Q | $cm^3$/min | $Q = ap \times f \times vc$ | | D |
| | | $Q = (ap \times ae \times vf) / 1000 = (ap \times ae \times fZ \times Z \times n) / 1000$ | | F |
| | | $Q = (D \times f \times vc) / 4$ | | B |
| P | kW | $P = X1 \times X2 \times (ap \times f \times vc \times kc) / (6 \times 10^4 \times \eta)$ | | D |
| | | $P = X1 \times X2 \times (ap \times ae \times vf \times kc) / (6 \times 10^7 \times \eta) = X1 \times X2 \times (Q \times kc) / (6 \times 10^4 \times \eta)$ | | F |
| | | $P = X1 \times X2 \times (D \times f \times vc \times kc) / (24 \times 10^4 \times \eta)$ | | B |
| Mc | Nm | $Mc = X1 \times X2 \times (D \times ap \times f \times kc) / 2000$ | | D |
| | | $Mc = X2 \times (D2 \times f \times kc) / 8000$ | | B |
| Fc | N | $Fc = X1 \times X2 \times ap \times f \times kc = X1 \times X2 \times b \times h^{1-mc} \times kc1.1$ | | D |
| | | $Fc = X1 \times X2 \times ap \times fZ \times kc \times ZiE = X1 \times X2 \times b \times hm^{1-mc} \times kc1.1 \times ZiE$ | | F |
| Ff | N | $Ff = X1 \times X2 \times 0{,}35 \times D \times f \times kc = X1 \times X2 \times 0{,}35 \times D \times f^{1-mc} \times kc1.1$ | | B |
| ZiE | | $ZiE = (\phi C \times Z) / 360$ | | F |
| $\phi C$ | calidad | $\gamma C = \phi 1 + \phi 2 = \phi A - \phi E$ | | F |
| $\phi 1$ | calidad | $\sin \phi 1 = (2 \times ae1) / d1$ | | F |
| $\phi 2$ | calidad | $\sin \phi 2 = (2 \times ae2) / d1$ | | F |
| hm | mm | $hm = (\sin \chi e \times fZ \times ae \times 360) / (\pi \times \phi C \times d1)$ | | F |
| | | $hm \approx \sin \chi e \times fZ \times \sqrt{(ae / d1)}$ | si $ae \leq (d1 / 3)$ | F |
| Rth | µm | $Rth \approx (f2 \times 1000) / (8 \times r\varepsilon)$ | | D |

D = Torneado F = Fresado B = Taladrado

## Referencias cruzadas de unidades según sistema métrico y pulgadas

| símbolo | unidad | |
|---|---|---|
| | sistema métrico | pulgadas |
| ae (WOC) | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| ap (DOC) | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| b | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| d, d1 etc | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| f | mm = 25,4 x pulg. | pulg. = (ipr )= 0,0394 x mm |
| Fc, Ff, Fp | N = 4,448 x libras | libras = 0,225 x N |
| fZ | mm = 25,4 x pulg. | pulg. = (ipt) = 0,0394 x mm |
| h, hm | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| kc, kc1.1 etc | $N/mm^2$ = 145 x psi | psi = 0,0069 x $N/mm^2$ |
| KT | µm = 25,4 x µpulg. | µpulg. = 0,0394 x µm |
| l, l1 etc | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| P, Pc, Pe | kW = 0,7457 x hp | hp = 1,341 x kW |
| Ra, Rt, Rz | µm = 25,4 x µpulg. | µpulg. = 0,0394 x µm |
| Rm | $N/mm^2$ = 2865 x psi | psi = 0,000349 x $N/mm^2$ |
| VB | mm = 25,4 x pulg. | pulg. = 0,0394 x mm |
| vc | m/min = 0,305 x SFM | sfm = 3,281 x m/min |
| vf | mm/min = 25,4 x IPM | ipm = 0,0394 x mm/min |

## Tabla de equivalencias decimales

| tamaño | pulgadas decimales | tamaño | pulgadas decimales | tamaño | pulgadas decimales | tamaño | pulgadas decimales | tamaño | pulgadas decimales |
|---|---|---|---|---|---|---|---|---|---|
| 107 | 0.0019 | 57 | 0.0430 | 9/64 | 0.1406 | 6,60 mm | 0.2598 | 7/16 | 0.4375 |
| 106 | 0.0023 | 1,10 mm | 0.0433 | 3,60 mm | 0.1417 | G | 0.2610 | 11,20 mm | 0.4409 |
| 105 | 0.0027 | 1,15 mm | 0.0453 | 27 | 0.1440 | 6,70 mm | 0.2638 | 11,50 mm | 0.4528 |
| 104 | 0.0031 | 56 | 0.0465 | 3,70 mm | 0.1457 | 17/64 | 0.2656 | 29/64 | 0.4531 |
| 103 | 0.0035 | 3/64 | 0.0469 | 26 | 0.1470 | 6,75 mm | 0.2657 | 11,80 mm | 0.4646 |
| 102 | 0.0039 | 1,20 mm | 0.0472 | 3,75 mm | 0.1476 | H | 0.2660 | 15/32 | 0.4688 |
| 101 | 0.0043 | 1,25 mm | 0.0492 | 25 | 0.1495 | 6,80 mm | 0.2677 | 12,00 mm | 0.4724 |
| 100 | 0.0047 | 1,30 mm | 0.0512 | 3,80 mm | 0.1496 | 6,90 mm | 0.2717 | 12,20 mm | 0.4803 |
| 99 | 0.0051 | 55 | 0.0520 | 24 | 0.1520 | I | 0.2720 | 31/64 | 0.4844 |
| 98 | 0.0055 | 1,35 mm | 0.0531 | 3,90 mm | 0.1535 | 7,00 mm | 0.2756 | 12,50 mm | 0.4921 |
| 97 | 0.0059 | 54 | 0.0550 | 23 | 0.1540 | J | 0.2770 | 1/2 | 0.5000 |
| 96 | 0.0063 | 1,40 mm | 0.0551 | 5/32 | 0.1562 | 7,10 mm | 0.2795 | 12,80 mm | 0.5039 |
| 95 | 0.0067 | 1,45 mm | 0.0571 | 22 | 0.1570 | K | 0.2810 | 13,00 mm | 0.5118 |
| 94 | 0.0071 | 1,50 mm | 0.0591 | 4,00 mm | 0.1575 | 9/32 | 0.2812 | 33/64 | 0.5156 |
| 93 | 0.0075 | 53 | 0.0595 | 21 | 0.1590 | 7,20 mm | 0.2835 | 13,20 mm | 0.5197 |
| 92 | 0.0079 | 1,55 mm | 0.0610 | 20 | 0.1610 | 7,25 mm | 0.2854 | 17/32 | 0.5312 |
| 0,20 mm | 0.0079 | 1/16 | 0.0625 | 4,10 mm | 0.1614 | 7,30 mm | 0.2874 | 13,50 mm | 0.5315 |
| 91 | 0.0083 | 1,60 mm | 0.0630 | 4,20 mm | 0.1654 | L | 0.2900 | 13,80 mm | 0.5433 |
| 90 | 0.0087 | 52 | 0.0635 | 19 | 0.1660 | 7,40 mm | 0.2913 | 35/64 | 0.5469 |
| 0,22 mm | 0.0087 | 1,65 mm | 0.0650 | 4,25 mm | 0.1673 | M | 0.2950 | 14,00 mm | 0.5512 |
| 89 | 0.0091 | 1,70 mm | 0.0669 | 4,30 mm | 0.1693 | 7,50 mm | 0.2953 | 14,25 mm | 0.5610 |
| 88 | 0.0095 | 51 | 0.0670 | 18 | 0.1695 | 19/64 | 0.2969 | 9/16 | 0.5625 |
| 0,25 mm | 0.0098 | 1,75 mm | 0.0689 | 11/64 | 0.1719 | 7,60 mm | 0.2992 | 14,50 mm | 0.5709 |
| 87 | 0.0100 | 50 | 0.0700 | 17 | 0.1730 | N | 0.3020 | 37/64 | 0.5781 |
| 86 | 0.0105 | 1,80 mm | 0.0709 | 4,40 mm | 0.1732 | 7,70 mm | 0.3031 | 14,75 mm | 0.5807 |
| 85 | 0.0110 | 1,85 mm | 0.0728 | 16 | 0.1770 | 7,75 mm | 0.3051 | 15,00 mm | 0.5906 |
| 0,28 mm | 0.0110 | 49 | 0.0730 | 4,50 mm | 0.1772 | 7,80 mm | 0.3071 | 19/32 | 0.5938 |
| 84 | 0.0115 | 1,90 mm | 0.0748 | 15 | 0.1800 | 7,90 mm | 0.3110 | 15,25 mm | 0.6004 |
| 0,30 mm | 0.0118 | 48 | 0.0760 | 4,60 mm | 0.1811 | 5/16 | 0.3125 | 39/64 | 0.6094 |
| 83 | 0.0120 | 1,95 mm | 0.0768 | 14 | 0.1820 | 8,00 mm | 0.3150 | 15,50 mm | 0.6102 |
| 82 | 0.0125 | 5/64 | 0.0781 | 13 | 0.1850 | O | 0.3160 | 15,75 mm | 0.6201 |
| 0,32 mm | 0.0126 | 47 | 0.0785 | 4,7 mm | 0.1850 | 8,10 mm | 0.3189 | 5/8 | 0.6250 |
| 81 | 0.0130 | 2,00 mm | 0.0787 | 4,75 mm | 0.1870 | 8,20 mm | 0.3228 | 16,00 mm | 0.6299 |
| 80 | 0.0135 | 2,05 mm | 0.0807 | 3/16 | 0.1875 | P | 0.3230 | 16,25 mm | 0.6398 |
| 0,35 mm | 0.0138 | 46 | 0.0810 | 4,8 mm | 0.1890 | 8,25 mm | 0.3248 | 41/64 | 0.6406 |
| 79 | 0.0145 | 45 | 0.0820 | 12 | 0.1890 | 8,30 mm | 0.3268 | 16,50 mm | 0.6496 |
| 0,38 mm | 0.0150 | 2,10 mm | 0.0827 | 11 | 0.1910 | 21/64 | 0.3281 | 21/32 | 0.6562 |
| 1/64 | 0.0156 | 2,15 mm | 0.0846 | 4,90 mm | 0.1929 | 8,40 mm | 0.3307 | 16,75 mm | 0.6594 |
| 0,40 mm | 0.0157 | 44 | 0.0860 | 10 | 0.1935 | Q | 0.3320 | 17,00 mm | 0.6693 |
| 78 | 0.0160 | 2,20 mm | 0.0866 | 9 | 0.1960 | 8,50 mm | 0.3346 | 43/64 | 0.6719 |
| 0,42 mm | 0.0165 | 2,25 mm | 0.0886 | 5,00 mm | 0.1969 | 8,60 mm | 0.3386 | 17,25 mm | 0.6791 |
| 0,45 mm | 0.0177 | 43 | 0.0890 | 8 | 0.1990 | R | 0.3390 | 11/16 | 0.6875 |
| 77 | 0.0180 | 2,30 mm | 0.0906 | 5,10 mm | 0.2008 | 8,70 mm | 0.3425 | 17,50 mm | 0.6890 |
| 0,48 mm | 0.0189 | 2,35 mm | 0.0925 | 7 | 0.2010 | 11/32 | 0.3438 | 45/64 | 0.7031 |
| 0,50 mm | 0.0197 | 42 | 0.0935 | 13/64 | 0.2031 | 8,75 mm | 0.3445 | 18,00 mm | 0.7087 |
| 76 | 0.0200 | 3/32 | 0.0938 | 6 | 0.2040 | 8,80 mm | 0.3465 | 23/32 | 0.7188 |
| 75 | 0.0210 | 2,40 mm | 0.0945 | 5,20 mm | 0.2047 | S | 0.3480 | 18,50 mm | 0.7283 |
| 0,55 mm | 0.0217 | 41 | 0.0960 | 5 | 0.2055 | 8,90 mm | 0.3504 | 47/64 | 0.7344 |
| 74 | 0.0225 | 2,45 mm | 0.0965 | 5,25 mm | 0.2067 | 9,00 mm | 0.3543 | 19,00 mm | 0.7480 |
| 0,60 mm | 0.0236 | 40 | 0.0980 | 5,30 mm | 0.2087 | T | 0.3580 | 3/4 | 0.7500 |
| 73 | 0.0240 | 2,50 mm | 0.0984 | 4 | 0.2090 | 9,10 mm | 0.3583 | 49/ 64 | 0.7656 |
| 0,62 mm | 0.0244 | 39 | 0.0995 | 5,40 mm | 0.2126 | 23/64 | 0.3594 | 19,50 mm | 0.7677 |
| 72 | 0.0250 | 38 | 0.1015 | 3 | 0.2130 | 9,20 mm | 0.3622 | 25/32 | 0.7812 |
| 0,65 mm | 0.0256 | 2,60 mm | 0.1024 | 5,50 mm | 0.2165 | 9,25 mm | 0.3642 | 20,00 mm | 0.7874 |
| 71 | 0.0260 | 37 | 0.1040 | 7/32 | 0.2188 | 9,30 mm | 0.3661 | 51/64 | 0.7969 |
| 0,70 mm | 0.0276 | 2,70 mm | 0.1063 | 5,60 mm | 0.2205 | U | 0.3680 | 20,50 mm | 0.8071 |
| 70 | 0.0280 | 36 | 0.1065 | 2 | 0.2211 | 9,40 mm | 0.3701 | 13/16 | 0.8125 |
| 69 | 0.0292 | 2,75 mm | 0.1083 | 5,70 mm | 0.2244 | 9,50 mm | 0.3740 | 21,00 mm | 0.8268 |
| 0,75 mm | 0.0295 | 7/64 | 0.1094 | 5,75 mm | 0.2264 | 3/8 | 0.3750 | 53/64 | 0.8281 |
| 68 | 0.0310 | 35 | 0.1100 | 1 | 0.2280 | V | 0.3770 | 27/32 | 0.8438 |
| 1/32 | 0.0312 | 2,80 mm | 0.1102 | 5,80 mm | 0.2283 | 9,60 mm | 0.3780 | 21,50 mm | 0.8465 |
| 0,80 mm | 0.0315 | 34 | 0.1110 | 5,90 mm | 0.2323 | 9,70 mm | 0.3819 | 55/64 | 0.8594 |
| 67 | 0.0320 | 33 | 0.1130 | A | 0.2340 | 9,75 mm | 0.3839 | 22,00 mm | 0.8661 |
| 66 | 0.0330 | 2,90 mm | 0.1142 | 15/64 | 0.2344 | 9,80 mm | 0.3858 | 7/8 | 0.8750 |
| 0,85 mm | 0.0335 | 32 | 0.1160 | 6,00 mm | 0.2362 | W | 0.3860 | 22,50 mm | 0.8858 |
| 65 | 0.0350 | 3,00 mm | 0.1181 | B | 0.2380 | 9,90 mm | 0.3898 | 57/64 | 0.8906 |
| 0,90 mm | 0.0354 | 31 | 0.1200 | 6,10 mm | 0.2402 | 25/64 | 0.3906 | 23,00 mm | 0.9055 |
| 64 | 0.0360 | 3,10 mm | 0.1220 | C | 0.2420 | 10,00 mm | 0.3937 | 29/32 | 0.9062 |
| 63 | 0.0370 | 1/8 | 0.1250 | 6,20 mm | 0.2441 | X | 0.3970 | 59/64 | 0.9219 |
| 0,95 mm | 0.0374 | 3,20 mm | 0.1260 | D | 0.2460 | 10,20 mm | 0.4016 | 23,50 mm | 0.9252 |
| 62 | 0.0380 | 3,25 mm | 0.1280 | 6,25 mm | 0.2461 | Y | 0.4040 | 15/16 | 0.9375 |
| 61 | 0.0390 | 30 | 0.1285 | 6,30 mm | 0.2480 | 13/32 | 0.4062 | 24,00 mm | 0.9449 |
| 1,00 mm | 0.0394 | 3,30 mm | 0.1299 | E | 0.2500 | Z | 0.4130 | 61/64 | 0.9531 |
| 60 | 0.0400 | 3,40 mm | 0.1339 | 1/4 | 0.2500 | 10,50 mm | 0.4134 | 24,50 mm | 0.9646 |
| 59 | 0.0410 | 29 | 0.1360 | 6,40 mm | 0.2520 | 27/64 | 0.4219 | 31/32 | 0.9688 |
| 1,05 mm | 0.0413 | 3,50 mm | 0.1378 | 6,50 mm | 0.2559 | 10,80 mm | 0.4252 | 25,00 mm | 0.9843 |
| 58 | 0.0420 | 28 | 0.1405 | F | 0.2570 | 11,00 mm | 0.4331 | 63/64 | 0.9844 |
| — | — | — | — | — | — | — | — | 1" | 1.0000 |

| número de material | DIN EN - D | AFNOR - F | BS - UK | JIS |
|---|---|---|---|---|
| 0.6010 | GG10 | — | Calidad 100 | FC 100 |
| 0.6015 | GG15 | FGL 150 | Calidad 150 | FC 150 |
| 0.6020 | GG20 | FGL 200 | Calidad 220 | FC 200 |
| 0.6025 | GG25 | FGL 250 | Calidad 250, 260 | FC 250 |
| 0.6030 | GG30 | FGL 300 | Calidad 300 | FC 300 |
| 0.6035 | GG35 | FGL 350 | Calidad 350 | FC 350 |
| 0.6655 | — | L-NUC 15 6 2 | F1 | — |
| 0.6656 | — | L-NUC 15 6 3 | F1 | — |
| 0.6660 | — | L-NC 20 2 | F2 | — |
| 0.6661 | — | L-NC 20 3 | F2 | — |
| 0.6676 | — | L-NC 30 3 | F3 | — |
| 0.7040 | GGG40 | FGS 400-15 | Calidad 420/12 | FCD 400 |
| 0.7043 | GGG40.3 | FGS 370-17 | Calidad 370/12 | FCD 370 |
| 0.7050 | GGG50 | FGS 500-7 | Calidad 500/7 | FCD 500 |
| 0.7060 | GGG60 | FGS 600-3 | Calidad 600/3 | FCD 600 |
| 0.7070 | GGG70 | FGS 700-2 | Calidad 700/2 | FCD 700 |
| 0.7080 | GGG80 | FGS 800-2 | Calidad 800/2 | FCD 800 |
| 0.7652 | — | S-NM 13 7 | S 6 | — |
| 0.7660 | — | S-NC 20 2 | S 2 | — |
| 0.7661 | — | S-NC 20 3 | S 2 | — |
| 0.7670 | — | S-N 22 | S 2 C | — |
| 0.7673 | — | S-NM 23 4 | S 2 M | — |
| 0.7676 | — | S-NC 30 3 | S 3 | — |
| 0.7677 | — | S-NC 30 1 | S 3 | — |
| 0.8035 | GTW35 | MB 35-7 | W 35-04 | FCMW 330 |
| 0.8038 | — | MB 380-12 | — | — |
| 0.8040 | GTW40 | MB 400-5 | W 40-05 | FCMW 370 |
| 0.8045 | GTW45 | MB 450-7 | W 45-07 | FCMWP 440 |
| 0.8135 | GTS35 | MN 350-10 | B 35-12 | FCMB 340 |
| 0.8145 | GTS45 | MP 50-5 | P 45-06 | — |
| 0.8155 | GTS55 | MP 60-3 | P 55-04 | — |
| 0.8165 | GTS65 | — | P 65-02 | FCMP 540 |
| 0.8170 | GTS70 | MP 70-2 | P 70-02 | FCMP 690 |
| 0.9620 | G-X 260 NiCr 4-2 | — | Calidad 2 A | — |
| 0.9625 | G-X 330 NiCr 4-2 | — | Calidad 2 B | — |
| 0.9630 | G-X 300 CrNiSi 9-5-2 | — | Calidad 2 C, D, E | — |
| 0.9635 | G-X 300 CrMo 15-3 | — | Calidad 3 A, B | — |
| 0.9640 | G-X 300 CrMoNi 15-2-1 | — | Calidad 3 A, B | — |
| 0.9645 | G-X 260 CrMoNi 20-2-1 | — | Calidad 3 C | — |
| 0.9650 | G-X 260 Cr 27 | — | Calidad 3 D | — |
| 0.9655 | G-X 300 CrMo 27-1 | — | Calidad 3 E | — |
| 0.xxx | GGV - 30 | — | — | FCV 300 |
| 0.xxx | GGV - 40 | — | — | FCV 400 |
| 1.0301 | C 10 | XC 10 | 045 M 10040 A 10 | S 10 C |
| 1.0401 | C 15 | XC 12, XC 18 | 080 M 15 | S 15 C |
| 1.0402 | C 22 | 1 C 22, XC 18, XC 25 | 1 C 22, 070 M 20 | S 20 C, S 2 C |
| 1.0406 | C 25 | 1 C 25 | 070 M 26 | S 25 C |
| 1.0501 | C 35 | XC 38, 1 C 35 | 080 M 36, 1 C 35 | S 35 C |
| 1.0503 | C 45 | 1 C 45, XC 48 H 1 | 1 C 45, 080 M 46 | S 45 C |
| 1.0511 | C 40 | 1 C 40, XC 42 H 1 | 080 M 40, 1 C 40 | S 40 C |
| 1.0528 | C 30 | — | 1 C 30, XC 32 | S 30 C |
| 1.0535 | C 55 | 1 C 55, XC 55 H 1 | 1 C 55, 070 M 55 | S 55 C |
| 1.0540 | C 50 | 1 C 50 | 1 C 50, 080 M50 | S 50 C |
| 1.0570 | S355J2G3 | E 36-3, E 36-4 | Fe 510 D1 FF, 50/35 | SM 490 _, SM 520 B |
| 1.0601 | C 60 | 1 C 60, AF 70 C 55 | 1 C 60, 080 A 67 | S 58 C |
| 1.0715 | 9 SMn 28 | S 250 | 080 M 15, 230 M 07 | SUM 22 |
| 1.0718 | 9 SMnPb 28 | S 250 Pb | — | SUM 22 L, SUM 23 L |
| 1.0721 | 10 S 20 | 13 MF 4, 10 F 1 | 210 M 15 | — |
| 1.0722 | 10 SPb 20 | CC 10 Pb, 10 PbF 2 | — | SUM 12 |
| 1.0726 | 35 S 20 | 35 MF 6 | 212 M 36 | SUM 41 |
| 1.0727 | 45 S 20 | 45 MF 61, 45 MF 4 | 212 M 36 | SUM 42 |
| 1.0728 | 60 S 20 | — | — | — |
| 1.0736 | 9 SMn 36 | S 300 | 240 M 07 | SUM 25 |
| 1.0737 | 9 SMnPb 36 | S 300 Pb | — | SUM 24 L |
| 1.1121 | Ck 10 (C 10 E) | XC 10 | 045 M 10, 040 A 10 | S 9 CK, S 10 C |
| 1.1141 | Ck 15 (C 15 E) | XC 12, XC 15 | 080 M 15, 040 A 15 | S 15, S 15 Ck |
| 1.1151 | C 22 E | 2 C 22, XC 18/25 | 055 M 15 | S 20 C, S 20 CK, S 22 C |
| 1.1157 | 40 Mn 4 | 35 M 5, 40 M 5 | 150 M 36 | — |
| 1.1158 | C 25 E | 2 C 25, XC 25 | 070 M 26 | S 25 C, S 28 C |

| UNI - I | UNE - E | AISI - US | condición | grupo de materiales |
|---|---|---|---|---|
| G 10 | FG 10 | Clase 20 B | U | 15 |
| G 15 | FG 15 | Clase 25 B | U | 15 |
| G 20 | FG 20 | Clase 30 B | U | 16 |
| G 25 | FG 25 | Clase 40 B | U | 16 |
| G 30 | FG 30 | Clase 45 B | U | 16 |
| G 35 | FG 35 | Clase 50 B | U | 16 |
| — | — | — | GG/AU | 17 |
| — | — | — | GG/AU | 17 |
| — | — | — | GG/AU | 17 |
| — | — | — | GG/AU | 18 |
| — | — | — | GG/AU | 31 |
| GS 400-12 | — | Calidad 60-40-18 | U | 17 |
| — | — | — | U | 17 |
| GS 500-7 | — | Calidad 65-45-12 | U | 17 |
| GS 600-3 | — | Calidad 80-55-06 | U | 18 |
| GS 700-2 | — | Calidad 100-70-03 | U | 18 |
| GS 800-2 | — | Calidad120-90-02 | U | 18 |
| — | — | — | GGG/AU | 17 |
| — | — | — | GGG/AU | 17 |
| — | — | — | GGG/AU | 18 |
| — | — | — | GGG/AU | 17 |
| — | — | — | GGG/AU | 17 |
| — | — | — | GGG/AU | 31 |
| — | — | — | GGG/AU | 31 |
| — | — | — | G | 20 |
| W 38-12 | — | — | G | 19 |
| W 40-05 | — | — | G | 19 |
| W 45-07 | — | — | G | 19 |
| B 35-10 | Tipo A | Calidad 22010, 32510 | G | 19 |
| P 45-06 | Tipo E | — | G | 19 |
| P 55-04 | Tipo C | — | G | 20 |
| P 65-02 | — | — | G | 20 |
| P 70-02 | — | — | G | 20 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 40 |
| — | — | — | GO | 17 |
| — | — | — | GO | 18 |
| C 10 | F. 1511 | 1010 | — | 1 |
| C 15, C 16 | F. 111 | 1015 | — | 1 |
| 1 C 22, C 20, C 21 | 1 C 22, F. 112 | 1020, 1023 | — | 1 |
| C 25, 1 C 25 | — | 1025 | var[1] | 2–3 |
| C 35, 1 C 35 | 1 C 35, F. 113 | 1035 | var[1] | 2–3 |
| C 45, 1 C 45 | 1 C 45, F. 114 | 1045 | var[1] | 2–3 |
| 1 C 40 | 1 C 40, F. 114.A | 1040 | var[1] | 2–3 |
| 1 C 30 | 1 C 30 | 1030 | var[1] | 2–3 |
| C 55, 1 C 55 | 1 C 55 | 1055 | var[1] | 4–5 |
| 1 C 50 | 1 C 50 | 1050 | var[1] | 2–3 |
| Fe 510 C FN | AE 355 D, Fe 510 D1 FF | — | — | 2 |
| C 60, 1 C 60 | 1 C 60 | 1060 | var[1] | 4–5 |
| CF 9 SMn 28, CF 9 M 07 | F. 2111 | 1213 | 1 | — |
| CF 9 SMnPb 28 | F. 2112 | 12 L 14, 12 L 13 | — | 1 |
| CF 10 S 20 | F. 2121 | 1102, 1108, 1109 | — | 1 |
| CF 10 SPb 20 | F. 2122 | 1108, 11 L 08 | — | 1 |
| CF 35 SMn 10 | F. 2131, F. 210.G | 1141, 1140 | var[1] | 2–3 |
| CF 44 SMn 28 | F. 2133 | 1146 | var[1] | 2–3 |
| — | — | 1151 | var[1] | 4–5 |
| CF 9 SMn 36 | F. 2113 | 1215 | — | 1 |
| CF 9 SMnPb 36 | F. 2114 | 12 L 14 | — | 1 |
| C10, 2 C 10 | F. 1510, C 10 k | 1010 | — | 1 |
| C 15, C 16 | F. 1110, F. 1511 | 1015 | — | 1 |
| C 20, C 25 | F. 1120 | 1020, 1023 | — | 1 |
| — | — | 1035, 1041 | var[1] | 2–3 |
| C 25 | F. 1120 | 1025 | var[1] | 2–3 |

| número de material | DIN EN - D | AFNOR - F | BS - UK | JIS |
|---|---|---|---|---|
| 1.1170 | 28 Mn 6 | 28 Mn 6, 35 M 5 | 28 Mn 6, 150 M 19 | SMn 433 |
| 1.1178 | C 30 E | — | 2 C 30, XC 32 | S 30 C |
| 1.1181 | C 35 E | 2 C 35, XC 38 H 1 | 080 M 36 | S 35 C |
| 1.1183 | Cf 35 | XC 42 TS | 080 A 35 | S 35 C |
| 1.1186 | C 40 E | 2 C 40, XC42 H 1 | 2 C 40, 080 M 40 | S 40 C |
| 1.1191 | C 45 E | XC 48 H 1, 2 C 45 | 2 C 45, 080 M 46 | S 45 C |
| 1.1193 | Cf 45 | XC 42 TS | 060 A 47 | S 45 C |
| 1.1203 | C 55 E | 2 C 55, XC 55 H 1 | 2 C 55, 070 M 55 | S 55 C |
| 1.1206 | C 50 E | 2 C 50 | 2 C 50, 080 M 50 | S 50 C |
| 1.1213 | Cf 53 | 42 M 4 TS | 060 A 57 | S 50 C |
| 1.1221 | C 60 E | 2 C 60 | 2 C 60, 060 A 62 | S 58 C |
| 1.2241 | 51 CrV 4 | 50 CV 4 | 735 A 51 | SUP 10 |
| 1.2369 | 81 MoCrV 42-16 | — | — | — |
| 1.3505 | 100 Cr 6 | 100 C 6 | 535 A 99 | SUJ 2 |
| 1.3520 | 100 CrMn 6 | — | 535 A 99 | SUJ 3 |
| 1.3533 | 17 NiCrMo 14 | 16 NCD 13 | — | — |
| 1.3536 | 100 CrMo 7-3 | — | — | — |
| 1.3537 | 100 CrMo 7 | 100 CD 7 | — | SUJ 4 |
| 1.3541 | X 45 Cr 13 | — | — | — |
| 1.3543 | X 102 CrMo 17 | Z 100 CD 17 | — | SUS440 C |
| 1.3551 | 80 MoCrV 42-16 | 80 DCV 40 | — | — |
| 1.3553 | X 82 WMoCrV 6-5-4 | Z 85 WDCV 6 | BM 2 | SKH 51 |
| 1.3558 | X 75 WCrV 18-4-1 | — | BT 1 | SKH 2 |
| 1.4000 | X 6 Cr 13 | Z 6 C 13 | 403 S 17 | SUS 410 S |
| 1.4002 | X 6 CrAl 13 | Z6 CA 13 | 405 S 17 | SUS 405 |
| 1.4005 | X 12 CrS 13 | Z12 CF 13 | 416 S 21 | SUS 416 |
| 1.4006 | X 12 Cr 13 (X 10 Cr 13) | Z 10 C 13, Z 12 C 13 | 410 S 21 | SUS 410 |
| 1.4007 | X 35 Cr 14 | — | — | SUS 420 |
| 1.4016 | X 6 Cr 17 | Z 8 C 17 | 430 S 17 | SUS 430 |
| 1.4021 | X 20 Cr 13 | Z 20 C 13 | 420 S 37 | SUS 420 |
| 1.4024 | X 15 Cr 13 | — | 403 S 17 | — |
| 1.4028 | X 30 Cr 13 | Z 30 C 13, Z 33 C 13 | 420 S 45 | SUS 420 |
| 1.4034 | X 46 Cr 13 | Z 40 C 14 | 420 S 45 | SUS 420 |
| 1.4057 | X 20 CrNi 17-2 | Z 15 CN 16-02 | 431 S 29 | SUS 431 |
| 1.4104 | X 12 CrMoS 17 | Z 10 CF 17 | 441 S 29 | SUS 430 F |
| 1.411 | X 90 CrMoV 1 | — | — | SUS 440 B |
| 1.4113 | X 6 CrMo 17-1 | Z 8 CD 17-01 | 434 S 17 | SUS 434 |
| 1.4125 | X 105 CrMo 17 | Z100 CD 17 | — | SUS 440 C |
| 1.4301 | X 5 CrNi 18-10 (X 4 CrNi 18-10) | Z 6 CN 18-09 | 304 S 16 | SUS 304 |
| 1.4303 | X 5 CrNi 18-12 (X 4 CrNi 18-12) | Z 8 CN 18-12 | 305 S 19 | — |
| 1.4305 | X 10 CrNiS 18-9 | Z 10 CNF 18-09 | 303 S 21 | SUS 303 |
| 1.4306 | X 2 CrNi 19-11 | Z 2 CN 18-10 | 304 S 11 | SUS 304 L |
| 1.4307 | X 2 CrNi 18-9 | Z 3 CN 18-10 | 304S11 | SUS 304 L |
| 1.4310 | X 12 CrNi 17-7 | Z 11 CN 18-08 | 301 S 21 | SUS 301 |
| 1.4311 | X 2 CrNiN 18-10 | Z 3 CN 18-10 Az | 304 S 61 | SUS 304 LN |
| 1.4362 | X 2 CrNiN 23-4 | Z 3 CN 23-04 Az | — | — |
| 1.4372 | X 12 CrMnNiN 17-7-5 | Z 12 CMN 17-07 Az | — | — |
| 1.4401 | X 5 CrNiMo 17-12-2 (X 4 CrNiMo 17-12-2) | Z 6 CND 17-11 | 316 S 31 | SUS 316 |
| 1.4404 | X 2 CrNiMo 17-13-2 (X 2 CrNiMo 17-12-2) | Z 2 CND 17-12 | 316 S 11 | SUS 316 L |
| 1.4406 | X 2 CrNiMoN 17-11-2 (X 2 CrNiMoN 17-11-2) | Z 2 CND 17-11 Az | 316 S 62 | SUS 316 LN |
| 1.4410 | X 2 CrNiMoN 25-7-4 | Z 3 CND 25-06 Az | — | — |
| 1.4418 | X 4 CrNiMo 16-5 | Z 6 CND 16 05 1 | — | — |
| 1.4429 | X 2 CrNiMoN 17-13-3 | Z 2 CND 17-13 Az | — | SUS 316 LN |
| 1.4432 | X 2 CrNiMo 17-12-3 | Z 3 CND 17-12-03 | 316 S 13 | SUS 316 L |
| 1.4434 | X 2 CrNiMoN 17-12-3 | Z 3 CND 19-14 Az | — | SUS 317 LN |
| 1.4435 | X 2 CrNiMo 18-14-3 | Z 2 CND 17-13 | 316 S 13 | SUS 316 L |
| 1.4436 | X 5 CrNiMo 17-13-3 (X 4 CrNiMo 17-13-3) | Z 6 CND 17-12 | 316 S 33 | SUS 316 |
| 1.4438 | X 2 CrNiMo 18-16-4 (X 2 CrNiMo 18-15-4) | Z 2 CND 19-15 | 317 S 12 | SUS 317 L |
| 1.4439 | X 2 CrNiMoN 17-13-5 | Z 3 CND 18-14-05 Az | — | — |
| 1.4441 | X 2 CrNiMo 18-15-3 | Z 3 CND 18-14-13 | 316 S 13 | — |
| 1.4460 | X 4 CrNiMoN 27-5-2 (X 3 CrNiMoN 27-5-2) | 25 CND 27-05 A2 | — | SUS 329 |
| 1.4462 | X 2 CrNiMoN 22-5-3 | Z2 CND 22-05 Az | — | — |
| 1.4466 | X 1 CrNiMoN 25-22-2 (X 2 CrNiMoN 25-22-2) | — | — | — |
| 1.4504 | [X 8 CrNiAl 17-7] | Z 8 CNA 17-07 | 316 S 111 | 17-7 PH |
| 1.4510 | X 6 CrTi 17 (X 3 CrTi 17) | Z 8 CT 17 | — | — |
| 1.4512 | X 6 CrTi 12 (X 2 CrTi 12) | Z 3 CT 12 | 409 S 19 | SUH 409 |
| 1.4532 | X 7 CrNiMoAl 15-7 (X 8 CrNiMoAl 15-7-2) | Z 8 CNDA 15-7 | — | — |
| 1.4540 | X 4 CrNiCuNb 16-4 | Z 6 CNU 17-04 | — | SUS 630 |
| 1.4541 | X 6 CrNiTi 18-10 | Z 6 CNT 18-10 | 321 S 12 | SUS 321 |

| UNI - I | UNE - E | AISI - US | condición | grupo de materiales |
|---|---|---|---|---|
| 28 Mn 6 | 28 Mn 6, 36 Mn 6 | 1330 | var[1] | 2–3 |
| 2 C 30, 080 M 30 | 2 C 30 | — | var[1] | 2–3 |
| 2 C 35, C 35 | 2 C 35, C 35 k | — | var[1] | 2–3 |
| C 36 | C 38 k | 1035 | var[1] | 2–3 |
| 2 C 40, C40 | 2 C 40, C 42 k | 1040 | var[1] | 2–3 |
| 2 C 45, C 45 | 2 C 45, C 45 k | — | var[1] | 2–3 |
| C 43 | C 42 k | 1045 | var[1] | 2–3 |
| 2 C 55, C 55 | 2 C 55, C 55 k | — | var[1] | 4–5 |
| 2 C 50, C 50 | 2 C 50, C 55 k | 1050 | var[1] | 2–3 |
| C 48 | C 48 k | 1050 | var[1] | 2–3 |
| 2 C 60, C 60 | 2 C 60 | — | var[1] | 4–5 |
| 50 CrV 4 | F.1430 | 6150 | var[1] | 6–9 |
| — | — | 613 | var[1] | 10–11 |
| 100 Cr 6 | — | 52100 | var[1] | 6–9 |
| 100 CrMo 7 | — | A 485/2 | var[1] | 6–9 |
| — | — | E-3310 | var[1] | 6–9 |
| — | — | 5120 | var[1] | 6–9 |
| 100 CrMo 7 | — | A 485/3 | var[1] | 6–9 |
| X 45 Cr 13 | — | — | var[1] | 10–11 |
| X 105 CrMo 17 | — | 440 C | var[1] | 10–11 |
| X 80 MoCrV 44 | — | — | var[1] | 10–11 |
| X 82 WMoV 6 5 | — | M2 regular C | var[1] | 10–11 |
| X 75 WCrV 18 | — | T 1 | var[1] | 10–11 |
| X5 Cr 13 | — | 410 S | FE | 12 |
| X 6 CrA 13 | — | 405 | FE | 12 |
| X 12 CrS 13 | — | 416 | FE | 12 |
| X 12 Cr 13 | — | 410 | MA | 12 |
| — | — | 420 | MA | 12 |
| X 8 Cr 17 | — | 430 | FE | 12 |
| X 20 Cr 13 | — | 420 | MA | 12 |
| — | — | 403 | MA | 12 |
| — | — | 420 | MA | 13.1 |
| — | — | 420 | MA | 13.1 |
| X 15 CrNi 16 | — | 431 | MA | 13.1 |
| X 10 CrS 17 | — | 430 F | MA | 13.1 |
| — | — | 440 B | MA | 13.1 |
| X 8 CrMo 17 | — | 434 | MA | 13.1 |
| — | — | 440 C | MA | 13.1 |
| X 5 CrNi 18 10 | — | 304 | AU | 14.1 |
| X 8 CrNi 18 12 | — | 305 | AU | 14.1 |
| X 10 CrNiS 18 09 | — | 303 | AU | 14.1 |
| X 2 CrNi 18 11 | — | 304 L | AU | 14.1 |
| — | — | 304 L | AU | 14.1 |
| X 12 CrNi 17 07 | — | 301 | AU | 14.1 |
| — | — | 304 LN | AU | 14.1 |
| — | — | — | DU | 14.2 |
| — | — | 201 | DU | 14.2 |
| X 5 CrNiMo 17 12 | — | 316 | AU | 14.1 |
| X 2 CrNiMo 17 12 | — | 316 L | AU | 14.1 |
| X 2 CrNiMoN | — | 316 LN | AU | 14.1 |
| — | — | — | DU | 14.2 |
| — | — | — | MA | 13.1 |
| X 2 CrNiMoN 17 13 | — | 316 LN | AU | 14.1 |
| — | — | 316 L | AU | 14.1 |
| — | — | 317 LN | AU | 14.1 |
| X 2 CrNiMo 17 13 | — | 316 L | AU | 14.1 |
| X 5 CrNiMo 17 13 | — | 316 | AU | 14.1 |
| X 2 CrNiMo 18 16 | — | 317 L | AU | 14.1 |
| — | — | — | AU | 14.1 |
| — | — | 316 LVM | AU | 14.1 |
| — | — | 329 | DU | 14.2 |
| — | — | 2205 | DU | 14.2 |
| — | — | 310 mod | S-AU | 14.3 |
| X 2 CrNiMo 17.12 | — | 17-7 PH | AU-PH | 14.4 |
| — | — | 439, 430 Ti | FE | 12 |
| — | — | 409 | FE | 12 |
| — | — | 632 | AU | 14.1 |
| — | — | 630 | AU | 14.1 |
| X 6 CrNiTi 18 11 | — | 321 | AU | 14.1 |

| número de material | DIN EN - D | AFNOR - F | BS - UK | JIS |
|---|---|---|---|---|
| 1.4542 | X 5 CrNiCuNb 17-4 | Z 6 CNU 17-04, Z 7 CNNb 17-07 | — | SUS 630 |
| 1.4548 | X 5 CrNiCuNb 17-4-4 | Z 7 CNNb 17-07 | — | SUS 630 |
| 1.4550 | X 6 CrNiNb 18-10 | Z 6 CNNB 18-10 | 347 S 17 | SUS 347 |
| 1.4552 | GX 5 CrNiNb 19-10 (G-X 5 CrNiNb 18-9) | Z 6 CNNb 18.10 M | 347 C 17 | SCS 21 |
| 1.4567 | X 3 CrNiCu 18-9 (X 3 CrNiCu 18-9-4) | Z 3 CNU 18-09 FF | — | — |
| 1.4568 | X 7 CrNiAl 17-7 | Z 8 CNA 17-7 | 316 S 111 | 17-7 PH |
| 1.4571 | X 6 CrNiMoTi 17-12-2 | Z 6 CNDT 17-12 | 320 S 31 | SUS 316 Ti |
| 1.4573 | X 10 CrNiMoTi 18-12 | Z 6 CNDT 17-13 | 320 S 33 | — |
| 1.4580 | X 6 CrNiMoNb 17-12-2 | Z 6 CNDNb 17-12 | — | — |
| 1.4581 | GX 5 CrNiMoNb 19-11 (G-X 5 CrNiMoNb 18-10) | Z 4 CNDNb 18.12 M | 318 C 17 | SCS 22 |
| 1.4583 | X 10 CrNiMoNb 18-12 | Z 6 CNDNb 17-13 | — | — |
| 1.4713 | X 10 CrAl 7 | Z 8 CA 7 | — | — |
| 1.4718 | X 45 CrSi 9-3 | Z 45 CS 9 | 401 S 45 | SUH 1 |
| 1.4720 | X 7 CrTi 12 | Z 6 CT 12 | — | SUS 409 |
| 1.4724 | X 10 CrAl 13 | Z 10 C 13 | 403 S 17 | SUS 405 |
| 1.4731 | X 40 CrSiMo 10-2 | Z 40 CSD 10 | — | SUH 3 |
| 1.4742 | X 10 CrAl 18 | Z 12 CAS 18, Z 10 CAS 18 | 430 S 17 | SUS 430 |
| 1.4748 | X 85 CrMoV 18-2 | Z 85 CDV 18.02 | — | — |
| 1.4762 | X 10 CrAl 24 | Z10 CAS 24 | — | SCH446 |
| 1.4821 | X 20 CrNiSi 25-4 | Z 20 CNS 25.04 | — | — |
| 1.4828 | X 15 CrNiSi 20-12 Z | 15 CN 23-13, Z 15 CNS 20-12 | 309 S 24 | SUS 309 S |
| 1.4833 | X 7 CrNi 23-14 | Z 15 CN 23.13, Z 15 CN 24.13 | 309 S 16 | SUH 309 |
| 1.4841 | X 15 CrNiSi 25-20 | Z 15 CNS 25-20, Z 12 CNS 25-20 | 310 S 24 | SUS310 |
| 1.4845 | X 12 CrNi 25-21 | Z 12 CN 26.21, Z 12 CN 25.20 | 310 S 31 | SUH 310 |
| 1.4864 | X 12 NiCrSi 36-16 | Z 20 NCS 33.16, Z 12 NCS 35.16 | — | SUH 330 |
| 1.4871 | X 53 CrMnNiN 21-9 | Z 53 CMN 21.09 Az | 349 S 54 | SUH 35 |
| 1.4873 | X 45 CrNiW 18-9 | Z 35 CNWS 14.14 | 331 S 40 | SUH 31 |
| 1.4875 | X 55 CrMnNiN 20-8 | Z 55 CMN 20.08 Az | — | — |
| 1.4876 | X 10 NiCrAlTi 32-20 | Z 8 NC 33.21, Z 8 NC 32.21 | — | — |
| 1.487 | X 12 CrNiTi 18-9 | Z 6 CNT 18.12, Z 6 CNT 18.10 | 321 S 12, 321 S 51 | SUS 321 |
| 1.4948 | X 6 CrNi 18-11 | Z 6 CN 18-09 | 304 S 51 | SUS304 |
| 1.5023 | 38 Si 7 | 46 S 7 | — | — |
| 1.5092 | 60 SiCr 7 | 61 SC 7 | 251 A 61 | SUP 7 |
| 1.5919 | 15 CrNi 6 | 16 NC 6 | 815 M 17 | SNC 15 |
| 1.5920 | 18 CrNi 8 | 20 NC 6 | 822 M17 | SNCM 616 |
| 1.6511 | 36 CrNiMo 4 | 36 CrNiMo 4 | 36 CrNiMo 4, 817 A 37 | SNCM 439 |
| 1.6580 | 30 CrNiMo 8 | 30 CrNiMo 8, 30 CND 8 | 30 CrNiMo 8 | SNCM 630 |
| 1.6582 | 34 CrNiMo 6 | 34 CrNiMo 6 | 34 CrNiMo 6, 817 M 40 | SNCM 447 |
| 1.6587 | 17 CrNiMo 6 | 18 NCD 6 | 820 M 17 | SNCM 815 |
| 1.7003 | 38 Cr 2 | 38 Cr 2 | 38 Cr 2, 120 M 36 | SMn 438 |
| 1.7003 | 46 Cr 2 | 46 Cr 2, 42 C 2 | 46 Cr 2, 605 M 36 | SMn 443 |
| 1.7030 | 28 Cr 4 | 30 CD 4 | 530 A 30 | — |
| 1.7033 | 34 Cr 4 | 34 Cr 4, 32 C 4 | 34 Cr 4, 530 A 32 | SCr 430 |
| 1.7034 | 37 Cr 4 | 37 Cr 4, 38 C 4 | 37 Cr 4, 530 A 36 | SCr 435 |
| 1.7035 | 41 Cr 4 | 41 Cr 4, 42 C 4 | 41 Cr 4, 530 M 40 | 41 Cr 4SCr 440 |
| 1.7037 | 34 CrS 4 | 34 CrS 4, 32 C 4 | 34 CrS 4, 530 A 32 | — |
| 1.7038 | 37 CrS 4 | 37 CrS 4, 38 C 4 | 37 CrS 4, 530 A 36 | — |
| 1.7039 | 41 CrS 4 | 41 CrS 4, 42 C 4 | 41 CrS 4, 530 M 40 | — |
| 1.7102 | 54 SiCr 6 | 51 S 7 | 251 A 58 | SKD12 |
| 1.7131 | 16 MnCr 5 | 16 MC 5 | 527 M 17 | — |
| 1.7147 | 20 MnCr 5 | 20 MC 5 | — | SMnC 420 |
| 1.7176 | 55 Cr 3 | 55 C 3 | 525 A 60 | SUP 9 |
| 1.7213 | 25 CrMoS 4 | 25 CrMoS 4, 25 CD 4 | 25 CrMoS 4, 708 A 25 | — |
| 1.7218 | 25 CrMo 4 | 25 CrMo 4, 25 CD 4 | 25 CrMo 4, 708 A 25 | SCM 430 |
| 1.7220 | 34 CrMo 4 | 34 CrMo 4, 34 CD 4 | 34 CrMo 4, 708 A 37 | SCM 435 |
| 1.7225 | 42 CrMo 4 | 42 CrMo 4, 42 CD 4 | 42 CrMo 4, 708 M 40 | SCM440 |
| 1.7226 | 34 CrMoS 4 | 34 CrMoS 4, 34 CD 4 | 34 CrMoS 4708 A 37 | — |
| 1.7227 | 42 CrMoS 4 | 42 CrMoS 4, 42 CD 4 | 42 CrMoS 4, 708 M 40 | — |
| 1.7228 | 50 CrMo 4 | 50 CrMo 4 | 50 CrMo 4, 708 A 47 | — |
| 1.7321 | 20 MoCr 4 | — | 805 M 20 | SNCM 220 |
| 1.7325 | 25 MoCr 4 | 18 CD 4 | — | — |
| 1.7361 | 32 CrMo 12 | 30 CD 12 | 722 M 24 | — |
| 1.7701 | 51 CrMoV 4 | 51 CDV 4 | — | SUP 13 |
| 1.8159 | 51 CrV 4 | 51 CrV 4, 50 CV 4 | 51 CrV 4 | SUP 10 |
| 1.8507 | 34 CrAlMo 5 | — | — | — |
| 1.8509 | 41 CrAlMo 7 | 40 CAD 6 12 | 905 M 39 | — |
| 1.8515 | 31 CrMo 12 | 30 CD 12 | 722 M 24 | — |
| 1.8523 | 39 CrMoV 13-9 | — | 897 M 39 | — |
| 1.8550 | 34 CrAlNi 7 | — | — | — |

| UNI - I | UNE - E | AISI - US | condición | grupo de materiales |
|---|---|---|---|---|
| — | — | 630 | AU-PH | 14.4 |
| — | — | 630 | AU-PH | 14.4 |
| X 8 CrNiNb 18 11 | — | 347 | AU | 14.1 |
| — | — | — | AU | 14.1 |
| — | — | 302 HQ | AU | 14.1 |
| X 2 CrNiMo 17.12 | — | 17-07 PH | AU-PH | 14.4 |
| X 6 CrNiMoTi 17 12 | — | 316 Ti | AU | 14.1 |
| X 6 CrNiMoTi 17 12 | — | (316 Ti) | AU | 14.1 |
| X 6 CrNiMoNb 17 12 | — | 316 Cb | AU | 14.1 |
| GX 6 CrNiMoNb 20 11 | — | — | AU | 14.1 |
| X 6 CrNiMoNb 17 13 | — | 316 Cb, (318) | AU | 14.1 |
| — | — | — | FE | 10–11 |
| X 45 CS 8 | — | HNV 3 | — | 31–32 |
| — | — | 409 | — | 31–32 |
| X 10 CrAl 12 | X 10 CrAl 13 | 405 | FE | 12 |
| — | — | — | — | 12 |
| X 8 Cr 17 | X 10 CrAl 18 | 430 | — | 12 |
| — | — | — | — | 31–32 |
| X 16 Cr 26 | — | 446 | — | 12 |
| — | X 15 CrNiSi 25 04 | — | DU | 14.2 |
| — | X 10 CrNiSi 20 | 309 | AU | 14.1 |
| X 6 CrNi 23 14 | — | 309 S | AU | 14.1 |
| X 16 CrNiSi 25 20 | X 15 CrNiSi 25 20 | 310 | AU | 14.1 |
| — | — | 310 S | AU | 14.1 |
| — | X 12 NiCrSi 36 16 | 330 | — | 31–32 |
| — | — | EV 8 | — | 10 |
| X 45 CrNiW 18 9 | — | EV 9 | — | 31–32 |
| — | — | EV 11 | — | 31–32 |
| — | X 10 NiCrAlTi 32 20 | — | S-AU | 31–32 |
| X 6 CrNiTi 18 11 | — | 321, 321 H | — | 31–32 |
| — | — | 304H | AU | 14.1 |
| — | — | — | var[1] | 6–9 |
| 60 SiCr 8 | F.1442 | 9260 | var[1] | 6–9 |
| — | F.1581 | 4320 | var[1] | 6–9 |
| 16 NiCrMo 12 | F.1525 | — | var[1] | 6–9 |
| 36 CrNiMo 4, 39 NiCrMo 3 1 | 36 CrNiMo 4, 40 NiCrMo 4 | — | var[1] | 6–9 |
| SNCM 630 | 30 CrNiMo 8, 32 NiCrMo 16 | — | var[1] | 6–9 |
| 34 CrNiMo 6 | 34 CrNiMo 6 | 4340 | var[1] | 6–9 |
| 18 NiCrMo 12 | F.1560 | — | var[1] | 6–9 |
| 38 Cr 2 | 38 Cr 2, 38 Cr 3 | — | var[1] | 6–9 |
| 46 Cr 2 | 46 Cr 2 | — | var[1] | 6–9 |
| — | — | — | var[1] | 6–9 |
| 34 Cr 4 | 34 Cr 4 | 5132 | var[1] | 6–9 |
| 37 Cr 4 | 37 Cr 4, 38 Cr 4 | 5135 | var[1] | 6–9 |
| 41 Cr 4 | 41 Cr 4, 42 Cr 4 | 5140 | var[1] | 6–9 |
| 34 CrS 4 | 34 CrS 4 | — | var[1] | 6–9 |
| 37 CrS 4 | 37 Cr 4, 38 Cr 4-1 | — | var[1] | 6–9 |
| 41 CrS 4 | 41 CrS 4, 42 Cr 4-1 | — | var[1] | 6–9 |
| 48 Si 7 | F.1450 | 9260 | var[1] | 6–9 |
| 16 MnCr 5 | F.1516 | — | var[1] | 6–9 |
| 20 MnCr 5 | F.1523 | — | var[1] | 6–9 |
| 55 Cr 3 | — | 5155 | var[1] | 6–9 |
| 25 CrMoS 4, 25 CrMo 4 | 25 CrMoS 4, 30 CrMo 4-1 | — | var[1] | 6–9 |
| 25 CrMo 4 | 25 CrMo 4, 30 CrMo 4 | 4130 | var[1] | 6–9 |
| 34 CrMo 4, 35 CrMo 4 | 34 CrMo 4, 35 CrMo 4 | 4137 | var[1] | 6–9 |
| 42 CrMo 4 | 42 CrMo 4 | — | var[1] | 6–9 |
| 34 CrMoS 4, 35 CrMo 4 | 34 CrMoS 4, 35 CrMo 4 | — | var[1] | 6–9 |
| 42 CrMoS 4, 42 CrMo 4 | 42 CrMoS 4, 40 CrMo 4-1 | — | var[1] | 6–9 |
| 50 CrMo 4 | 50 CrMo 4 | 4150 | var[1] | 6–9 |
| 16 NiCrMo 2 | F.1523 | 8620 | var[1] | 6–9 |
| 20 NiCrMo 2 | — | 8625 | var[1] | 6–9 |
| — | — | — | var[1] | 6–9 |
| 51 CrMoV 4 | — | — | var[1] | 6–9 |
| 51 CrV 4, 50 CrV 4 | 51 CrV 4 | 6150 | var[1] | 6–9 |
| — | 35 CrAlMo 5 | A 355/D | var[1] | 6–9 |
| 41 CrAlMo 7 | 41 CrAlMo 7 | A 355/A | var[1] | 6–9 |
| 31 CrMo 12 | 31 CrMo 12 | — | var[1] | 6–9 |
| 36 CrMoV 12 | — | — | var[1] | 6–9 |
| — | — | A 355/C | var[1] | 6–9 |

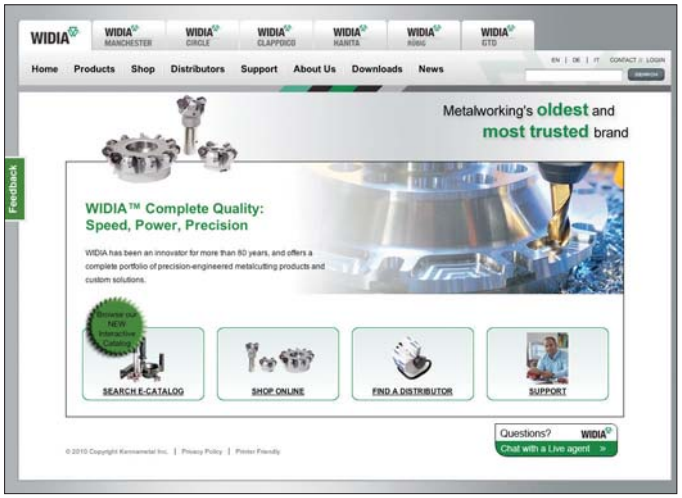
| DIN ISO 513 | VDI 3323 | Material | Condición | Rm N/mm² | Dureza HB 30 | Ejemplos |
|---|---|---|---|---|---|---|
| P | 1 | Acero sin alear/acero fundido C < 0,25% | G | 420 | 125 | 9 SMn 28, St 37.3, C 10, Ck 22, GS-16 Mn 5 |
| | 2 | 0,25 ≤ C < 0,55% | G | 650 | 190 | 35 S 20, GS-45, GS-52, St 52.3, C 25, C 45, Ck 45, Cf 53 |
| | 3 | Acero de corte libre | V | 850 | 250 | 35 S 20, GS-45, GS-52, St 52.3, C 25, C 45, Ck 45, Cf 53 |
| | 4 | 0,55% ≤ C | G | 750 | 220 | GS-60, 60 S 20, C 60, Ck 67, C 60 W, Ck 75, C 105 W 1, C 110 W |
| | 5 | | V | 1000 | 300 | GS-60, 60 S 20, C 60, Ck 67, C 60 W, Ck 75, C 105 W 1, C 110 W |
| | 6 | Acero de baja aleación/acero fundido | G | 600 | 180 | 15 Cr 3, 16 MnCr 5, 17 CrNiMo 6, 25 CrMo 4, 29 CrMoV 9, 30 CrNiMo8 |
| | 7 | | V | 930 | 275 | 31 CrV 3, 42 CrMo 4, 51 CrV 4, 62 SiMnCr 4, 100 Cr 6, G-105 W 1 |
| | 8 | | V | 1000 | 300 | 105 WCr 6 |
| | 9 | | V | 1200 | 350 | 105 WCr 6 |
| | 10 | Acero de alta aleación/acero fundido | G | 680 | 200 | X 210 Cr 12, X 40 CrMoV 5 1, X 30 WCrV 9 3, X 85 CrMoV 18 2 |
| | 11 | Acero para herramientas | V | 1100 | 325 | X 38 CrMoV 5 3, X 23 CrNi 17, X 155 CrVMo 12 1, S 6-5-2-5 |
| | 12 | Acero inoxidable/acero fundido | FE/MA | 680 | 200 | 1.4000, 1.4005, 1.4021, 1.4109, 1.4119, 1.4120, 1.4313, 1.4510, 1.4512, 1.4523 |
| | 13.1 | | MA | 820 | 240 | 1.4000, 1.4002, 1.4005, 1.4006, 1.4024, 1.4119, 1.4120, 1.4313, 1.4510, 1.4512, 1.4523 |
| | 13.2 | | MA-PH | 1060 | 330 | 1.4542, 1.4548, 1.4923 |
| M | 14.1 | Acero inoxidable/acero fundido | AU | 600 | 180 | 1.4301, 1.4401, 1.4436, 1.4541, 1.4550, 1.4568, 1.4571, 1.4573, 1.4580 |
| | 14.2 | | DU | 740 | 230 | 1.4362, 1.4417, 1.4410, 1.4460, 1.4462, 1.4575, 1.4582 |
| | 14.3 | | S-AU | 680 | 200 | 1.4465, 1.4505, 1.4506, 1.4529 (254SMO), 1.4539, 1.4563, 1.4577, 1.4586, 654SMO |
| | 14.4 | | AU-PH | 1060 | 330 | 1.4504, 1.4568 |
| K | 15 | Fundición gris GG | FE/PE | | 180 | GG-10, GG-15, GG-170 HB |
| | 16 | | PE | | 260 | GG20, GG-25, GG-30, GG-25Cr |
| | 17 | Fundición nodular GGG | FE | | 160 | GGG-35.3, GGG-40, GGG-50, GGV-30 |
| | 18 | | PE | | 250 | ≥GGG-60, GGV-40 |
| | 19 | Fundición maleable GTS/GTW | FE | | 130 | GTS-35-10, GTS-45-06, GTW-S-38-12 |
| | 20 | | PE | | 230 | GTW-35-04, GTS-55-04, GTS-65-02 |
| N | 21 | Aleaciones de aluminio forjado | NAG | | 60 | Al 99,5, AlMg 1 |
| | 22 | | AG | | 100 | AlCuMg 1, AlMgSiPb, AlMgSi 1 |
| | 23 | Aleaciones de aluminio fundido Si < 12% | NAG | | 75 | G-AlSi 10 Mg, G-AlSi12 |
| | 24 | | AG | | 90 | G-AlCu 5 Si 3 |
| | 25 | Si > 12% | | | 130 | G-AlSi 17, G-AlSi 23 |
| | 26 | Cobre/aleaciones de cobre Pb > 1% | | | 110 | Latón, CuNi 18 Zn 19 Pb |
| | 27 | | | | 90 | Latón, latón rojo, aleaciones de CuZn33, CuZn-/CuSnZn |
| | 28 | | | | 100 | Broce, cobre electrolítico, aleaciones de CuNi 3 Si, CuSn |
| | 29 | Materiales no metálicos | | | | Plásticos termoendurecibles, FVK, materiales plásticos reforzados con fibra, baquelita |
| | 30 | | | | | Goma dura |
| S | 31 | Aleaciones de alta temperatura Basadas en Fe | G | | 200 | 1.4864, 1.4865, 1.4876 |
| | 32 | | AG | | 280 | 1.4864, 1.4865, 1.4876 |
| | 33 | Basadas en Ni/Co | G | | 250 | INCONEL® 718, Nimonic 80 A, Hasteloy, Udimet |
| | 34 | | AG | | 350 | INCONEL 718, Nimonic 80 A, Hasteloy, Udimet |
| | 35 | | GO | | 320 | INCONEL 718, Nimonic 80 A, Hasteloy, Udimet |
| | 36 | Titanio/aleaciones de titanio, aleaciones alfa/beta | | 400 | | Titanio |
| | 37 | | AG | 1050 | | TiAl 6 V 4 |
| H | 38.1 | Acero | H | | 45 HRC | 90 MnV 8, Hardox 400 |
| | 38.2 | | H | | 55 HRC | Hardox 500 |
| | 39.1 | | H | | 60 HRC | HSS, 90 MnV 8 |
| | 39.2 | | H | | > 62 HRC | HSS, 90 MnV 8 |
| | 40.1 | Fundición templada | GO | | 400 | G-X 260 Cr 27, G-X 260 NiCr 42, G-X 300 CrNiSi 9 5 2, G-X 330 NiCr 42 |
| | 40.2 | | GO | | > 440 | G-X 260 Cr 27, G-X 260 NiCr 42, G-X 300 CrNiSi 9 5 2, G-X 330 NiCr 42 |
| | 41.1 | Fundición | H | | 55 HRC | G-X 300 NiMo 3 Mg |
| | 41.2 | | H | | > 57 HRC | G-X 300 NiMo 3 Mg |

## Condición y grupos de materiales

Muchos materiales (en su mayoría aceros) pueden estar disponibles en varias microestructuras que difieren en su maquinabilidad significativamente.
Dichos materiales forman parte de varios grupos de materiales según su condición real.

AG — Endurecido
AU — Austenítico, AISI 300
BF — Tratado al calor con una fuerza específica
BG — Tratado al calor con una microestructura específica
BY — Tratado al calor con una maquinabilidad mejorada
DU — Acero inoxidable Duplex (austenítico-ferrítico)
FE — Ferrítico
G — Recocido
GG — Fundición gris
GGG — Fundición nodular
GO — Fundición
H — Endurecido
MA — Martensítico
N — Normalizado
NAG — No endurecido (sin endurecer)
PH — Endurecido por precipitación
S-AU — Superaustenítico
U — Sin tratar
V — Tratado al calor
var[1] — Variable

# En la web




## *Registro rápido, gratuito y sencillo*

Puede registrarse fácilmente en www.widia.com y obtener acceso completo a las funciones del sitio.

## *Póngase en contacto con el distribuidor local autorizado de WIDIA™ en su zona*

El grupo de productos WIDIA ofrece productos y servicios de primera calidad en todo el mundo. Los distribuidores con los que trabajamos nos conocen y, lo que es más importante, le conocen a usted. Saben mejor que nadie en la industria cómo aprovechar el potencial de WIDIA y ponerlo al servicio de sus clientes y de cada sector, región y negocio específicos.

## *Contacto*

Nuestros clientes son una prioridad. Queremos ofrecerle el mejor servicio de atención al cliente del sector. Si tiene algún comentario o pregunta que desee hacernos llegar, no dude en ponerse en contacto con nosotros. Intentaremos responder a todas las solicitudes en un plazo máximo de 24 horas.

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Tanto si su operación es de torneado como fresado o taladrado, las marcas WIDIA son las herramientas de alto rendimiento que necesita. Ofrecemos soluciones estándar y a medida para el mercado de ingeniería general.

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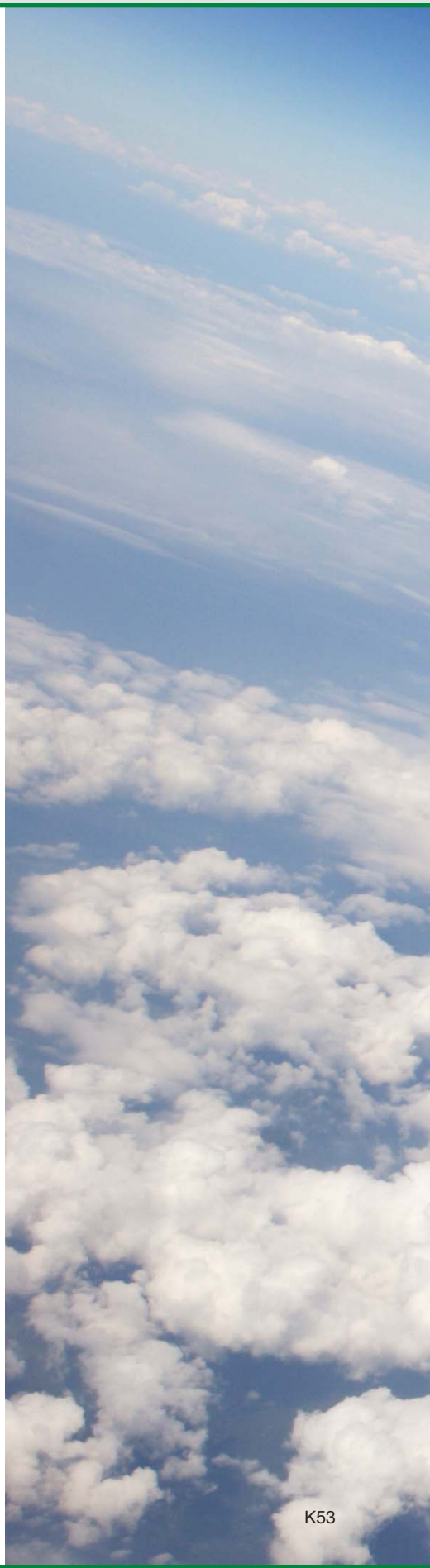

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# Seguridad para el corte del metal

## INSTRUCCIONES DE SEGURIDAD IMPORTANTES

### ¡Léalas antes de utilizar las herramientas de este catálogo!

### Peligros de partículas expulsadas y fragmentación

Las operaciones modernas de corte de metal implican elevadas velocidades de corte y husillo temperaturas y fuerzas de corte altas. Durante las operaciones de corte de metal, es posible que se desprendan virutas metálicas calientes de la pieza de trabajo. Aunque las herramientas de corte se han diseñado y fabricado para aguantar altas fuerzas y temperaturas de corte, en ocasiones se pueden fragmentar, especialmente si están sometidas a una tensión excesiva, golpes fuertes o cualquier otro abuso.

**Para evitar daños personales:**

- Use siempre un equipo de protección individual (EPI) adecuado, incluidas gafas de seguridad, cuando utilice máquinas de corte de metal o trabaje cerca de ellas.
- Asegúrese siempre de que estén instaladas todas las protecciones de la máquina.

### Peligro de inhalación y de contacto con la piel:

El rectificado del metal duro u otros materiales de las herramientas de corte avanzados producen polvo o neblinas que contienen partículas metálicas. Si se respira este polvo o neblina, especialmente durante un período prolongado, pueden desarrollarse enfermedades pulmonares permanentes o temporales o empeorar las condiciones de salud existentes. El contacto con este polvo o neblina puede irritar los ojos, la piel y las membranas mucosas y puede hacer que las enfermedades de la piel empeoren.

**Para evitar daños personales:**

- Utilice siempre mascarillas de protección para la respiración y gafas de seguridad durante el rectificado.
- Controle la ventilación y recoja y elimine adecuadamente el polvo, neblina o sedimentos derivados del rectificado.
- Evite el contacto de la piel con el polvo o la neblina.

Para obtener más información, lea la Hoja de Datos de Seguridad de Materiales, suministrada por Kennametal y consulte la Normativa de salud e higiene general del sector, parte 1910, título 29 del Código de normativa federal.

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