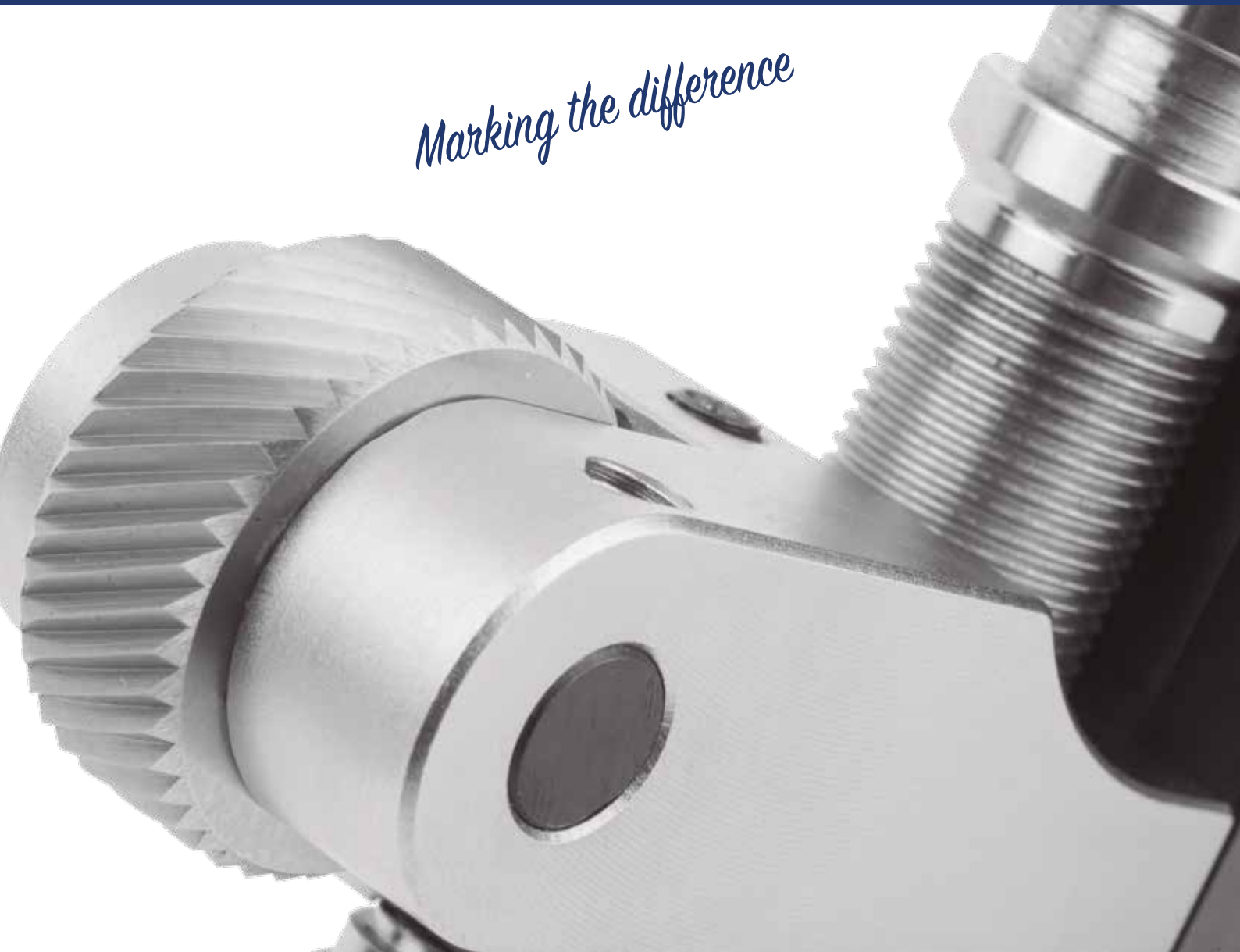




TECNOLOGÍA DE MOLETEADO Y BROCHADO ROTATORIO
KNURLING & ROTARY BROACHING TECHNOLOGY

Marking the difference



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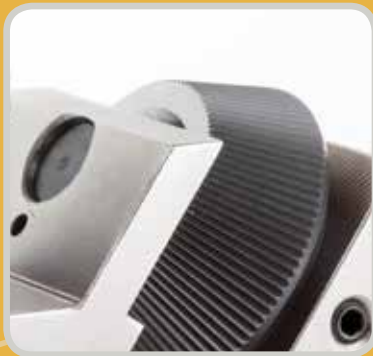


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MOLETEADO KNURLING





1. Moleteado por deformación

Con este tipo de moleteado las estrías se generan por deformación del material, al ejercer las moletas presión sobre la pieza mientras gira. Este método no implica arranque de material por lo que no hay generación de virutas. Debido a la deformación del material se produce un incremento del diámetro de la pieza. El valor del incremento es variable, ya que depende del material de la pieza mecanizada y de la forma y paso de las estrías generadas (ver tabla página 8).

1. El moleteado por deformación es imperativo cuando se usa la técnica del moleteado radial (polgeé).
2. Cuando el perfil a mecanizar es de forma RGV, RKE, RKV.
3. Cuando es necesario que el diámetro final de la pieza sea mayor que el diámetro de partida (figura 1).
4. Cuando hay que realizar un moleteado en el fondo de una garganta (figura 2).
5. Para realizar moleteados hasta una cara (figura 3).
6. Para moletear en conos o caras frontales (figuras 4 y 5).

2. Moleteado por corte

En el moleteado por corte las estrías se generan por arranque de material. Este tipo de moleteado no genera sobreesfuerzos sobre la máquina y en muchos casos se obtiene un moleteado de mayor calidad y precisión.

Las herramientas utilizadas para esta técnica de moleteado llevan las moletas con un ángulo de inclinación de 30° respecto al eje de giro de la pieza. Esta inclinación hace que la moleta vaya cortando las estrías según gira y avanza a lo largo de la generatriz de la pieza.

El moleteado por corte no genera incremento del diámetro de la pieza mecanizada, ya que en teoría no hay deformación del material. Aunque cabe resaltar que la realidad es que siempre hay un leve desplazamiento del material, que si bien no es de la misma magnitud que el que se generaría por el moleteado por deformación, hay que tenerlo en cuenta cuando la pieza a realizar requiere de cierta precisión en el diámetro final.

Este sistema de moleteado no es aplicable en todos los casos. Solo los perfiles RAA, RBL, RBR y RGE se pueden ejecutar con las herramientas de moletear por corte.

1. El moleteado por corte posibilita la ejecución de piezas tubulares de paredes finas, imposibles de realizar mediante moleteado por deformación.
2. Cuando el material a moletear no es deformable como plásticos, nylon, hierro fundido.

1. Form knurling

In form knurling the teeth are generated by deformation of the material, because the knurls exert pressure on the piece while it turns. This method is made without removing material so no chips are produced. Due to deformation of the material the diameter of the piece is increased. The value of this increase is variable as it depends on the material of the piece machined and the form and pitch of the teeth generated (see table page 8).

1. Form knurling is imperative when a radial knurling technique (polgeé) is used.
2. When the profile to machine is RGV, RKE, RKV.
3. When the final diameter of the piece needs to be bigger than the starting diameter (figure 1).
4. When you have to make a knurling in the bottom of a throat (figure 2).
5. To make knurling till a face (figure 3).
6. To knurling in cones or front faces (figures 4 and 5).

2. Cut-knurling

In cut-knurling the teeth are generated by removing material. This type of knurling does not generate overstrain on the machine and in many cases a higher quality and more accurate knurling is obtained.

The tools used for this knurling technique fit knurls with a 30° angle in relation to the rotation axis of the piece. Due to this inclination the knurls cut the teeth while they are turning along the piece.

The cut-knurling system does not generate an increase in the diameter of the machined piece as in theory the material is not deformed. Although it must be stated that there is always a slight displacement of the material that even though it is not of the same magnitude as that generated by form knurling, it must be taken into account when the piece to be made requires a certain precision in the final diameter.

This knurling system is not applicable in all cases. Only RAA, RBL, RBR and RGE profiles can be run with cut-knurling tools.

1. Cut-knurling makes it possible to execute thin walled tubular pieces, whereas with form knurling it is impossible.
2. When the material to be knurled is not deformable as plastics, nylon, cast iron.



Básicamente existen dos técnicas de moleteado.

There are basically two knurling techniques.

1. MOLETEADO CON AVANCE RADIAL (Tipo R)

1. RADIAL FEED KNURLING (R type)

El moleteado radial es aquel en el que la longitud del moleteado en la pieza coincide con el espesor de la moleta a utilizar, por lo tanto la herramienta de moletear solo hay que desplazarla radialmente (avance normalmente representado con la letra R).

Radial knurling is one in which the length of the knurling in the piece coincides with the thickness of the knurl, therefore the knurling tool is to be moved radially (feed usually represented with the letter R).

En esta técnica de moleteado no es necesario que la moleta vaya biselada, si bien siempre es mejor utilizar moletas biseladas para evitar una rotura prematura de las esquinas de los dientes. Los biseles confieren robustez a los cantos de las moletas.



In this knurling technique it is not necessary to use beveled knurls, although it is always better so as to avoid premature breakage of the teeth angles. The bevels give strength to the edges of the knurls.

This knurling technique is only applicable to form knurling. It is never applicable to cut-knurling.

Esa técnica de moleteado solo es utilizable con herramientas de moletear por deformación. Nunca con herramientas de moletear por corte.

This knurling technique is only applicable in form knurling. Never in cut-knurling.

2. MOLETEADO CON AVANCE AXIAL (Tipo F)

2. AXIAL FEED KNURLING (F type)

El moleteado axial es aquel en el que la longitud del moleteado en la pieza es mayor que el espesor de la moleta a utilizar, por lo tanto la herramienta de moletear hay que desplazarla axialmente (avance normalmente representado con la letra F) hasta alcanzar la longitud de moleteado total requerida.

In axial knurling the length of knurling piece is longer than the thickness of the knurl, therefore the knurling tool has to move axially (feed usually represented with the letter F).

Esta técnica de moleteado es utilizable tanto para las herramientas de moletear por deformación como las que trabajan por corte. En el caso de las herramientas de moletear por deformación, las moletas han de llevar biseles imperativamente. En el caso de las herramientas de moletear por corte las moletas no tienen que estar biseladas.

This knurling technique is applicable to both form knurling tools and cut-knurling tools. In form knurling tools, the knurls must be beveled. In cut-knurling tools, the knurls must be unbeveled.





ELECCIÓN DE LA HERRAMIENTA DE MOLETEADO CHOOSING THE MOST SUITABLE KNURLING TOOL



En muchos casos un mismo tipo de moleteado se puede realizar con diferentes tipos de herramientas. De presión ó de corte, de una o varias moletas.

In many cases the same type of knurling can be made using different types of tools. Pressure knurling tools or cut-knurling tools of one knurl or more.

En el siguiente cuadro detallamos para cada tipo de moleteado, con qué herramienta se puede realizar y de qué manera.

The following table shows which kind of tool can be used for each type of knurling.

+ Moleteados mecanizables con herramientas de deformación Allowed knurling for form knurling tools

| Tipo de moleteado Type of knurling | Herramienta Tool | Moleta Knurl | Avance radial Radial feed (R) | Avance axial Axial feed (F) |
|---------------------------------------|---------------------------------|-----------------|----------------------------------|--------------------------------|
| RAA | De una moleta One knurl | AA | SI / YES | SI / YES |
| | De dos moletas Two knurls | AA + AA | SI / YES | SI / YES |
| | De tres moletas Three knurls | AA + AA + AA | NO / NO | SI / YES |
| RBR | De una moleta One knurl | BR | SI / YES | SI / YES |
| | De dos moletas Two knurls | BR + BR | SI / YES | SI / YES |
| | De tres moletas Three knurls | BR + BR + BR | NO / NO | SI / YES |
| RBL | De una moleta One knurl | BL | SI / YES | SI / YES |
| | De dos moletas Two knurls | BL + BL | SI / YES | SI / YES |
| | De tres moletas Three knurls | BL + BL + BL | NO / NO | SI / YES |
| RGE | De una moleta One knurl | GV | SI / YES | NO / NO |
| | De dos moletas Two knurls | BL + BR | SI / YES | SI / YES |
| | De tres moletas Three knurls | BL + BR + BR | NO / NO | SI / YES |
| RGV | De una moleta One knurl | GE | SI / YES | NO / NO |
| | De dos moletas Two knurls | - | - | - |
| | De tres moletas Three knurls | - | - | - |
| RKE | De una moleta One knurl | KV | SI / YES | NO / NO |
| | De dos moletas Two knurls | - | - | - |
| | De tres moletas Three knurls | - | - | - |
| RKV | De una moleta One knurl | KE | SI / YES | NO / NO |
| | De dos moletas Two knurls | - | - | - |
| | De tres moletas Three knurls | - | - | - |



ELECCIÓN DE LA HERRAMIENTA DE MOLETEADO

CHOOSING THE MOST SUITABLE KNURLING TOOL



Moleteados mecanizables con herramientas de corte

Allowed knurling for cut-knurling tools

| Tipo de moleteado Type of knurling | Herramienta Tool | Versión Version | Moleta Knurl | Avance radial Radial feed (R) | Avance axial Axial feed (F) |
|---------------------------------------|---------------------------------|--------------------|--------------------------|----------------------------------|--------------------------------|
| RAA | De una moleta One knurl | Derecha Righth | BR 30° | NO / NO | SI / YES |
| | | Izquierda Left | BL 30° | NO / NO | SI / YES |
| RBR 30° | De una moleta One knurl | Derecha Righth | AA | NO / NO | SI / YES |
| RBL 30° | De una moleta One knurl | Izquierda Left | AA | NO / NO | SI / YES |
| RGE 30° | De dos moletas Two knurls | - | AA + AA | NO / NO | SI / YES |
| | De tres moletas Three knurls | - | AA + AA + AA | NO / NO | SI / YES |
| RGE 45° | De dos moletas Two knurls | - | BL 15° + BR 15° | NO / NO | SI / YES |
| | De tres moletas Three knurls | - | BL 15° + BR 15° + BR 15° | NO / NO | SI / YES |



Posibles problemas al moletear

Possible problems and how to solve them

| Problema Problem | Causa Cause | Solución Solution |
|--|--|---|
| Moleteado doble Double knurling | Escaso avance radial al comenzar el moleteado en la esquina de la pieza Low radial feed at the beginning of the knurling at the edge of the workpiece | Aumentar el avance radial al comienzo del moleteado Increase the radial feed at the beginning of knurling |
| | El perímetro de la pieza no es un múltiplo entero del paso The perimeter of the workpiece is not a whole multiple of the pitch | Tornear las piezas a un diámetro que proporcione un perímetro múltiplo entero del paso Modify the workpieces diameter. Perimeter has to be a whole multiple of pitch |
| Fácil rotura de las moletas Easy breaking of the knurls | Excesiva profundidad de moleteado Excessive knurling depth | Reducir la profundidad a valores admisibles para el paso utilizado Reduce the knurling depth to values according to the pitch used |
| Excesivo desgaste de las moletas Excessive wear of the knurls | Excesiva profundidad de moleteado Excessive knurling depth | Ajustar la profundidad de moleteado a los valores correctos Adjust the depth of the knurling to a correct values |
| | Las condiciones de trabajo no son las adecuadas Unappropriate work conditions | Revisar la velocidad de corte y el avance axial Check the cutting speed and axial feed |



MOLETEADO POR DEFORMACIÓN · VELOCIDADES DE CORTE Y AVANCES

FORM KNURLING · FEED AND SPEED



| Material Material | Ø Pieza Ø Piece | Ø Moleta Ø Knurl | VC (m/min) VC (m/min) | Avance radial (mm/rev) Radial feed (mm/rev) (R) | Avance axial (mm/rev) Axial feed (mm/rev) (F) | | | |
|--|--------------------|---------------------|--------------------------|---|--|-----------|-----------|-----------|
| | | | | | Paso (mm) Pitch (mm) | | | |
| | | | | | 0.3 + 0.6 | 0.6 + 1.2 | 1.2 + 1.6 | 1.6 + 2.0 |
| Acero 600 N/mm ² 600 N/mm ² steel | <10 mm | 10 / 15 mm | 20 ÷ 50 | 0.05 ÷ 0.10 | 0.15 | 0.10 | 0.08 | 0.07 |
| | 10 - 50 mm | 15 / 20 mm | 25 ÷ 55 | | 0.20 | 0.15 | 0.13 | 0.10 |
| | | 25 mm | 30 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.13 |
| | 50 - 100 mm | 20 / 25 mm | 30 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.13 |
| | 100 - 200 mm | 20 / 25 mm | 30 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.13 |
| 200 - 300 mm | 25 mm | 30 ÷ 60 | 0.25 | 0.20 | 0.15 | 0.13 | | |
| Acero 900 N/mm ² 900 N/mm ² steel | <10 mm | 10 / 15 mm | 15 ÷ 40 | 0.04 ÷ 0.08 | 0.12 | 0.08 | 0.05 | 0.04 |
| | 10 - 50 mm | 15 / 20 mm | 20 ÷ 45 | | 0.15 | 0.10 | 0.08 | 0.06 |
| | | 25 mm | 25 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 50 - 100 mm | 20 / 25 mm | 25 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 100 - 200 mm | 20 / 25 mm | 25 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.08 |
| 200 - 300 mm | 25 mm | 25 ÷ 50 | 0.20 | 0.15 | 0.10 | 0.08 | | |
| Acero inoxidable Stainless steel | <10 mm | 10 / 15 mm | 15 ÷ 40 | 0.04 ÷ 0.08 | 0.12 | 0.08 | 0.05 | 0.04 |
| | 10 - 50 mm | 15 / 20 mm | 20 ÷ 45 | | 0.15 | 0.10 | 0.08 | 0.06 |
| | | 25 mm | 25 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 50 - 100 mm | 20 / 25 mm | 25 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 100 - 200 mm | 20 / 25 mm | 25 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.08 |
| 200 - 300 mm | 25 mm | 25 ÷ 50 | 0.20 | 0.15 | 0.10 | 0.08 | | |
| Acero fundido Cast steel | <10 mm | 10 / 15 mm | 20 ÷ 40 | 0.05 ÷ 0.10 | 0.15 | 0.10 | 0.08 | 0.07 |
| | 10 - 50 mm | 15 / 20 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.13 | 0.10 |
| | | 25 mm | 30 ÷ 50 | | 0.25 | 0.20 | 0.15 | 0.13 |
| | 50 - 100 mm | 20 / 25 mm | 30 ÷ 50 | | 0.25 | 0.20 | 0.15 | 0.13 |
| | 100 - 200 mm | 20 / 25 mm | 30 ÷ 50 | | 0.25 | 0.20 | 0.15 | 0.13 |
| 200 - 300 mm | 25 mm | 30 ÷ 50 | 0.25 | 0.20 | 0.15 | 0.13 | | |
| Aluminio Aluminium | <10 mm | 10 / 15 mm | 25 ÷ 45 | 0.05 ÷ 0.10 | 0.12 | 0.08 | 0.05 | 0.04 |
| | 10 - 50 mm | 15 / 20 mm | 30 ÷ 50 | | 0.20 | 0.15 | 0.10 | 0.06 |
| | | 25 mm | 35 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.13 |
| | 50 - 100 mm | 20 / 25 mm | 35 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.13 |
| | 100 - 200 mm | 20 / 25 mm | 35 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.13 |
| 200 - 300 mm | 25 mm | 35 ÷ 60 | 0.25 | 0.20 | 0.15 | 0.13 | | |
| Latón Brass | <10 mm | 10 / 15 mm | 30 ÷ 50 | 0.05 ÷ 0.10 | 0.20 | 0.15 | 0.12 | 0.13 |
| | 10 - 50 mm | 15 / 20 mm | 35 ÷ 55 | | 0.25 | 0.20 | 0.18 | 0.15 |
| | | 25 mm | 40 ÷ 65 | | 0.30 | 0.25 | 0.20 | 0.18 |
| | 50 - 100 mm | 20 / 25 mm | 40 ÷ 65 | | 0.30 | 0.25 | 0.20 | 0.18 |
| | 100 - 200 mm | 20 / 25 mm | 40 ÷ 65 | | 0.30 | 0.25 | 0.20 | 0.18 |
| 200 - 300 mm | 25 mm | 40 ÷ 65 | 0.30 | 0.25 | 0.20 | 0.18 | | |

Valores recomendados / Recommended values



MOLETEADO POR CORTE · VELOCIDADES DE CORTE Y AVANCES CUT-KNURLING · FEED AND SPEED



| Material Material | Ø Pieza Ø Piece | Ø Moleta Ø Knurl | VC (m/min) VC (m/min) | Avance radial (mm/rev) Radial feed (mm/rev) (R) | Avance axial (mm/rev) Axial feed (mm/rev) (F) | | | |
|--|--------------------|---------------------|--------------------------|---|--|-----------|-----------|-----------|
| | | | | | Paso (mm) Pitch (mm) | | | |
| | | | | | 0.3 + 0.6 | 0.6 + 1.2 | 1.2 + 1.6 | 1.6 + 2.0 |
| Acero 600 N/mm ² 600 N/mm ² steel | <10 mm | 8.9 mm | 30 ÷ 50 | 0.05 ÷ 0.10 | 0.15 | 0.10 | 0.08 | 0.05 |
| | 10 - 50 mm | 14.5 / 21.5 mm | 35 ÷ 55 | | 0.20 | 0.15 | 0.13 | 0.10 |
| | | 21.5 mm | 40 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 50 - 100 mm | 21.5 mm | 40 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 100 - 200 mm | 21.5 mm | 40 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.12 |
| 200 - 300 mm | 35 / 42 mm | 60 ÷ 80 | 0.30 | 0.25 | 0.20 | 0.15 | | |
| Acero 900 N/mm ² 900 N/mm ² steel | <10 mm | 8.9 mm | 15 ÷ 30 | 0.04 ÷ 0.08 | 0.12 | 0.08 | 0.05 | 0.04 |
| | 10 - 50 mm | 14.5 / 21.5 mm | 20 ÷ 40 | | 0.15 | 0.10 | 0.08 | 0.06 |
| | | 21.5 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 50 - 100 mm | 21.5 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 100 - 200 mm | 21.5 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.10 | 0.08 |
| 200 - 300 mm | 35 / 42 mm | 35 ÷ 55 | 0.20 | 0.15 | 0.10 | 0.08 | | |
| Acero inoxidable Stainless steel | <10 mm | 8.9 mm | 15 ÷ 30 | 0.04 ÷ 0.08 | 0.12 | 0.08 | 0.05 | 0.04 |
| | 10 - 50 mm | 14.5 / 21.5 mm | 20 ÷ 40 | | 0.15 | 0.10 | 0.08 | 0.06 |
| | | 21.5 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 50 - 100 mm | 21.5 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.10 | 0.08 |
| | 100 - 200 mm | 21.5 mm | 25 ÷ 45 | | 0.20 | 0.15 | 0.10 | 0.08 |
| 200 - 300 mm | 35 / 42 mm | 35 ÷ 55 | 0.20 | 0.15 | 0.10 | 0.08 | | |
| Acero fundido Cast steel | <10 mm | 8.9 mm | 30 ÷ 50 | 0.05 ÷ 0.10 | 0.15 | 0.10 | 0.08 | 0.05 |
| | 10 - 50 mm | 14.5 / 21.5 mm | 35 ÷ 55 | | 0.20 | 0.15 | 0.13 | 0.10 |
| | | 21.5 mm | 40 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 50 - 100 mm | 21.5 mm | 40 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 100 - 200 mm | 21.5 mm | 40 ÷ 60 | | 0.25 | 0.20 | 0.15 | 0.12 |
| 200 - 300 mm | 35 / 42 mm | 60 ÷ 80 | 0.30 | 0.25 | 0.20 | 0.15 | | |
| Aluminio Aluminium | <10 mm | 8.9 mm | 50 ÷ 70 | 0.05 ÷ 0.10 | 0.15 | 0.10 | 0.05 | 0.05 |
| | 10 - 50 mm | 14.5 / 21.5 mm | 55 ÷ 75 | | 0.20 | 0.15 | 0.13 | 0.10 |
| | | 21.5 mm | 60 ÷ 90 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 50 - 100 mm | 21.5 mm | 60 ÷ 90 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 100 - 200 mm | 21.5 mm | 60 ÷ 90 | | 0.25 | 0.20 | 0.15 | 0.12 |
| 200 - 300 mm | 35 / 42 mm | 80 ÷ 110 | 0.30 | 0.25 | 0.20 | 0.15 | | |
| Latón Brass | <10 mm | 8.9 mm | 35 ÷ 55 | 0.05 ÷ 0.10 | 0.15 | 0.10 | 0.12 | 0.05 |
| | 10 - 50 mm | 14.5 / 21.5 mm | 40 ÷ 60 | | 0.20 | 0.15 | 0.13 | 0.10 |
| | | 21.5 mm | 45 ÷ 65 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 50 - 100 mm | 21.5 mm | 45 ÷ 65 | | 0.25 | 0.20 | 0.15 | 0.12 |
| | 100 - 200 mm | 21.5 mm | 45 ÷ 65 | | 0.25 | 0.20 | 0.15 | 0.12 |
| 200 - 300 mm | 35 / 42 mm | 70 ÷ 90 | 0.30 | 0.25 | 0.20 | 0.15 | | |

Valores recomendados / Recommended values

INCREMENTO DEL Ø DE LA PIEZA MOLETEADA POR DEFORMACIÓN
INCREASE OF Ø OF THE KNURLED PART BY FORM KNURLING



| Material Material | Paso (mm) Pitch (mm) | | | | | | | | | | | |
|-------------------------------------|-------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | Tipo Type | 0.3 | 0.4 | 0.5 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
| Acero de 90 kg 90 kg steel | RAA | 0.08 | 0.13 | 0.18 | 0.22 | 0.36 | 0.43 | 0.50 | 0.58 | 0.66 | 0.68 | 0.96 |
| | RBL | 0.08 | 0.13 | 0.21 | 0.24 | 0.33 | 0.43 | 0.52 | 0.65 | 0.70 | 0.76 | 0.87 |
| | RBR | 0.08 | 0.13 | 0.21 | 0.24 | 0.33 | 0.43 | 0.52 | 0.65 | 0.70 | 0.76 | 0.87 |
| | RGE | 0.10 | 0.18 | 0.17 | 0.30 | 0.38 | 0.51 | 0.63 | 0.70 | 0.83 | 0.93 | 0.95 |
| Acero de 60 kg 60 kg steel | RAA | 0.08 | 0.15 | 0.20 | 0.24 | 0.38 | 0.45 | 0.52 | 0.60 | 0.68 | 0.70 | 0.98 |
| | RBL | 0.10 | 0.15 | 0.23 | 0.26 | 0.35 | 0.45 | 0.54 | 0.67 | 0.72 | 0.78 | 0.90 |
| | RBR | 0.10 | 0.15 | 0.23 | 0.26 | 0.35 | 0.45 | 0.54 | 0.67 | 0.72 | 0.78 | 0.90 |
| | RGE | 0.12 | 0.20 | 0.29 | 0.32 | 0.40 | 0.53 | 0.65 | 0.73 | 0.85 | 0.95 | 0.98 |
| Acero inoxidable Stainless steel | RAA | 0.10 | 0.14 | 0.20 | 0.25 | 0.33 | 0.45 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 |
| | RBL | 0.12 | 0.20 | 0.23 | 0.29 | 0.40 | 0.50 | 0.60 | 0.70 | 0.78 | 0.88 | 0.98 |
| | RBR | 0.12 | 0.20 | 0.23 | 0.29 | 0.40 | 0.50 | 0.60 | 0.70 | 0.78 | 0.88 | 0.98 |
| | RGE | 0.10 | 0.14 | 0.20 | 0.25 | 0.33 | 0.53 | 0.52 | 0.65 | 0.70 | 0.75 | 0.80 |
| Aluminio Aluminium | RAA | 0.10 | 0.15 | 0.20 | 0.25 | 0.33 | 0.45 | 0.50 | 0.58 | 0.65 | 0.79 | 0.85 |
| | RBL | 0.12 | 0.17 | 0.24 | 0.27 | 0.39 | 0.49 | 0.57 | 0.58 | 0.65 | 0.80 | 0.95 |
| | RBR | 0.12 | 0.17 | 0.24 | 0.27 | 0.39 | 0.49 | 0.57 | 0.58 | 0.65 | 0.80 | 0.95 |
| | RGE | 0.11 | 0.15 | 0.22 | 0.25 | 0.33 | 0.45 | 0.53 | 0.65 | 0.70 | 0.74 | 0.90 |
| Latón Brass | RAA | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.42 | 0.45 | 0.50 | 0.52 | 0.56 |
| | RBL | 0.10 | 0.15 | 0.20 | 0.23 | 0.30 | 0.40 | 0.45 | 0.53 | 0.59 | 0.63 | 0.68 |
| | RBR | 0.10 | 0.15 | 0.20 | 0.23 | 0.30 | 0.40 | 0.45 | 0.53 | 0.59 | 0.63 | 0.68 |
| | RGE | 0.12 | 0.17 | 0.20 | 0.23 | 0.30 | 0.38 | 0.40 | 0.46 | 0.50 | 0.60 | 0.65 |

* Valores aproximados / Approximate values



RELACIÓN ENTRE EL DIÁMETRO A MOLETEAR Y EL PASO RELATIONSHIP BETWEEN PART DIAMETER AND PITCH



La relación entre el diámetro de la pieza a molear y el paso de la moleta seleccionada es muy importante para poder lograr un moleteado de calidad. Siempre hay que tratar de conseguir que la longitud de la circunferencia de la pieza a molear sea múltiplo del paso de la moleta utilizada.

The ratio between the diameter of the piece to be knurled and the pitch of the knurl is very important to achieve good quality knurling. The length of the circumference of the piece should always be a multiple of the knurl pitch used.

EJEMPLO 1

Diámetro previo de la pieza: 21 mm
Paso de la moleta: 1.0 mm
Relación: $21 \times 3.1416 / 1.0 = 65.97$
Diferencia con número entero: $66 - 65.97 = 0.03$

EXAMPLE 1

Previous diameter of the workpiece: 21 mm
Pitch of the knurl: 1.0 mm
Ratio: $21 \times 3.1416 / 1.0 = 65.97$
Difference with whole number: $66 - 65.97 = 0.03$

Cuanta mayor diferencia haya entre el valor obtenido del cálculo anterior y un número entero, mayor esfuerzo tendrá que realizar el conjunto moleteador-moleta para tratar de compensar la desproporción. Ese sobreesfuerzo se traduce en un moleteado de peor calidad y una reducción en el rendimiento de la moleta.

The greater the difference between the value obtained from the above calculation and a whole number, the more effort the tool will have to do to try to compensate the disproportion. This over-pressure generates a reduction in the quality of the knurling and in the performance of the knurl.

En el peor de los casos, cuando el valor de esa proporción difiere demasiado de un valor entero, se produce "doble moleteado". En este supuesto, el conjunto moleteador-moleta no logra compensar la desproporción y durante las primeras la moleta hace múltiples penetraciones en la pieza sin respetar el paso.

In the worst case, when the value of this proportion differs too much of a whole value, it makes a "double knurling".

EJEMPLO 2

Diámetro previo de la pieza: 18 mm
Paso de la moleta: 1.0 mm
Relación: $18 \times 3.1416 / 1.0 = 56.56$
Diferencia con número entero: $57 - 56.56 = 0.44$

EXAMPLE 2

Previous diameter of the workpiece: 18 mm
Pitch of the knurl: 1.0 mm
Ratio: $18 \times 3.1416 / 1.0 = 56.56$
Difference with whole number: $57 - 56.56 = 0.44$



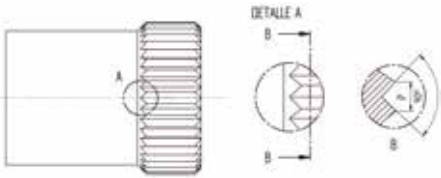
MOLETEADO EN PIEZA SEGÚN DIN 82

KNURLING ON COMPONENTS ACCORDING TO DIN 82



RAA

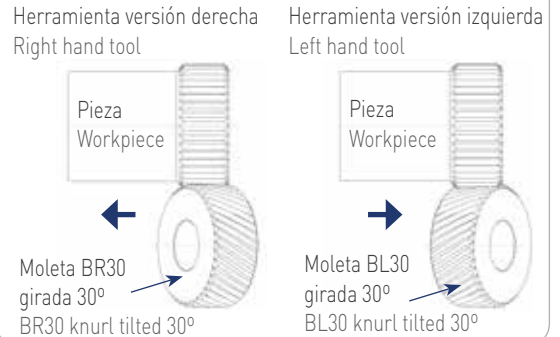
Moleteado con estrías paralelas al eje
Knurling with grooves parallel to axis



Moleteado por deformación Form knurling

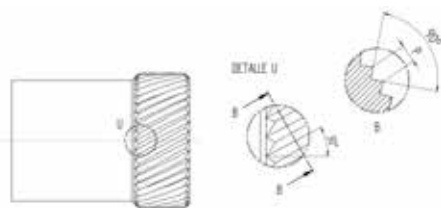


Moleteado por corte Cut-knurling

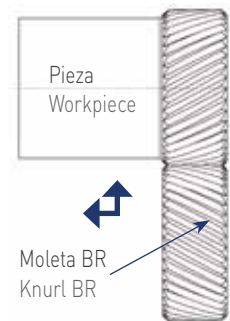


RBL

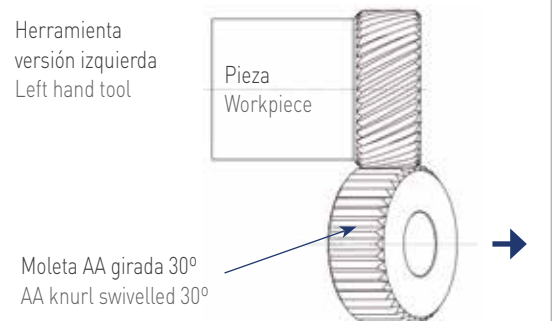
Moleteado con estrías en hélice hacia la izquierda
Knurling with left spiral grooves



Moleteado por deformación Form knurling

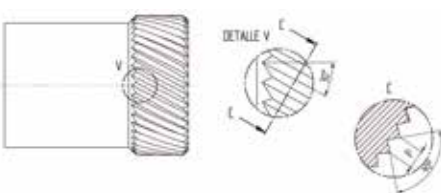


Moleteado por corte Cut-knurling



RBR

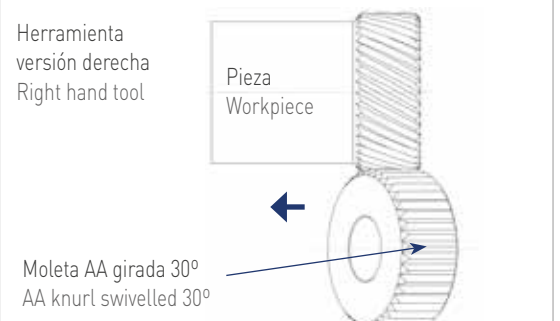
Moleteado con estrías en hélice hacia la derecha
Knurling with right spiral grooves



Moleteado por deformación Form knurling

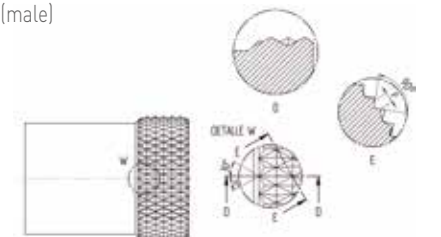


Moleteado por corte Cut-knurling

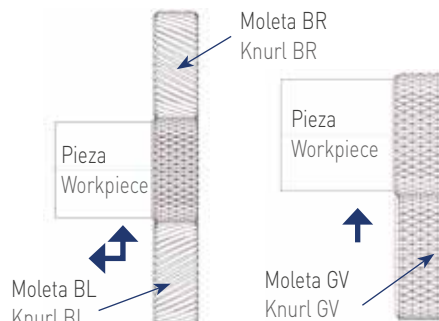


RGE

Moleteado con estrías cruzadas derecha-izquierda
puntas salientes
Knurling with left-right crossed grooves points up (male)



Moleteado por deformación Form knurling



Moleteado por corte Cut-knurling



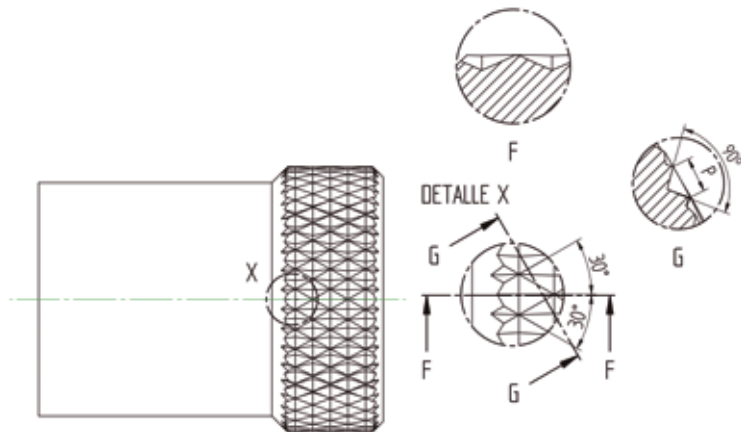


MOLETEADO EN PIEZA SEGÚN DIN 82 KNURLING ON COMPONENTS ACCORDING TO DIN 82

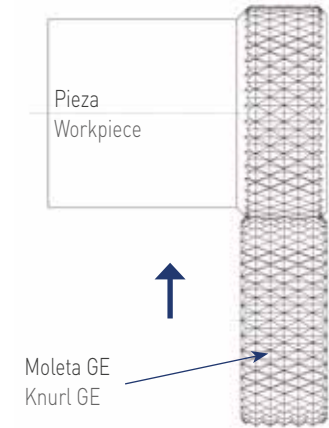


RGV

Moleteado con estrías cruzadas derecha-izquierda puntas entrantes
Knurling with left-right crossed grooves points down (female)

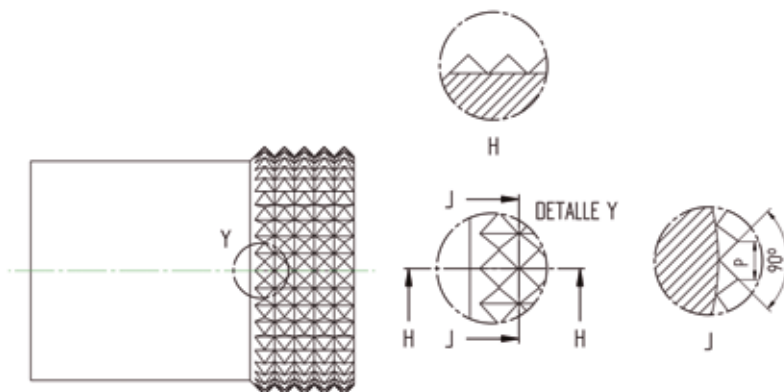


Moleteado por deformación
Form knurling

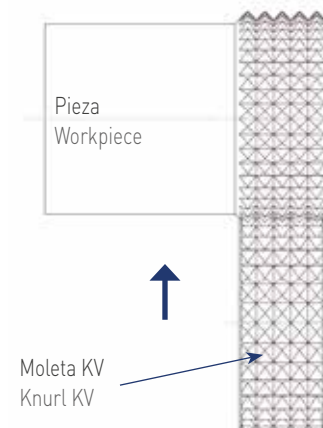


RKE

Moleteado con estrías cruzadas en cuadrado puntas salientes
Knurling with square crossed grooves points up (male)

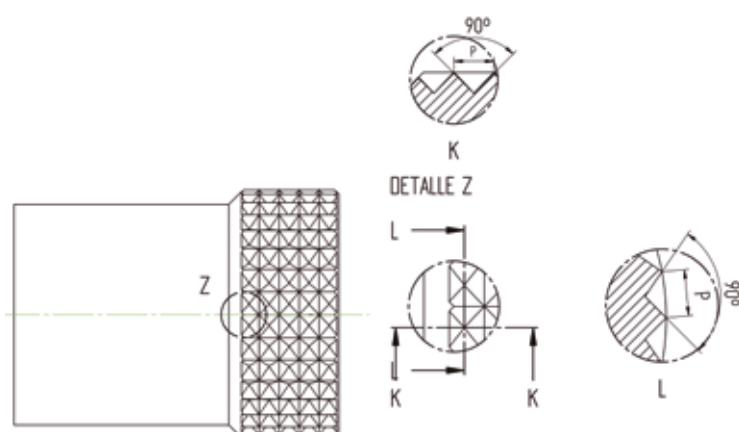


Moleteado por deformación
Form knurling

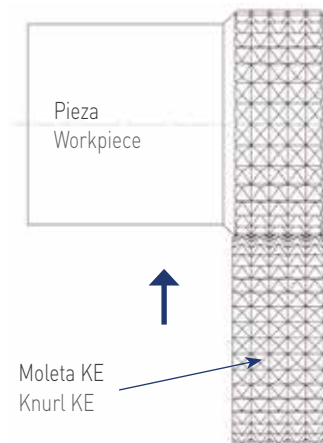


RKV

Moleteado con estrías cruzadas en cuadrado puntas entrantes
Knurling with square crossed grooves points down (female)



Moleteado por deformación
Form knurling





GAMA MOLETAS INTEGI

INTEGI KNURL RANGE



Moleta con dentado recto
Straight pattern knurl

Moleta con dentado helicoidal izq.
Lefthand spiral knurl

Moleta con dentado helicoidal drch.
Righthand spiral knurl

Moleta con dentado helicoidal izq.
Lefthand spiral knurl

Moleta con dentado helicoidal drch.
Righthand spiral knurl



DIENTES FRESADO

| | Dimensiones Sizes | Bisel Bevel | DIENTES FRESADO | | | | |
|--------------------------------------|----------------------|----------------|-----------------|------|------|------|------|
| | | | AA | BL15 | BR15 | BL30 | BR30 |
| MOLETAS DE DEFORMACION / FORM KNURLS | 10x4x4 | F | ● | | | ● | ● |
| | 10x5x4 | F | ● | | | ● | ● |
| | 15x4x4 | F | ● | | | ● | ● |
| | 15x5x4 | F | ● | | | ● | ● |
| | 15x6x4 | F | ● | | | ● | ● |
| | 15x6x10/6 | F | ● | | | ● | ● |
| | 20x6x6 | F | ● | | | ● | ● |
| | 20x8x6 | F | ● | | | ● | ● |
| | 20x10x6 | F | ● | | | ● | ● |
| | 20x8x13/6 | F | ● | | | ● | ● |
| | 20x6x6,5 | F | ● | | | ● | ● |
| | 20x8x6,5 | F | ● | | | ● | ● |
| | 20x10x6,5 | F | ● | | | ● | ● |
| | 25x6x6 | F | ● | | | ● | ● |
| | 25x8x6 | F | ● | | | ● | ● |
| | 25x10x6 | F | ● | | | ● | ● |
| | 25x8x8 | F | ● | | | ● | ● |
| | 25x10x8 | F | ● | | | ● | ● |
| 25x12x8 | F | ● | | | ● | ● | |
| 25x10x15 | F | ● | | | ● | ● | |
| MOLETAS DE CORTE CUT KNURLS | 8.9x2.5x4 | S | ● | ● | ● | ● | ● |
| | 14.5x3x5 | S | ● | ● | ● | ● | ● |
| | 21.5x5x8 | S | ● | ● | ● | ● | ● |
| | 25x6x8 | S | ● | ● | ● | ● | ● |
| | 32x8x14 | S | ● | ● | ● | ● | ● |
| | 42x12x18 | S | ● | ● | ● | ● | ● |

Pasos disponibles · Available pitches

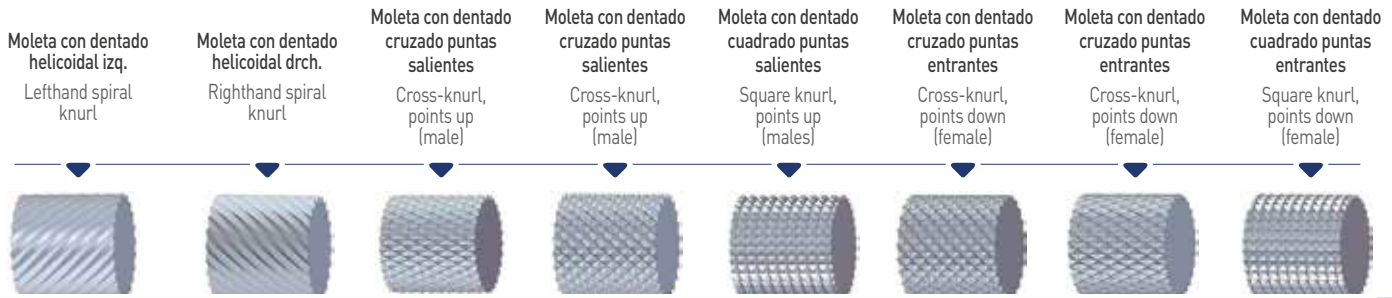
| | | | |
|---|--|---|--|
| ● | 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0 mm | ● | 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0 - 1.2 - 1.5 - 1.6 - 1.8 - 2.0 mm |
| ● | 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0 - 1.2 mm | ● | 1.0 - 1.5 - 2.0 mm |
| ● | 0.5 - 0.6 - 0.8 - 1.0 - 1.2 mm | ● | 1.0 - 1.5 - 2.0 - 2.5 - 3.0 mm |
| ● | 0.3 - 0.4 - 0.5 - 0.6 - 0.7 - 0.8 - 1.0 - 1.2 - 1.5 mm | ● | 1.0 - 1.5 - 2.0 - 2.5 - 3.0 - 3.5 - 4.0 mm |

Otros pasos bajo pedido / Other pitches under request



GAMA MOLETAS INTEGI

INTEGI KNURL RANGE



| DIENTES / MILLED TEETH | | | | | DIENTES CONFORMADOS / FORMED TEETH | | |
|------------------------|------|------|------|----|------------------------------------|------|----|
| BL45 | BR45 | GE30 | GE45 | KE | GV30 | GV45 | KV |
| ● | ● | ● | ● | | ● | ● | |
| ● | ● | ● | ● | | ● | ● | |
| ● | ● | ● | ● | | ● | ● | |
| ● | ● | ● | ● | | ● | ● | |
| ● | ● | ● | ● | | ● | ● | |
| ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | | | | |
| ● | ● | ● | ● | | ● | ● | |

| RECUBRIMIENTO | DESCRIPCION |
|-------------------|-------------------------------|
| TiN | Titanium Nitride PVD |
| TiCN | Titanium Carbon Nitride PVD |
| TiAlN | Titanium Aluminum Nitride PVD |
| AlCrN | Aluminum Chromium Nitride PVD |
| Nitried (Tenifer) | Nitried (Tenifer) |

| Tipo de bisel · Type of bevel | |
|-------------------------------|--|
| F | Bisel en ambas caras (Moleta de deformación) · Bevel on both faces |
| S | Sin bisel (Moleta de corte) · Unbeveled |



MOLETAS ESPECIALES SPECIAL KNURLS



+ Moletas cónicas Conical knurls



► Datos necesarios para la fabricación de moletas cónicas:

- Forma de tallado (KAA, KBL, ...)
- Ángulo del diente
- Diámetro D
- Diámetro del agujero D_i
- Espesor E
- Paso en D_m
- Diámetro medio D_m o ángulo del cono
- Material
- Recubrimiento
- Biselados

► Necessary data to manufacture conical knurls:

- Knurling pattern (KAA, KBL, ...)
- Teeth angle
- D diameter
- D_i bore diameter
- E width
- Pitch measured at D_m
- D_m mid-diameter or angle of the cone
- Material
- Coating
- Chamfers

+ Moletas cóncavas y convexas Concave and convex knurls



► Datos necesarios para la fabricación de moletas cóncavas y convexas:

- Forma de la moleta
- Forma de tallado
- Ángulo del diente
- Diámetro D
- Diámetro del agujero D_i
- Espesor E
- Paso en D
- Radio
- Material
- Recubrimiento
- Biselados

► Necessary data to manufacture concave and convex knurls:

- Knurl form
- Knurling pattern
- Teeth angle
- D diameter
- D_i bore diameter
- E width
- Pitch
- Radius
- Material
- Coating
- Chamfers





▶ MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS

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- M2 17
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- KM1-M7 20

2· HIGH · HIGH

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- M8 22
- M20 23
- M4 24
- M10 25
- M19 26
- M15 27

2 MOLETAS · 2 KNURLS

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- M9 29
- M21 30
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3 MOLETAS · 3 KNURLS

- M17 36





MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M1



+ Características

- Recomendado para moleteados tipo RAA
- Para trabajos no repetitivos
- Eje de HSS fijado mediante circlip

Tipos de máquinas

- Para tornos convencionales

+ Features

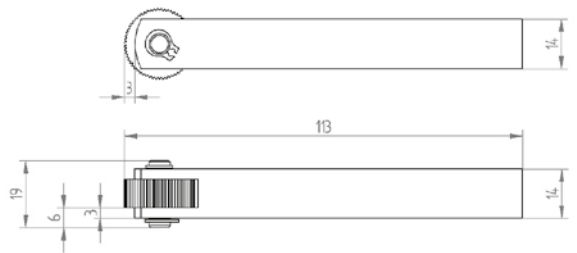
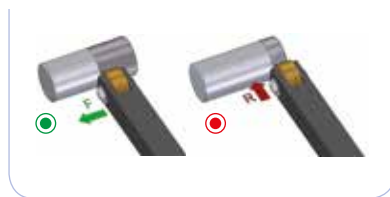
- Recommended for RAA type knurling
- For non-repetitive works
- HSS pin fixed by circlip

Machine Types

- For conventional lathes



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R | RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | | |
| Con moleta tipo With knurl type | | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
| 01010100 | M1 20.08.14 | R+L | Ø 8-200 | 20x8x6 | 0.2 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01990100 | EM1 |





MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M2



(Fig. 1)

+ Características

- Recomendado para moleteados tipo RGE
- Cabeza giratoria para el auto-centrado de las moletas (Fig. 1)
- Para trabajos no repetitivos
- Ejes de HSS

Tipos de máquinas

- Para tornos convencionales

+ Features

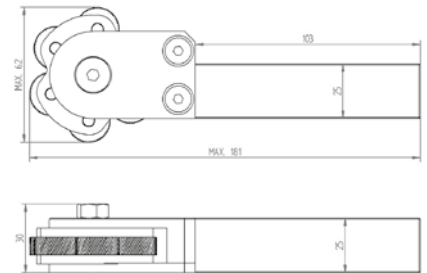
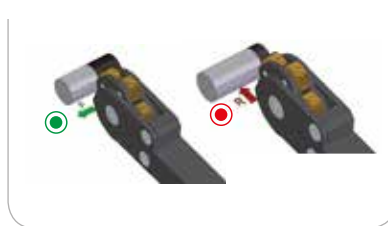
- Recommended for RGE type knurling
- Revolving head for knurls self-centering (Fig. 1)
- For non-repetitive works
- HSS pins

Machine Types

- For conventional lathes



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
| 01020100 | M2 20.08.25 | R+L | Ø 8-200 | 20x8x6 | 1.0 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01990201 | EM2-SET | |

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M3

Características

- Recomendado para moleteados tipo RGE
- Ajuste y centrado de las moletas sobre la pieza mediante husillo roscado
- Doble posición de los brazos para mayor capacidad de trabajo (Fig. 1)
- Menor riesgo de flexión de la pieza al no ejercer presión radial
- Apta para trabajos no repetitivos
- Ejes de HSS fijados mediante circlip

Tipos de máquinas

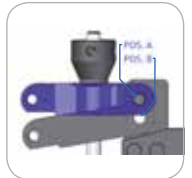
- Para tornos convencionales

Features

- Recommended for RGE type knurling
- Knurls self-centering by threaded spindle
- Double position of the arms for higher working capacity (Fig. 1)
- Lower risk of bending the workpiece as tool does not make radial pressure
- Suitable for non-repetitive works
- HSS pins fixed by circlip

Machine Types

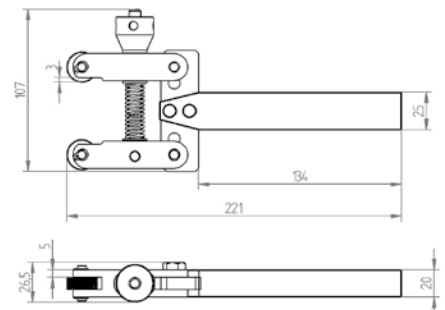
- For conventional lathes



(Fig. 1)



Avance Feed



Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | |
|--------------------|-------------------------|--------------------|---------------------------------|-----------------|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
| 01030100 | M3 20.08.25 | R+L | Pos A: Ø 5-40 Pos B: Ø 30-50 | 20x8x6 | 1.2 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01992701 | EM3/M7-SET | |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M7



(Fig. 1)

+ Características

- Recomendado para moleteados tipo RGE
- Cabeza basculante para el autocentrado de las moletas (Fig. 1)
- Para trabajos no repetitivos
- Ejes de HSS fijados mediante circlip

Tipos de máquinas

- Para tornos convencionales y CNC

+ Features

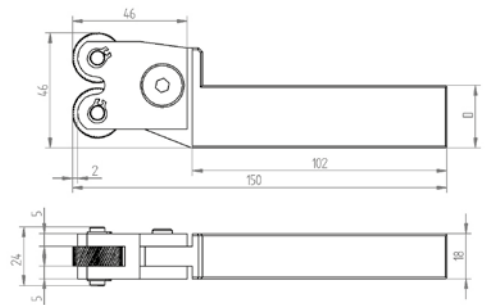
- Recommended for RGE type knurling
- Pivoting head for knurls self-centering (Fig. 1)
- For non-repetitive works
- HSS pins fixed by circlip

Machine Types

- For conventional and CN lathes



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | D | Kg Kg |
| 01160200 | M7N 20.08.20 | R+L | Ø 8-200 | 20x8x6 | 20 | 0.7 |
| 01160300 | M7N 20.08.25 | R+L | Ø 8-200 | 20x8x6 | 25 | 0.7 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01992701 | EM3/M7-SET | |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



KM1-M7

+ Características

- Conjunto básico de moleteado
- Para trabajos no repetitivos

Contenido

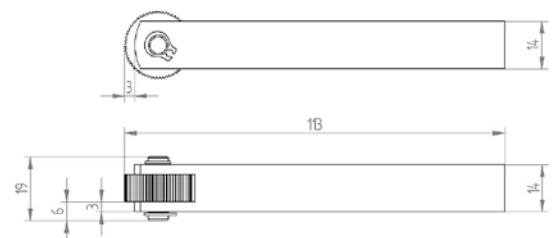
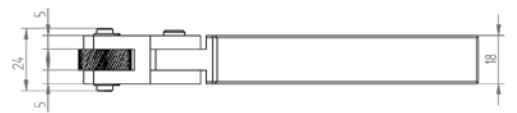
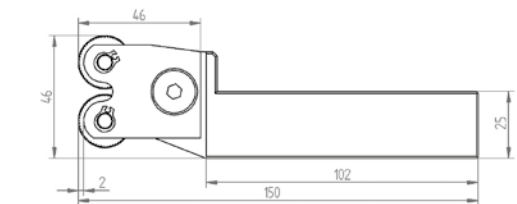
- 1 x Herramienta M1 20.08.14
- 1 x Herramienta M7N 20.08.25
- 1 x Eje de repuesto EM1
- 2 x Eje de repuesto EM3/M7
- 1 x Moleta BL30 20x8x6 0.8
- 1 x Moleta BR30 20x8x6 0.8
- 1 x Moleta BL30 20x8x6 1.2
- 1 x Moleta BR30 20x8x6 1.2
- 1 x Moleta BL30 20x8x6 1.6
- 1 x Moleta BR30 20x8x6 1.6
- 1 x Moleta AA 20x8x6 0.8
- 1 x Moleta AA 20x8x6 1.2
- 1 x Moleta AA 20x8x6 1.6

+ Features

- Basic knurling kit
- For non-repetitive works

Content

- 1 x Tool M1 20.08.14
- 1 x Tool M7N 20.08.25
- 1 x HSS pin EM1
- 2 x HSS pin EM3/M7
- 1 x Knurl BL30 20x8x6 0.8
- 1 x Knurl BR30 20x8x6 0.8
- 1 x Knurl BL30 20x8x6 1.2
- 1 x Knurl BR30 20x8x6 1.2
- 1 x Knurl BL30 20x8x6 1.6
- 1 x Knurl BR30 20x8x6 1.6
- 1 x Knurl AA 20x8x6 0.8
- 1 x Knurl AA 20x8x6 1.2
- 1 x Knurl AA 20x8x6 1.6



| Herramienta Tool | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
| 01110100 | KM1-M7 | R+L | Ø 8-200 | 20x8x6 | 1.1 |

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M6

+ Características

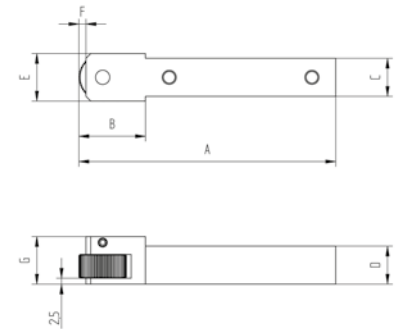
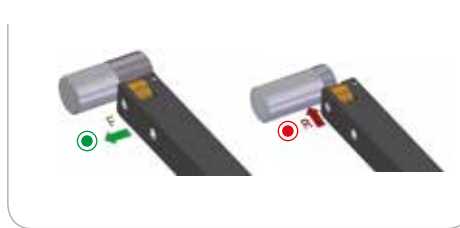
- Recomendado para moleteados tipo RAA
- Eje de metal duro
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Carbide pin
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the tool shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R | RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | | |
| Con moleta tipo With knurl type | | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|-------|------|----|----|----|-----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | A | B | C | D | E | F | G | Kg Kg |
| 01062800 | M6 15.06.08-N | R+L | Ø 3-100 | 15x6x4 | 102.5 | 22.5 | 8 | 8 | 14 | 3.5 | 14 | 0,3 |
| 01062900 | M6 15.06.10-N | R+L | Ø 3-100 | 15x6x4 | 102.5 | 22.5 | 10 | 10 | 14 | 3.5 | 14 | 0,3 |
| 01063000 | M6 15.06.12-N | R+L | Ø 3-100 | 15x6x4 | 102.5 | 22.5 | 12 | 12 | 14 | 3.5 | 14 | 0,3 |
| 01063100 | M6 15.06.14-N | R+L | Ø 3-100 | 15x6x4 | 102.5 | 22.5 | 14 | 14 | 14 | 3.5 | 14 | 0,3 |
| 01061300 | M6 20.06.10 | R+L | Ø 5-200 | 20x6x6 | 108 | 28 | 10 | 10 | 20 | 3 | 20 | 0,3 |
| 01061400 | M6 20.06.12 | R+L | Ø 5-200 | 20x6x6 | 108 | 28 | 12 | 12 | 20 | 3 | 20 | 0,3 |
| 01061500 | M6 20.06.14 | R+L | Ø 5-200 | 20x6x6 | 108 | 28 | 14 | 14 | 20 | 3 | 20 | 0,3 |
| 01061600 | M6 20.06.16 | R+L | Ø 5-200 | 20x6x6 | 108 | 28 | 16 | 16 | 20 | 3 | 20 | 0,4 |
| 01061700 | M6 20.06.20 | R+L | Ø 5-200 | 20x6x6 | 108 | 28 | 20 | 20 | 20 | 3 | 20 | 0,5 |
| 01061800 | M6 20.08.10 | R+L | Ø 5-200 | 20x8x6 | 108 | 28 | 10 | 10 | 20 | 3 | 20 | 0,3 |
| 01061900 | M6 20.08.12 | R+L | Ø 5-200 | 20x8x6 | 108 | 28 | 12 | 12 | 20 | 3 | 20 | 0,3 |
| 01062000 | M6 20.08.14 | R+L | Ø 5-200 | 20x8x6 | 108 | 28 | 14 | 14 | 20 | 3 | 20 | 0,3 |
| 01062100 | M6 20.08.16 | R+L | Ø 5-200 | 20x8x6 | 108 | 28 | 16 | 16 | 20 | 3 | 20 | 0,4 |
| 01062200 | M6 20.08.20 | R+L | Ø 5-200 | 20x8x6 | 108 | 28 | 20 | 20 | 20 | 3 | 20 | 0,5 |
| 01062300 | M6 20.10.10 | R+L | Ø 5-200 | 20x10x6 | 108 | 28 | 10 | 10 | 20 | 3 | 20 | 0,3 |
| 01062400 | M6 20.10.12 | R+L | Ø 5-200 | 20x10x6 | 108 | 28 | 12 | 12 | 20 | 3 | 20 | 0,3 |
| 01062500 | M6 20.10.14 | R+L | Ø 5-200 | 20x10x6 | 108 | 28 | 14 | 14 | 20 | 3 | 20 | 0,3 |
| 01062600 | M6 20.10.16 | R+L | Ø 5-200 | 20x10x6 | 108 | 28 | 16 | 16 | 20 | 3 | 20 | 0,4 |
| 01062700 | M6 20.10.20 | R+L | Ø 5-200 | 20x10x6 | 108 | 28 | 20 | 20 | 20 | 3 | 20 | 0,5 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01990301 | E 14.4 HM |
| 01990601 | E 20.6 HM |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M8

+ Características

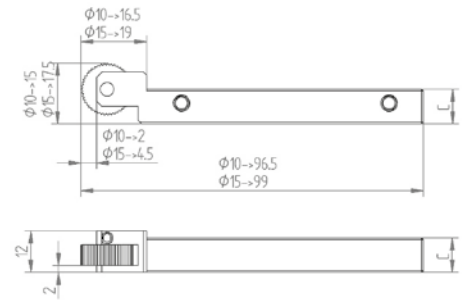
- Recomendado para moleteados tipo RAA
- Eje de metal duro
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Carbide pin
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R | RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | | |
| Con moleta tipo With knurl type | | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg Kg |
| 01200100 | M8 15.04.08 R | R | Ø 3-50 / Ø 3-100 | 10x4x4 / 15x4x4 | 8 | 0.2 |
| 01200200 | M8 15.04.08 L | L | Ø 3-50 / Ø 3-100 | 10x4x4 / 15x4x4 | 8 | 0.2 |
| 01200300 | M8 15.04.10 R | R | Ø 3-50 / Ø 3-100 | 10x4x4 / 15x4x4 | 10 | 0.2 |
| 01200400 | M8 15.04.10 L | L | Ø 3-50 / Ø 3-100 | 10x4x4 / 15x4x4 | 10 | 0.2 |
| 01200500 | M8 15.04.12 R | R | Ø 3-50 / Ø 3-100 | 10x4x4 / 15x4x4 | 12 | 0.2 |
| 01200600 | M8 15.04.12 L | L | Ø 3-50 / Ø 3-100 | 10x4x4 / 15x4x4 | 12 | 0.2 |
| 01200700 | M8 15.05.08 R | R | Ø 3-50 / Ø 3-100 | 10x5x4 / 15x5x4 | 8 | 0.2 |
| 01200800 | M8 15.05.08 L | L | Ø 3-50 / Ø 3-100 | 10x5x4 / 15x5x4 | 8 | 0.2 |
| 01200900 | M8 15.05.10 R | R | Ø 3-50 / Ø 3-100 | 10x5x4 / 15x5x4 | 10 | 0.2 |
| 01201000 | M8 15.05.10 L | L | Ø 3-50 / Ø 3-100 | 10x5x4 / 15x5x4 | 10 | 0.2 |
| 01201100 | M8 15.05.12 R | R | Ø 3-50 / Ø 3-100 | 10x5x4 / 15x5x4 | 12 | 0.2 |
| 01201200 | M8 15.05.12 L | L | Ø 3-50 / Ø 3-100 | 10x5x4 / 15x5x4 | 12 | 0.2 |
| 01201300 | M8 15.06.08 R | R | Ø 3-100 | 15x6x4 | 8 | 0.2 |
| 01201400 | M8 15.06.08 L | L | Ø 3-100 | 15x6x4 | 8 | 0.2 |
| 01201500 | M8 15.06.10 R | R | Ø 3-100 | 15x6x4 | 10 | 0.2 |
| 01201600 | M8 15.06.10 L | L | Ø 3-100 | 15x6x4 | 10 | 0.2 |
| 01201700 | M8 15.06.12 R | R | Ø 3-100 | 15x6x4 | 12 | 0.2 |
| 01201800 | M8 15.06.12 L | L | Ø 3-100 | 15x6x4 | 12 | 0.2 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01989701 | E 12.4 HM |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M20

+ Características

- Recomendado para moleteados tipo RAA
- Para moleteados hasta una cara lateral (Fig.1)
- Eje de HSS
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

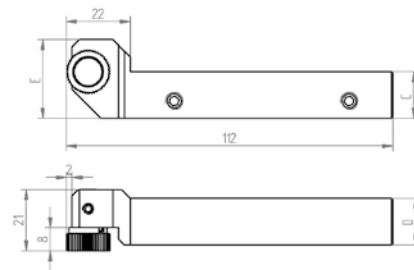
- Recommended for RAA type knurling
- For knurling up to a shoulder (Fig.1)
- HSS bushing
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank



(Fig. 1)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | |
| Con moleta tipo With knurl type | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01290300 | M20 15.06.10 R | R | ∅ 3-100 | 15x6x10/6 | 10 | 10 | 0.3 |
| 01290400 | M20 15.06.10 L | L | ∅ 3-100 | 15x6x10/6 | 10 | 10 | 0.3 |
| 01290500 | M20 15.06.12 R | R | ∅ 3-100 | 15x6x10/6 | 12 | 16 | 0.3 |
| 01290600 | M20 15.06.12 L | L | ∅ 3-100 | 15x6x10/6 | 12 | 16 | 0.3 |
| 01290700 | M20 15.06.16 R | R | ∅ 3-100 | 15x6x10/6 | 16 | 16 | 0.3 |
| 01290800 | M20 15.06.16 L | L | ∅ 3-100 | 15x6x10/6 | 16 | 16 | 0.3 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01983220 | EAM20/M21 |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



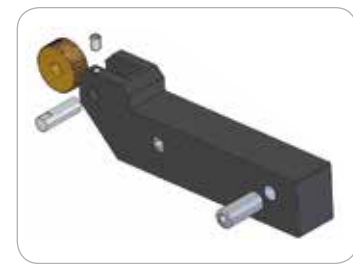
M4

+ Características

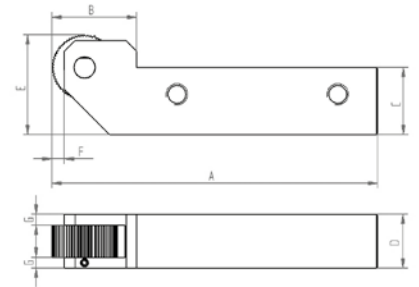
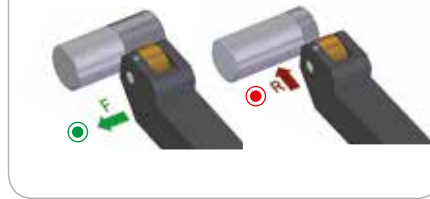
- Recomendado para moleteados tipo RAA
- Eje de metal duro
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Carbide pin
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R | RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | | |
| Con moleta tipo With knurl type | | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|-----|------|----|----|------|-----|-----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | A | B | C | D | E | F | G | Kg Kg |
| 01041200 | M4 20.08.16 | R+L | Ø 8-200 | 20x8x6 | 120 | 29,5 | 16 | 20 | 26 | 2,5 | 6 | 0,3 |
| 01041300 | M4 20.08.20 | R+L | Ø 8-200 | 20x8x6 | 120 | 29,5 | 20 | 20 | 30 | 2,5 | 6 | 0,4 |
| 01041400 | M4 20.08.25 | R+L | Ø 8-200 | 20x8x6 | 120 | 29,5 | 25 | 20 | 35 | 2,5 | 6 | 0,5 |
| 01041500 | M4 20.10.20 | R+L | Ø 8-200 | 20x10x6 | 120 | 29,5 | 20 | 20 | 30 | 2,5 | 5 | 0,4 |
| 01041600 | M4 20.10.25 | R+L | Ø 8-200 | 20x10x6 | 120 | 29,5 | 25 | 20 | 35 | 2,5 | 5 | 0,5 |
| 01041700 | M4 25.08.20 | R+L | Ø 8-300 | 25x8x8 | 122 | 32 | 20 | 20 | 32,5 | 5 | 6 | 0,4 |
| 01041800 | M4 25.08.25 | R+L | Ø 8-300 | 25x8x8 | 122 | 32 | 25 | 20 | 37,5 | 5 | 6 | 0,5 |
| 01041900 | M4 25.10.20 | R+L | Ø 8-300 | 25x10x8 | 122 | 32 | 20 | 20 | 32,5 | 5 | 5 | 0,4 |
| 01042000 | M4 25.10.25 | R+L | Ø 8-300 | 25x10x8 | 122 | 32 | 25 | 20 | 37,5 | 5 | 5 | 0,5 |
| 01042100 | M4 25.12.20 | R+L | Ø 8-300 | 25x12x8 | 122 | 32 | 20 | 25 | 32,5 | 5 | 6,5 | 0,6 |
| 01042200 | M4 25.12.25 | R+L | Ø 8-300 | 25x12x8 | 122 | 32 | 25 | 25 | 37,5 | 5 | 6,5 | 0,6 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01990601 | E 20.6 HM |
| 01986001 | E 20.8 HM |
| 01992501 | E 25.8 HM |





MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M10

+ Características

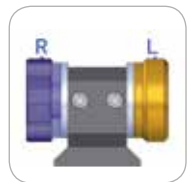
- Recomendado para moleteados tipo RAA
- Para moleteados hasta una cara lateral (Fig. 1)
- Eje de HSS
- Para trabajar a derechas o izquierdas (Fig. 2)
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango
- Provista de arandela de HSS para prevenir el desgaste de la herramienta

+ Features

- Recommended for RAA type knurling
- For knurling up to a shoulder (Fig. 1)
- HSS bushing
- Able to fit on right-hand or left-hand (Fig. 2)
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank
- Supplied with a HSS hardened washer to prevent tool wearing



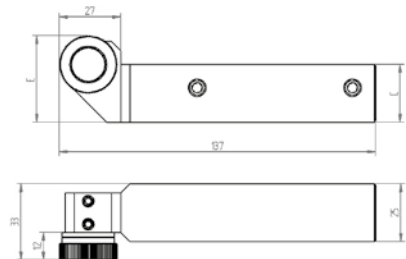
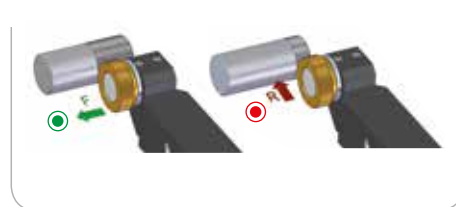
(Fig. 1)



(Fig. 2)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | |
| Con moleta tipo With knurl type | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | E | Kg Kg |
| 01070100 | M10 25.10.20 | R+L | ∅ 8-200 | 25x10x15/11 | 20 | 30 | 0.7 |
| 01070200 | M10 25.10.25 | R+L | ∅ 8-200 | 25x10x15/11 | 25 | 35 | 0.8 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01983200 | EAM10 |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M19

+ Características

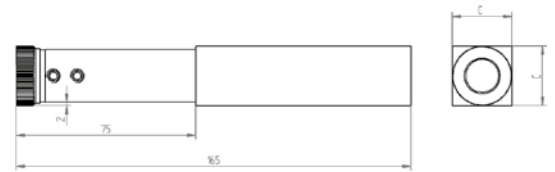
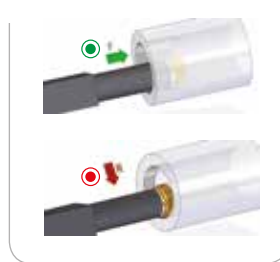
- Recomendado para moleteados tipo RAA
- Para moleteado interior
- Eje de HSS
- Provista de arandela de HSS para evitar el desgaste de la herramienta

+ Features

- Recommended for RAA type knurling
- For internal knurling
- HSS bushing
- Supplied with a HSS hardened washer to prevent tool wearing



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R | RAA | RBL 30° | RBL 45° | RBR 30° | RBR 45° | RGE 30° | RGE 45° | RGV 30° | RGV 45° | RKE | RKV |
|-------------------------------------|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-----|
| Tipo de moleteado Knurling form | | | | | | | | | | | | |
| Con moleta tipo With knurl type | | AA | BR 30° | BR 45° | BL 30° | BL 45° | GV 30° | GV 45° | GE 30° | GE 45° | KV | KE |
| Avances permitidos Allowed feeds | | F ● R ● | F ● R ● | F ● R ● | F ● R ● | F ● R ● | R ● | R ● | R ● | R ● | R ● | R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg Kg |
| 01190100 | M19 25.10.20 | R+L | ∅ 30-200 | 25x10x15/11 | 20 | 0.7 |
| 01190200 | M19 25.10.25 | R+L | ∅ 30-200 | 25x10x15/11 | 25 | 0.8 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01983200 | EAM10 |





MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M15

+ Características

- Recomendado para moleteados tipo RKAA
- Para moleteado frontal o cónico
- Cabeza portamoletas giratoria (Fig. 1)
- Eje de metal duro

+ Features

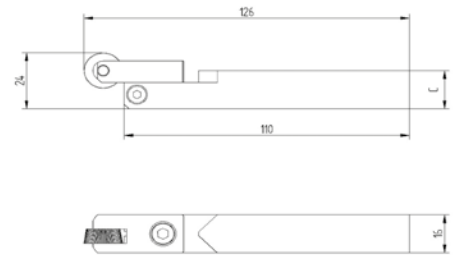
- Recommended for RKAA type knurling
- For conical or face knurling
- Swivel tool head (Fig. 1)
- Carbide pin



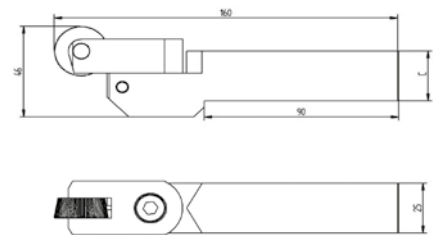
(Fig. 1)



+ Avance Feed



Modelo M15 15



Modelo M15 25

+ Formas de moleteados realizables Feasible knurling forms

| | R RKAA | RKBL 30° | RKBR 30° |
|-------------------------------------|------------------|----------|----------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | KA | KBR 30° | KBL 30° |
| Avances permitidos Allowed feeds | R | R | R |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-------------------|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta* Knurl* | C | Kg Kg |
| 01150100 | M15 15.06.12 | R+L | Ø 3-100 | 15x6x4 (conica) | 12 | 0,3 |
| 01150200 | M15 15.06.16 | R+L | Ø 3-100 | 15x6x4 (conica) | 16 | 0,3 |
| 01150300 | M15 25.08.20 | R+L | Ø 8-300 | 25x8x8 (conica) | 20 | 0,6 |
| 01150400 | M15 25.08.25 | R+L | Ø 8-300 | 25x8x8 (conica) | 25 | 0,8 |
| 01150500 | M15 25.10.20 | R+L | Ø 8-300 | 25x10x8 (conica) | 20 | 0,6 |
| 01150600 | M15 25.10.25 | R+L | Ø 8-300 | 25x10x8 (conica) | 25 | 0,8 |
| 01150700 | M15 25.12.20 | R+L | Ø 8-300 | 25x12x8 (conica) | 20 | 0,6 |
| 01150800 | M15 25.12.25 | R+L | Ø 8-300 | 25x12x8 (conica) | 25 | 0,8 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01982200 | E 16.4 HM |
| 01992500 | EM15 25.08 HSS |



*Dimensiones aproximadas / Approximate sizes

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



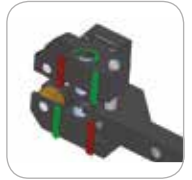
M12

+ Características

- Recomendado para moleteados tipo RGE en piezas de pequeño diámetro
- Menor riesgo de flexión de la pieza al no ejercer presión radial
- Sistema de centrado para compensar un posible desalineamiento del torno (Fig. 2)
- Ajuste y centrado de las moletas sobre la pieza mediante husillo roscado (Fig. 1)
- Ejes de metal duro
- Superficie de los brazos endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

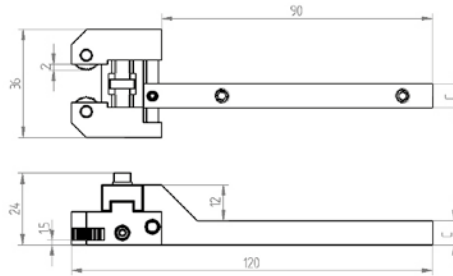
- Recommended for RGE type knurling on small diameter workpieces
- Lower risk of bending the workpiece as tool does not make radial pressure
- Self-centering system to compensate a possible misalignment of the lathe turret (Fig. 2)
- Knurls self-centering by threaded spindle (Fig. 1)
- Carbide pins
- Anti-wearing treatment of the arms surface.
- Adjustment of tool clearance angle by threaded studs integrated in the shank



(Fig. 1)



(Fig. 2)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | R RGE 30° | R RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

Herramienta | Tool

| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg Kg |
|----------------|-------------------------|--------------------|-----------------------|-----------------|----|----------|
| 01120500 | M12 10.04.08 R | R | ∅ 1-12 | 10x4x4 | 8 | 0.2 |
| 01120600 | M12 10.04.08 L | L | ∅ 1-12 | 10x4x4 | 8 | 0.2 |
| 01120700 | M12 10.04.10 R | R | ∅ 1-12 | 10x4x4 | 10 | 0.2 |
| 01120800 | M12 10.04.10 L | L | ∅ 1-12 | 10x4x4 | 10 | 0.2 |
| 01120900 | M12 10.04.12 R | R | ∅ 1-12 | 10x4x4 | 12 | 0.2 |
| 01121000 | M12 10.04.12 L | L | ∅ 1-12 | 10x4x4 | 12 | 0.2 |

Repuesto | Spare Part

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 01989701 | E 12.4 HM |

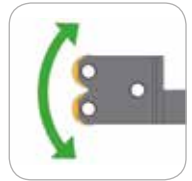




MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M9



(Fig. 1)



(Fig. 2)

+ Características

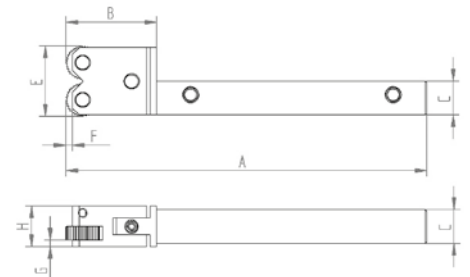
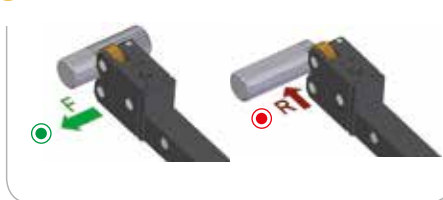
- Recomendado para moleteados tipo RGE
- Cabeza basculante para el autocentrado de las moletas sobre la pieza (Fig. 1)
- Cabeza reversible para trabajar a derechas o izquierdas (Fig. 2)
- Ejes de metal duro
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RGE type knurling
- Pivoting head for knurls self-centering (Fig. 1)
- Tool with reversible head able to fit on left-hand or right-hand lathes (Fig. 2)
- Carbide pins
- Anti-wearing treatment surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | R RGE 30° | R RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|-------|------|----|----|-----|---|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | A | B | C | E | F | G | H | Kg Kg |
| 01180100 | M9 10.04.08 | R+L | ∅ 3-50 | 10x4x4 | 107 | 27 | 8 | 21 | 2 | 2 | 12 | 0.1 |
| 01180200 | M9 10.04.10 | R+L | ∅ 3-50 | 10x4x4 | 107 | 27 | 10 | 21 | 2 | 2 | 12 | 0.1 |
| 01180300 | M9 10.04.12 | R+L | ∅ 3-50 | 10x4x4 | 107 | 27 | 12 | 21 | 2 | 2 | 12 | 0.1 |
| 01180400 | M9 15.04.16 | R+L | ∅ 3-100 | 15x4x4 | 130.5 | 40.5 | 16 | 32 | 1.5 | 3 | 16 | 0.1 |
| 01180500 | M9 15.05.16 | R+L | ∅ 3-100 | 15x5x4 | 130.5 | 40.5 | 16 | 32 | 1.5 | 3 | 16 | 0.1 |
| 01180600 | M9 15.06.16 | R+L | ∅ 3-100 | 15x6x4 | 130.5 | 40.5 | 16 | 32 | 1.5 | 3 | 16 | 0.1 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01989701 | E 12.4 HM | |
| 01982200 | E 16.4 HM | |

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M21

+ Características

- Recomendado para moleteados tipo RGE
- Para moleteados hasta una cara lateral (Fig. 1)
- Eje de HSS
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango
- Provista de arandela de HSS para prevenir el desgaste de la herramienta

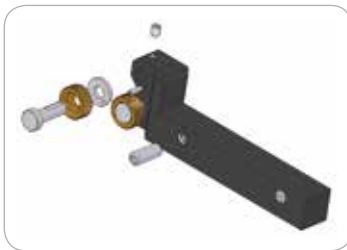
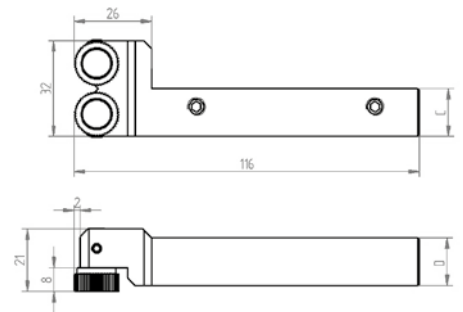
+ Features

- Recommended for RGE type knurling
- For knurling up to a shoulder (Fig. 1)
- HSS bushing
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank
- Supplied with a HSS hardened washer to prevent tool wearing



(Fig. 1)

+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01280300 | M21 15.06.10 R | R | Ø 3-100 | 15x6x10/6 | 10 | 10 | 0.4 |
| 01280400 | M21 15.06.10 L | L | Ø 3-100 | 15x6x10/6 | 10 | 10 | 0.4 |
| 01280500 | M21 15.06.12 R | R | Ø 3-100 | 15x6x10/6 | 12 | 16 | 0.4 |
| 01280600 | M21 15.06.12 L | L | Ø 3-100 | 15x6x10/6 | 12 | 16 | 0.4 |
| 01280700 | M21 15.06.16 R | R | Ø 3-100 | 15x6x10/6 | 16 | 16 | 0.4 |
| 01280800 | M21 15.06.16 L | L | Ø 3-100 | 15x6x10/6 | 16 | 16 | 0.4 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01983220 | EAM20/M21 | |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M5

+ Características

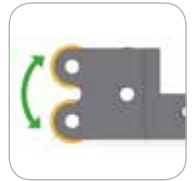
- Recomendado para moleteados tipo RGE
- Cabeza basculante para el autocentrado de las moletas sobre la pieza (Fig. 1)
- Cabeza reversible para trabajar a derechas o izquierdas (Fig. 2)
- Ejes de metal duro
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RGE type knurling
- Pivoting head for knurls self-centering (Fig. 1)
- Tool with reversible head able to fit on left-hand or right-hand lathes (Fig. 2)
- Carbide pins
- Anti-wearing treatment surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank

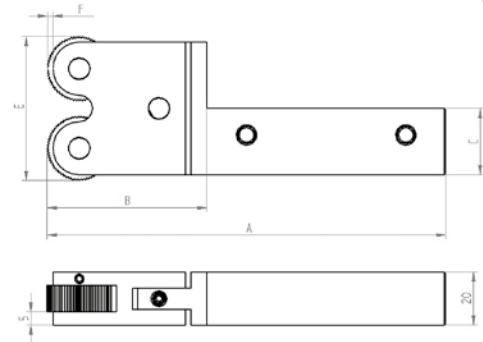
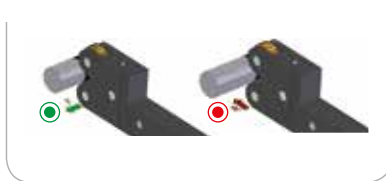


(Fig. 1)



(Fig. 2)

+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|-------|----|----|----|-----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | A | B | C | E | F | Kg Kg |
| 01050700 | M5 20.08.20 | R+L | Ø 8-200 | 20x8x6 | 139,5 | 49 | 20 | 42 | 2.5 | 1.0 |
| 01050800 | M5 20.08.25 | R+L | Ø 8-200 | 20x8x6 | 139,5 | 49 | 25 | 42 | 2.5 | 1.0 |
| 01050900 | M5 20.10.20 | R+L | Ø 8-200 | 20x10x6 | 139,5 | 49 | 20 | 42 | 2.5 | 1.0 |
| 01051000 | M5 20.10.25 | R+L | Ø 8-200 | 20x10x6 | 139,5 | 49 | 25 | 42 | 2.5 | 1.0 |
| 01050100 | M5 25.08.20 | R+L | Ø 8-300 | 25x8x8 | 150 | 60 | 20 | 55 | 2.1 | 1.0 |
| 01050200 | M5 25.08.25 | R+L | Ø 8-300 | 25x8x8 | 150 | 60 | 25 | 55 | 2.1 | 1.0 |
| 01050300 | M5 25.10.20 | R+L | Ø 8-300 | 25x10x8 | 150 | 60 | 20 | 55 | 2.1 | 1.0 |
| 01050400 | M5 25.10.25 | R+L | Ø 8-300 | 25x10x8 | 150 | 60 | 25 | 55 | 2.1 | 1.0 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01990601 | E 20.6 HM |
| 01986001 | E 20.8 HM |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M11

+ Características

- Recomendado para moleteados tipo RGE
- Para moleteados hasta una cara lateral (Fig. 1)
- Cabeza basculante para el autocentrado de las moletas sobre la pieza (Fig. 2)
- Ejes de HSS
- Superficie endurecida para una mayor resistencia al desgaste
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RGE type knurling
- For knurling up to a shoulder (Fig. 1)
- Pivoting head for knurls self-centering (Fig. 2)
- HSS bushings
- Anti-wearing treatment of the tool surface
- Adjustment of tool clearance angle by threaded studs integrated in the shank



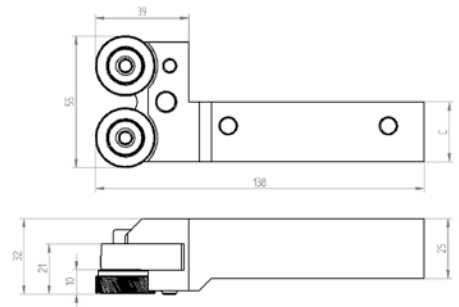
(Fig. 1)



(Fig. 2)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | R RGE 30° | R RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg Kg |
| 01080100 | M11 25.10.20 R | R | ∅ 8-200 | 25x10x15/11 | 20 | 1.0 |
| 01080200 | M11 25.10.20 L | L | ∅ 8-200 | 25x10x15/11 | 20 | 1.0 |
| 01080300 | M11 25.10.25 R | R | ∅ 8-200 | 25x10x15/11 | 25 | 1.2 |
| 01080400 | M11 25.10.25 L | L | ∅ 8-200 | 25x10x15/11 | 25 | 1.2 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985400 | ETM11 | |

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



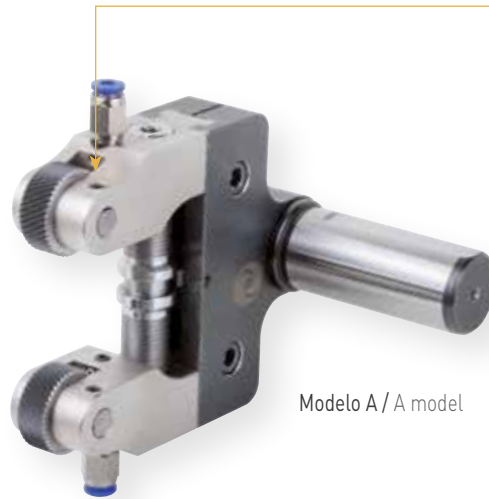
M22

+ Características

- Recomendado para moleteados tipo RGE en piezas de pequeño diámetro
- Menor riesgo de flexión de la pieza al no ejercer presión radial
- Sistema de centrado para compensar un posible desalineamiento del torno (Fig. 1)
- Ajuste y centrado de las moletas sobre la pieza mediante husillo roscado (Fig. 2)
- Ejes de metal duro (Modelo A)
- Superficie de los brazos endurecida para una mayor resistencia al desgaste
- Disponible con brazos modelo B para moleteados hasta una cara. (Fig. 3)

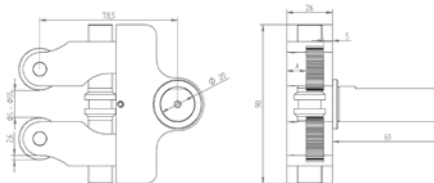
+ Features

- Recommended for RGE type knurling on small diameter workpieces
- Lower risk of bending the workpiece as tool does not make radial pressure
- Self-centering system to compensate a possible misalignment of the lathe turret (Fig. 1)
- Knurls self-centering by threaded spindle (Fig. 2)
- Carbide pins (A model)
- Anti-wearing treatment of the arms surface
- Available with B type arms for knurling up to a shoulder (Fig. 3)



Modelo A / A model

➤ MODELO A MODEL



(Fig. 1)



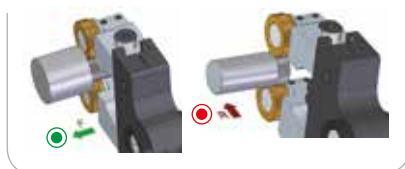
(Fig. 2)



(Fig. 3)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | RAA | R RGE 30° | R RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

Herramienta | Tool

| Código Code | Referencia Reference | Tipo Type | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg |
|----------------|-------------------------|--------------|--------------------|-----------------------|-----------------|-------|-----|
| 01300100 | M22 D19.05-A | A | R+L | ∅ 6-50 mm | 25x10x8 | 19.05 | 1.7 |
| 01300101 | M22 D19.05-B | B | R+L | ∅ 6-50 mm | 25x10x15/11 | 19.05 | 1.7 |
| 01300200 | M22 D20-A | A | R+L | ∅ 6-50 mm | 25x10x8 | 20 | 1.7 |
| 01300201 | M22 D20-B | B | R+L | ∅ 6-50 mm | 25x10x15/11 | 20 | 1.7 |
| 01300300 | M22 D22-A | A | R+L | ∅ 6-50 mm | 25x10x8 | 22 | 1.7 |
| 01300301 | M22 D22-B | B | R+L | ∅ 6-50 mm | 25x10x15/11 | 22 | 1.7 |
| 01300400 | M22 D25-A | A | R+L | ∅ 6-50 mm | 25x10x8 | 25 | 1.7 |
| 01300401 | M22 D25-B | B | R+L | ∅ 6-50 mm | 25x10x15/11 | 25 | 1.7 |
| 01300500 | M22 D25.4-A | A | R+L | ∅ 6-50 mm | 25x10x8 | 25.4 | 1.7 |
| 01300501 | M22 D25.4-B | B | R+L | ∅ 6-50 mm | 25x10x15/11 | 25.4 | 1.7 |

Repuesto | Spare Part

| Código Code | Referencia Reference | |
|---------------------------|-------------------------|--|
| Modelo A Model | | |
| 01990800 | E 26.8 HM | |
| Modelo B Model | | |
| 01983200 | EAM10 | |

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M23

+ Características

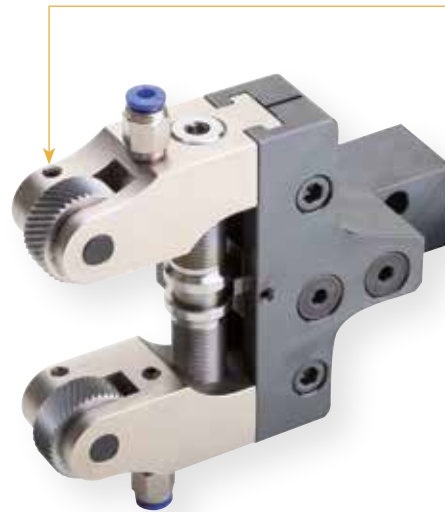
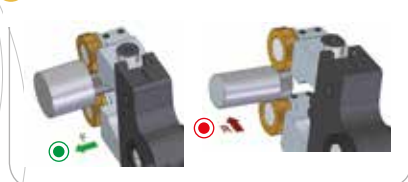
- Recomendado para moleteados tipo RGE en piezas de pequeño diámetro
- Menor riesgo de flexión de la pieza al no ejercer presión radial
- Sistema de centrado para compensar un posible desalineamiento del torno (Fig. 1)
- Ajuste y centrado de las moletas sobre la pieza mediante husillo roscado (Fig. 2)
- Ejes de metal duro
- Superficie de los brazos endurecida para una mayor resistencia al desgaste
- Disponible con brazos modelo B para moleteados hasta una cara. (Fig. 3)

+ Features

- Recommended for RGE type knurling on small diameter workpieces
- Lower risk of bending the workpiece as tool does not make radial pressure
- Self-centering system to compensate a possible misalignment of the lathe turret (Fig. 1)
- Knurls self-centering by threaded spindle (Fig. 2)
- Carbide pins
- Anti-wearing treatment of the arms surface
- Available with B type arms for knurling up to a shoulder (Fig. 3)

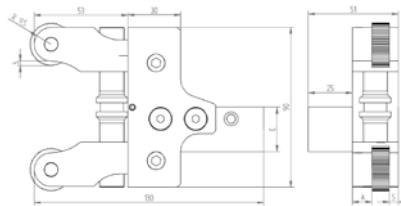


+ Avance Feed



Modelo A / A model

MODELO A MODEL



(Fig. 1)



(Fig. 2)



(Fig. 3)

+ Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|---------|---------------|---------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | AA+AA | BL30° + BR30° | BL45° + BR45° |
| Avances permitidos Allowed feeds | F ● R ● | F ● R ● | F ● R ● |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------|--------------------|-----------------------|-----------------|----|-----|
| Código Code | Referencia Reference | Tipo Type | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg |
| 01310100 | M23 20 R-A | A | R | ∅ 6-50 | 25x10x8 | 20 | 1.7 |
| 01310101 | M23 20 R-B | B | R | ∅ 6-50 | 25x10x15/11 | 20 | 1.7 |
| 01310200 | M23 20 L-A | A | L | ∅ 6-50 | 25x10x8 | 20 | 1.7 |
| 01310201 | M23 20 L-B | B | L | ∅ 6-50 | 25x10x15/11 | 20 | 1.7 |
| 01310300 | M23 25 R-A | A | R | ∅ 6-50 | 25x10x8 | 25 | 1.7 |
| 01310301 | M23 25 R-B | B | R | ∅ 6-50 | 25x10x15/11 | 25 | 1.7 |
| 01310400 | M23 25 L-A | A | L | ∅ 6-50 | 25x10x8 | 25 | 1.7 |
| 01310401 | M23 25 L-B | B | L | ∅ 6-50 | 25x10x15/11 | 25 | 1.7 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| Modelo A Model | |
| 01990800 | E 26.8 HM |
| Modelo B Model | |
| 01983200 | EAM10 |

MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M16

+ Características

- Recomendado para moleteados tipo RKA
- Especial para moleteado según DIN-72783
- Menor riesgo de flexión de la pieza al no ejercer presión radial
- Sistema de centrado para compensar un posible desalineamiento del torno (Fig. 1)
- Ajuste y centrado de las moletas sobre la pieza mediante husillo roscado (Fig. 2)
- Ejes de metal duro
- Provista de arandelas de HSS para evitar el desgaste de los brazos portamoletas

+ Features

- Recommended for RKA type knurling
- Specially designed for knurling according to DIN-72783
- Lower risk of bending the workpiece as tool does not make radial pressure
- Self-centering system to compensate a possible misalignment of the lathe turret (Fig. 1)
- Knurls self-centering by threaded spindle (Fig. 2)
- Carbide pins
- Supplied with HSS hardened washers to prevent arms wearing



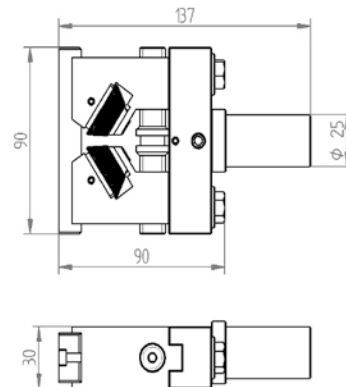
+ Avance Feed



(Fig. 1)



(Fig. 2)



+ Formas de moleteados realizables Feasible knurling forms

| | RKA | RKGE 30° | RKGE 45° |
|-------------------------------------|----------|-----------------|-----------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurl type | KA + KAA | KBL30° + KBR30° | KBL45° + KBR45° |
| Avances permitidos Allowed feeds | F | F | F |


R Moleteados recomendados | Recommended knurling

Herramienta | Tool

| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
|----------------|-------------------------|--------------------|-----------------------|-------------------|----------|
| 01210100 | M16 | R+L | ∅ 1 - 12 | Cónica Conical | 1.5 |

Repuesto | Spare Part

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 01981700 | EM16 HM |



MOLETEADORES POR DEFORMACIÓN FORM-KNURLING TOOLS



M17

Características

- Recomendado para moleteados tipo RAA y RGE
- Ataque frontal mediante 3 garras de ajuste simultaneo (Fig. 1)
- Sistema de centrado para compensar un posible desalineamiento del torno (Fig. 2)
- Ejes de metal duro
- Superficie endurecida para una mayor resistencia al desgaste
- Disponible con brazos modelo B para moleteados hasta una cara. (Fig. 3)

Features

- Recommended for RAA and RGE type knurling
- Frontal feeding by means of 3 jaws simultaneously adjusted (Fig. 1)
- Self-centering system to compensate a possible misalignment of the lathe turret (Fig. 2)
- Carbide pins
- Anti-wearing treatment of the tool surface
- Available with B type arms for knurling up to a shoulder (Fig. 3)



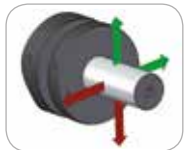
Modelo A / A model



(Fig. 1)

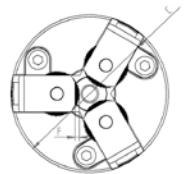
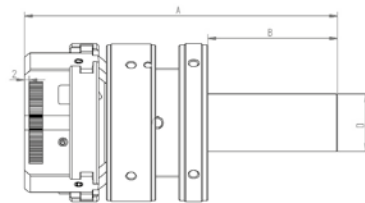


(Fig. 2)



(Fig. 3)

Avance Feed



Formas de moleteados realizables Feasible knurling forms

| | RAA | RGE 30° | RGE 45° |
|-------------------------------------|----------|-----------------------|-----------------------|
| Tipo de moleteado Knurling form | | | |
| Con moleta tipo With knurt type | AA+AA+AA | BL30° + BR30° + BR30° | BL45° + BR45° + BR45° |
| Avances permitidos Allowed feeds | F | F | F |

Moleteados recomendados | Recommended knurlings

LONGITUD MÁXIMA DE MOLETEADO (mm) MAXIMUM KNURLING LENGTH (mm)

| Modelo Model | Ø Pieza Piece Ø | Longitud (mm) Length (mm) |
|-----------------|--------------------|------------------------------|
| M17 10 | <10 | 40 |
| M17 15 | | 69 |
| M17 15 | <14 | 69 |
| | >14<21 | 37 |
| | >21<30 | 17 |

Herramienta | Tool

| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | A | B | C | E | F | Kg Kg |
|----------------|-------------------------|--------------------|-----------------------|-----------------|-----|------|----|-------|-----|----------|
| 01170300 | M17 10.04.1/2" | A | Ø 2 ÷ 10 | 10x4x4 | 107 | 57,5 | 44 | 12,7 | 1,5 | 1,0 |
| 01170100 | M17 10.04.16 | A | Ø 2 ÷ 10 | 10x4x4 | 107 | 57,5 | 44 | 16 | 1,5 | 1,0 |
| 01170500 | M17 20.06.3/4" | A | Ø 4 ÷ 30 | 20x6x6 | 139 | 57,5 | 70 | 19,05 | 2,0 | 1,4 |
| 01170200 | M17 20.06.20 | A | Ø 4 ÷ 30 | 20x6x6 | 139 | 57,5 | 70 | 20 | 2,0 | 1,4 |
| 01170600 | M17 20.06.22 | A | Ø 4 ÷ 30 | 20x6x6 | 139 | 57,5 | 70 | 22 | 2,0 | 1,5 |
| 01170700 | M17 20.06.25 | A | Ø 4 ÷ 30 | 20x6x6 | 139 | 57,5 | 70 | 25 | 2,0 | 1,5 |
| 01170400 | M17 20.06.1" | A | Ø 4 ÷ 30 | 20x6x6 | 139 | 57,5 | 70 | 25,4 | 2,0 | 1,5 |
| 01170301 | M17 15.06.1/2" | B | Ø 2 ÷ 10 | 15x6x10/6 | 113 | 57,5 | 44 | 12,7 | - | 1,0 |
| 01170101 | M17 15.06.16 | B | Ø 2 ÷ 10 | 15x6x10/6 | 113 | 57,5 | 44 | 16 | - | 1,0 |
| 01170501 | M17 25.10.3/4" | B | Ø 4 ÷ 30 | 25x10x15/11 | 149 | 57,5 | 70 | 19,05 | - | 1,4 |
| 01170201 | M17 25.10.20 | B | Ø 4 ÷ 30 | 25x10x15/11 | 149 | 57,5 | 70 | 20 | - | 1,4 |
| 01170601 | M17 25.10.22 | B | Ø 4 ÷ 30 | 25x10x15/11 | 149 | 57,5 | 70 | 22 | - | 1,5 |
| 01170701 | M17 25.10.25 | B | Ø 4 ÷ 30 | 25x10x15/11 | 149 | 57,5 | 70 | 25 | - | 1,5 |
| 01170401 | M17 25.10.1" | B | Ø 4 ÷ 30 | 25x10x15/11 | 149 | 57,5 | 70 | 25,4 | - | 1,5 |

Repuesto | Spare Part

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 01981800 | EM17 10.04 HM |
| 01998201 | EM17 20.06 HM |
| 01983220 | EAM20/M21 |
| 01983200 | EAM10 |



▶ MOLETEADORES POR CORTE CUT-KNURLING TOOLS

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- MF 14 46
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- MF 42 49

KITS

- KMF 50





MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MFS 89



(Fig. 1)

+ Características

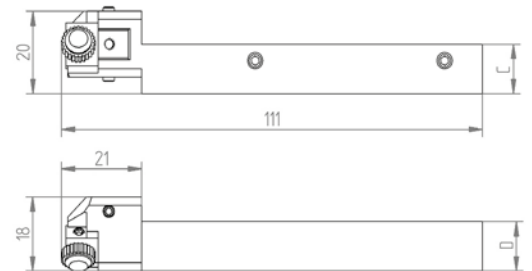
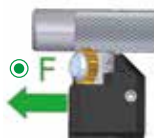
- Recomendado para moleteados tipo RAA
- Cabeza basculante para el alineamiento de la moleta (Fig. 1)
- Eje de HSS
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Pivoting head for knurl alignment (Fig. 1)
- HSS bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RAA | RBR 30° | R RAA | RBL 30° |
|-------------------------------------|---------------------------------------|---------|--|---------|
| Tipo de moleteado Knurling form | | | | |
| Con moleta tipo With knurl type | BR30° | AA | BL30° | AA |
| Con herramienta With tool | Versión derecha R Right - handed R | | Versión izquierda L Left - handed L | |
| Avances permitidos Allowed feeds | F | F | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01090900 | MFS 89.25.08 R | R | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 8 | 8 | 0.2 |
| 01091000 | MFS 89.25.08 L | L | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 8 | 8 | 0.2 |
| 01091100 | MFS 89.25.10 R | R | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 10 | 10 | 0.2 |
| 01091200 | MFS 89.25.10 L | L | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 10 | 10 | 0.2 |
| 01091300 | MFS 89.25.12 R | R | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 12 | 12 | 0.2 |
| 01091400 | MFS 89.25.12 L | L | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 12 | 12 | 0.2 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01993300 | ES 89.25HSS |





MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MFS1 14



(Fig. 1)

+ Características

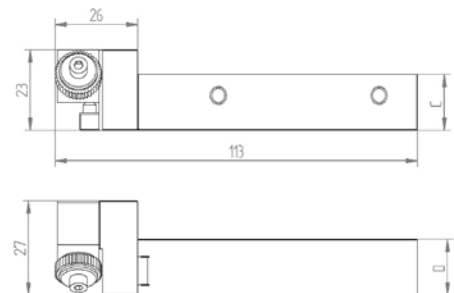
- Recomendado para moleteados tipo RAA
- Cabeza basculante para el alineamiento de la moleta (Fig. 1)
- Eje de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Pivoting head for knurl alignment (Fig. 1)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RAA | RBR 30° | R RAA | RBL 30° |
|-------------------------------------|---------------------------------------|---------|--|---------|
| Tipo de moleteado Knurling form | | | | |
| Con moleta tipo With knurl type | BR30° | AA | BL30° | AA |
| Con herramienta With tool | Versión derecha R Right - handed R | | Versión izquierda L Left - handed L | |
| Avances permitidos Allowed feeds | F | F | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01260100 | MFS1 14.53.12 R | R | ∅ 3 ÷ 50 | 14.5x3x5 | 12 | 14 | 0.3 |
| 01260200 | MFS1 14.53.12 L | L | ∅ 3 ÷ 50 | 14.5x3x5 | 12 | 14 | 0.3 |
| 01260300 | MFS1 14.53.14 R | R | ∅ 3 ÷ 50 | 14.5x3x5 | 14 | 14 | 0.3 |
| 01260400 | MFS1 14.53.14 L | L | ∅ 3 ÷ 50 | 14.5x3x5 | 14 | 14 | 0.3 |
| 01260500 | MFS1 14.53.16 R | R | ∅ 3 ÷ 50 | 14.5x3x5 | 16 | 16 | 0.3 |
| 01260600 | MFS1 14.53.16 L | L | ∅ 3 ÷ 50 | 14.5x3x5 | 16 | 16 | 0.3 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985600 | EAT 14.53 | |

MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MFS 14

+ Características

- Recomendado para moleteados tipo RAA
- Cabeza basculante para el alineamiento de la moleta (Fig. 1)
- Cabeza reversible para trabajar a derechas o izquierdas (Fig. 2)
- Eje de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Pivoting head for knurl alignment (Fig. 1)
- Tool with reversible head able to fit on left-hand or right-hand lathes (Fig. 2)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank

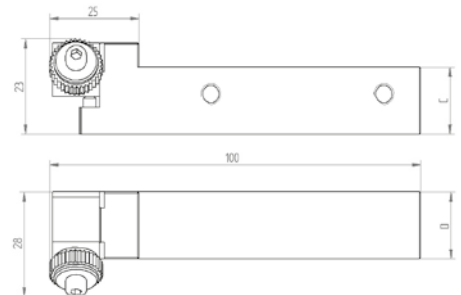
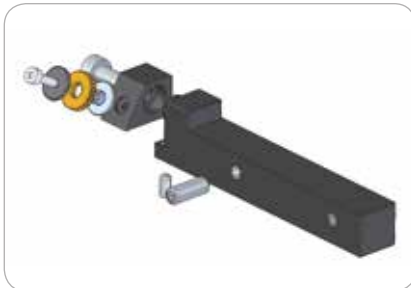


(Fig. 1)



(Fig. 2)

+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RAA | RBR 30° | R RAA | RBL 30° |
|-------------------------------------|---------------------------------------|---------|--|---------|
| Tipo de moleteado Knurling form | | | | |
| Con moleta tipo With knurl type | BR30° | AA | BL30° | AA |
| Con herramienta With tool | Versión derecha R Right - handed R | | Versión izquierda L Left - handed L | |
| Avances permitidos Allowed feeds | F | F | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01090500 | MFS 14.53.12 | R+L | ∅ 3 ÷ 50 | 14.5x3x5 | 12 | 16 | 0.2 |
| 01090100 | MFS 14.53.14 | R+L | ∅ 3 ÷ 50 | 14.5x3x5 | 14 | 16 | 0.2 |
| 01090200 | MFS 14.53.16 | R+L | ∅ 3 ÷ 50 | 14.5x3x5 | 16 | 16 | 0.2 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01985600 | EAT 14.53 |





MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MFS 21

+ Características

- Recomendado para moleteados tipo RAA
- Cabeza basculante para el alineamiento de la moleta (Fig. 1)
- Cabeza reversible para trabajar a derechas o izquierdas (Fig. 2)
- Eje de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

- Recommended for RAA type knurling
- Pivoting head for knurl alignment (Fig. 1)
- Tool with reversible head able to fit on lefthand or right-hand lathes (Fig. 2)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



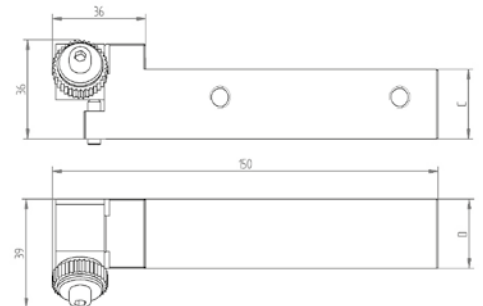
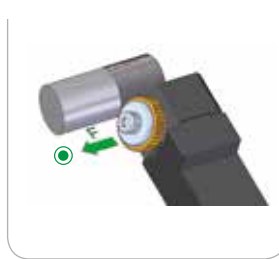
(Fig. 1)



(Fig. 2)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | ^R RAA | RBR 30° | ^R RAA | RBL 30° |
|-------------------------------------|---------------------------------------|---------|--|---------|
| Tipo de moleteado Knurling form | | | | |
| Con moleta tipo With knurl type | BR30° | AA | BL30° | AA |
| Con herramienta With tool | Versión derecha R Right - handed R | | Versión izquierda L Left - handed L | |
| Avances permitidos Allowed feeds | F | F | F | F |

^R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01090300 | MFS 21.55.20 | R+L | ∅ 4 ÷ 250 | 21.5x5x8 | 20 | 25 | 0.8 |
| 01090400 | MFS 21.55.25 | R+L | ∅ 4 ÷ 250 | 21.5x5x8 | 25 | 25 | 0.8 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985700 | EAT 21.55 | |



MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MFS 32

+ Características

- Recomendado para moleteados tipo RAA
- Giro de la cabeza portamoletas mediante tornillo sin fin, para un alineamiento preciso de la moleta (Fig. 1)
- Cuerpo reversible para trabajar a derechas o a izquierdas (Fig. 2)
- Mínimo voladizo entre el amarre y el extremo de la moleta (Fig. 3)
- Máxima rigidez para garantizar una calidad excelente de moleteado.
- Posibilidad de moletear cualquier hélice entre 0°-30° (Fig. 4)

+ Features

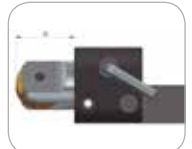
- Recommended for RAA knurling
- Pivoting head by endless screw, for a precise knurl alignment (Fig. 1)
- Reversible body for righthand or lefthand tool version (Fig. 2)
- Minimum tool overhang (Fig. 3)
- Maximum rigidity to guarantee an excellent knurling quality.
- Possibility of knurling any helix between 0°-30° (Fig. 4)



(Fig. 1)



(Fig. 2)



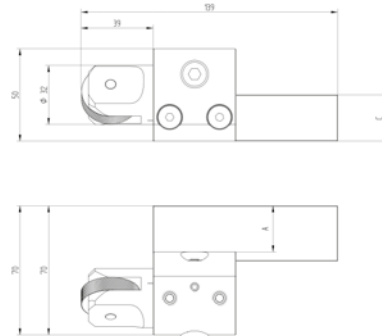
(Fig. 3)



(Fig. 4)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RAA | RBR 30° | R RAA | RBL 30° |
|-------------------------------------|---|---------|--|---------|
| Tipo de moleteado Knurling form | | | | |
| Con moleta tipo With knurl type | BR30° | AA | BL30° | AA |
| Con herramienta With tool | Cabeza inclinada 30° a la derecha Knurl head tilted 30° to the right | | Cabeza inclinada 30° a la izquierda Knurl head tilted 30° to the left | |
| Avances permitidos Allowed feeds | F | F | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01230100 | MFS 32.08.20 | R+L | ∅ 50 - 1000 | 32x8x14 | 20 | 25 | 1.5 |
| 01230200 | MFS 32.08.25 | R+L | ∅ 50 - 1000 | 32x8x14 | 25 | 25 | 1.5 |
| 01230300 | MFS 32.08.32 | R+L | ∅ 50 - 1000 | 32x8x14 | 32 | 32 | 1.5 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01239901 | TCMFS 32 |





MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MFS 42



(Fig. 1)

+ Características

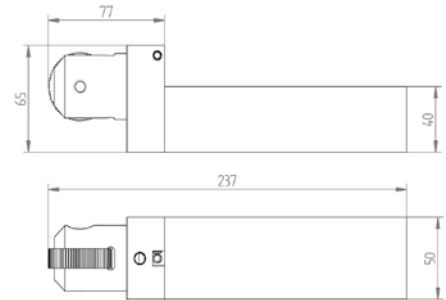
- Recomendado para moleteados tipo RAA
- Cabeza basculante para el alineamiento de la moleta (Fig. 1)
- Posibilidad de trabajar a derechas o a izquierdas girando la cabeza
- Eje de HSS

+ Features

- Recommended for RAA type knurling
- Pivoting head for knurl alignment (Fig. 1)
- Tool with reversible head able to fit on left-hand or right-hand lathes
- HSS bushing



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RAA | RBR 30° | R RAA | RBL 30° |
|-------------------------------------|---------------------------------------|---------|--|---------|
| Tipo de moleteado Knurling form | | | | |
| Con moleta tipo With knurl type | BR30° | AA | BL30° | AA |
| Con herramienta With tool | Versión derecha R Right - handed R | | Versión izquierda L Left - handed L | |
| Avances permitidos Allowed feeds | F | F | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
| 01270100 | MFS 42.12.40 | R+L | ∅ 100 ÷ 3000 | 42x12x18 | 7.0 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01995901 | TCMFS 42 |





MOLETEADORES POR CORTE CUT-KNURLING TOOLS



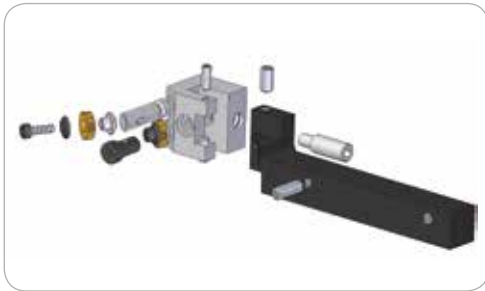
MF 89

+ Características

- Recomendado para moleteados tipo RGE
- Ajuste de las moletas según diámetro a moletear mediante escala graduada (Fig. 2)
- Cabeza basculante para el alineamiento de las moletas (Fig. 1)
- Ejes de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

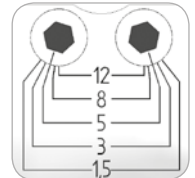
- Recommended for RGE type knurling
- Easy setting to the workpiece diameter by means of a graduated scale (Fig. 2)
- Pivoting head for knurls self-centering (Fig. 1)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



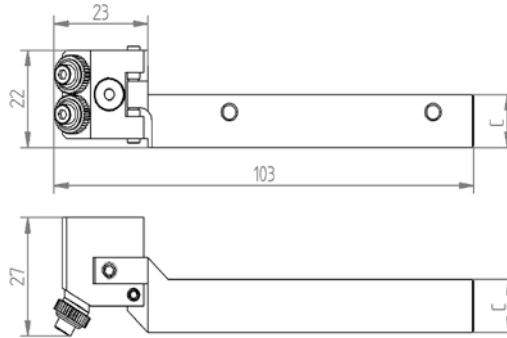
+ Avance Feed



(Fig. 1)



(Fig. 2)



+ Formas de moleteados realizables Feasible knurling forms

| | R RGE 30° | R RGE 45° |
|-------------------------------------|--------------|---------------|
| Tipo de moleteado Knurling form | | |
| Con moleta tipo With knurl type | AA + AA | BL15° + BR15° |
| Avances permitidos Allowed feeds | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | Kg Kg |
| 01101300 | MF 89.25.08 R | R | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 8 | 0.2 |
| 01101400 | MF 89.25.08 L | L | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 8 | 0.2 |
| 01101500 | MF 89.25.10 R | R | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 10 | 0.2 |
| 01101600 | MF 89.25.10 L | L | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 10 | 0.2 |
| 01101700 | MF 89.25.12 R | R | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 12 | 0.2 |
| 01101800 | MF 89.25.12 L | L | Ø 1.5 ÷ 12 | 8.9x2.5x4 | 12 | 0.2 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985500 | EAT 89.25 | |



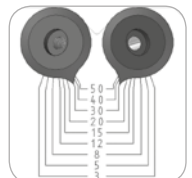
MOLETEADORES POR CORTE CUT-KNURLING TOOLS



MF1 14



(Fig. 1)



(Fig. 2)

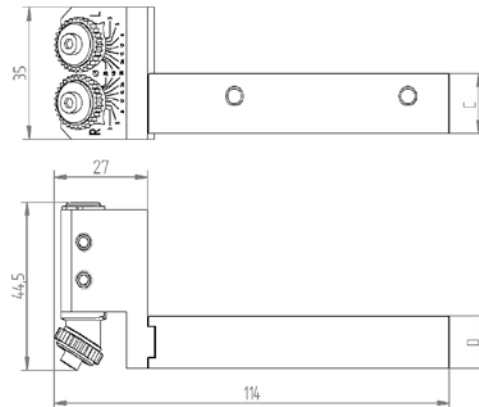
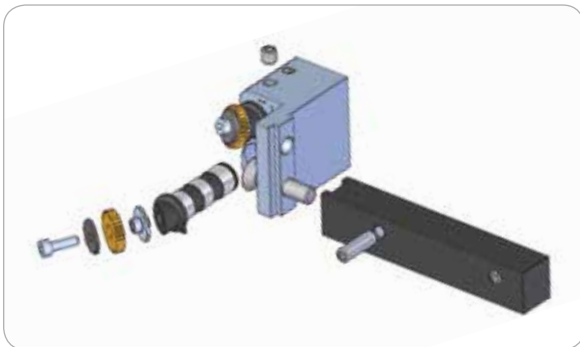
+ Características

- Recomendado para moleteados tipo RGE
- Ajuste de las moletas según diámetro a moletear mediante escala graduada (Fig. 2)
- Doble posición del mango para trabajar a derechas o izquierdas (Fig. 1)
- Ejes de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

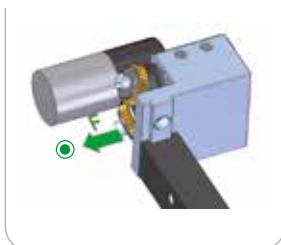


+ Features

- Recommended for RGE type knurling
- Easy setting to the workpiece diameter by means of a graduated scale (Fig. 2)
- Tool with reversible shank able to lit on left-hand or right-hand lathes (Fig. 1)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RGE 30° | R RGE 45° |
|-------------------------------------|--------------|---------------|
| Tipo de moleteado Knurling form | | |
| Con moleta tipo With knurl type | AA + AA | BL15° + BR15° |
| Avances permitidos Allowed feeds | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01250100 | MF1 14.53.12 | R+L | ∅ 3 ÷ 50 | 14.5x3x5 | 12 | 14 | 0.5 |
| 01250200 | MF1 14.53.14 | R+L | ∅ 3 ÷ 50 | 14.5x3x5 | 14 | 14 | 0.5 |
| 01250300 | MF1 14.53.16 | R+L | ∅ 3 ÷ 50 | 14.5x3x5 | 16 | 16 | 0.5 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985600 | EAT 14.53 | |



MOLETEADORES POR CORTE CUT-KNURLING TOOLS



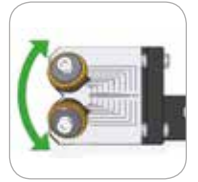
MF 14

+ Características

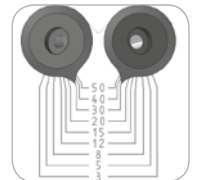
- Recomendado para moleteados tipo RGE
- Ajuste de las moletas según diámetro a moletear mediante escala graduada (Fig. 2)
- Cabeza basculante para el alineamiento de las moletas (Fig. 1)
- Ejes de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

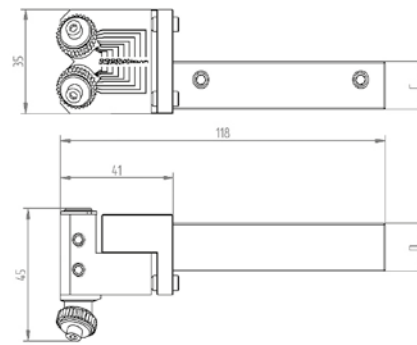
- Recommended for RGE type knurling
- Easy setting to the workpiece diameter by means of a graduated scale (Fig. 2)
- Pivoting head for knurls self-centering (Fig. 1)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



(Fig. 1)



(Fig. 2)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RGE 30° | R RGE 45° |
|-------------------------------------|--------------|---------------|
| Tipo de moleteado Knurling form | | |
| Con moleta tipo With knurl type | AA + AA | BL15° + BR15° |
| Avances permitidos Allowed feeds | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01100900 | MF14.53.12 R | R | ∅ 3 ÷ 50 | 14.5x3x5 | 12 | 16 | 0.5 |
| 01101000 | MF 14.53.12 L | L | ∅ 3 ÷ 50 | 14.5x3x5 | 12 | 16 | 0.5 |
| 01100100 | MF 14.53.14 R | R | ∅ 3 ÷ 50 | 14.5x3x5 | 14 | 16 | 0.5 |
| 01100200 | MF 14.53.14 L | L | ∅ 3 ÷ 50 | 14.5x3x5 | 14 | 16 | 0.5 |
| 01100300 | MF 14.53.16 R | R | ∅ 3 ÷ 50 | 14.5x3x5 | 16 | 16 | 0.5 |
| 01100400 | MF 14.53.16 L | L | ∅ 3 ÷ 50 | 14.5x3x5 | 16 | 16 | 0.5 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01985600 | EAT 14.53 |





MOLETEADORES POR CORTE CUT-KNURLING TOOLS



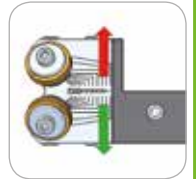
MF 21

+ Características

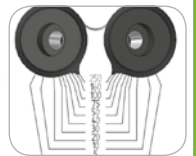
- Recomendado para moleteados tipo RGE
- Ajuste de las moletas según diámetro a moletear mediante escala graduada (Fig. 2)
- Cabeza ajustable en altura para el alineamiento de las moletas (Fig. 1)
- Cabeza reversible para trabajar a derechas o izquierdas (Fig. 3)
- Ejes de HSS+TIN
- Ajuste del ángulo de ataque mediante tornillos integrados en el mango

+ Features

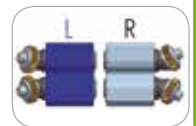
- Recommended for RGE type knurling
- Easy setting to the workpiece diameter by means of a graduated scale (Fig. 2)
- Up&down tool head alignment for knurls centering (Fig. 1)
- Tool with reversible head able to fit on left-hand or right-hand lathes (Fig. 3)
- HSS+TIN bushing
- Adjustment of tool clearance angle by threaded studs integrated in the shank



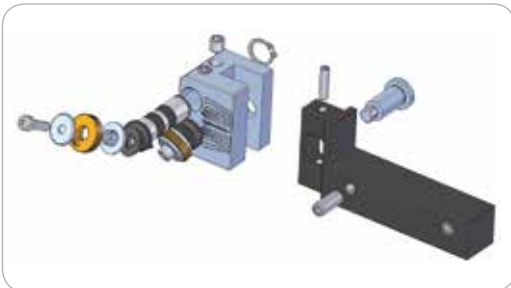
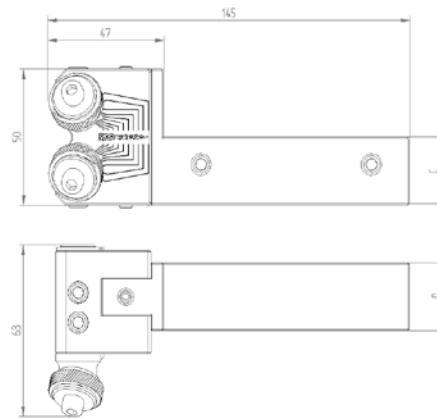
(Fig. 1)



(Fig. 2)



(Fig. 3)

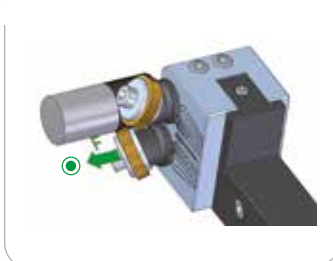


+ Formas de moleteados realizables Feasible knurling forms

| | R RGE 30° | R RGE 45° |
|-------------------------------------|--------------|---------------|
| Tipo de moleteado Knurling form | | |
| Con moleta tipo With knurl type | AA + AA | BL15° + BR15° |
| Avances permitidos Allowed feeds | F | F |

R Moleteados recomendados | Recommended knurling

+ Avance Feed



| Herramienta Tool | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | C | D | Kg Kg |
| 01100500 | MF 21.55.20 | R+L | ∅ 5 ÷ 250 | 21.5x5x8 | 20 | 25 | 1.3 |
| 01100700 | MF 21.55.25 | R+L | ∅ 5 ÷ 250 | 21.5x5x8 | 25 | 25 | 1.4 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985700 | EAT 21.55 | |



MOLETEADORES POR CORTE CUT-KNURLING TOOLS



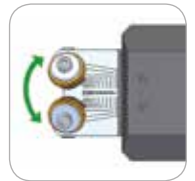
MF 21 VDI

+ Características

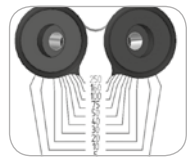
- Recomendado para moleteados tipo RGE
- Ajuste de las moletas según diámetro a moletear mediante escala graduada (Fig. 2)
- Cabeza basculante para el alineamiento de las moletas (Fig. 1)
- Ejes de HSS+TIN

+ Features

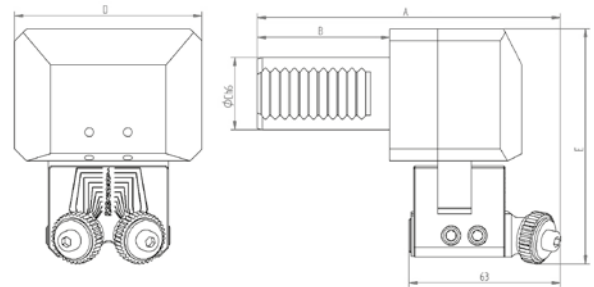
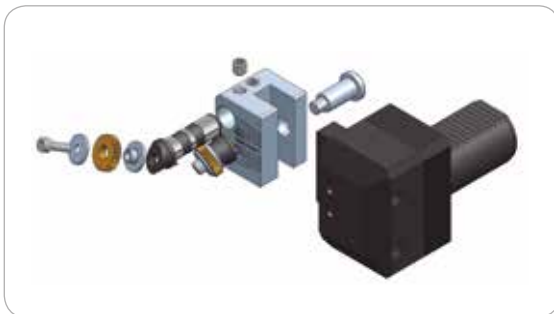
- Recommended for RGE type knurling
- Easy setting to the workpiece diameter by means of a graduated scale (Fig. 2)
- Pivoting head for knurl alignment (Fig. 1)
- HSS+TIN bushing



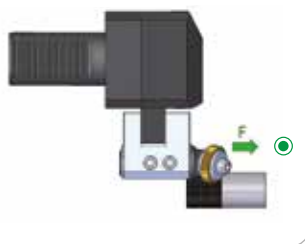
(Fig. 1)



(Fig. 2)



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RGE 30° | R RGE 45° |
|-------------------------------------|--------------|---------------|
| Tipo de moleteado Knurling form | | |
| Con moleta tipo With knurl type | AA + AA | BL15° + BR15° |
| Avances permitidos Allowed feeds | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|-----|----|----|----|----|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | A | B | C | D | E | Kg Kg |
| 01140100 | MF 21.55 VDI 30R | R | Ø 5 ÷ 250 | 21.5x5x8 | 126 | 55 | 30 | 68 | 95 | 0.5 |
| 01140200 | MF 21.55 VDI 30L | L | Ø 5 ÷ 250 | 21.5x5x8 | 126 | 55 | 30 | 68 | 95 | 0.5 |
| 01140300 | MF 21.55 VDI 40R | R | Ø 5 ÷ 250 | 21.5x5x8 | 136 | 63 | 40 | 78 | 98 | 0.5 |
| 01140400 | MF 21.55 VDI 40L | L | Ø 5 ÷ 250 | 21.5x5x8 | 136 | 63 | 40 | 78 | 98 | 0.5 |

| Repuesto Spare Part | | |
|-----------------------|-------------------------|--|
| Código Code | Referencia Reference | |
| 01985700 | EAT 21.55 | |



MOLETEADORES POR CORTE CUT-KNURLING TOOLS



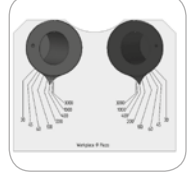
MF 42



(Fig. 1)



(Fig. 2)



(Fig. 3)

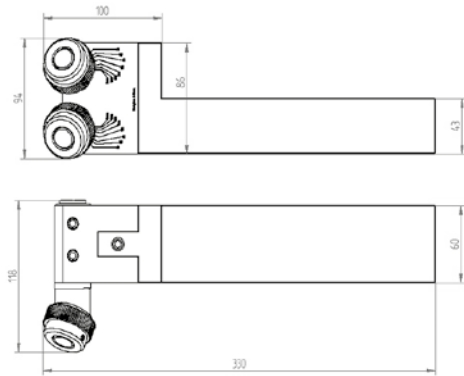
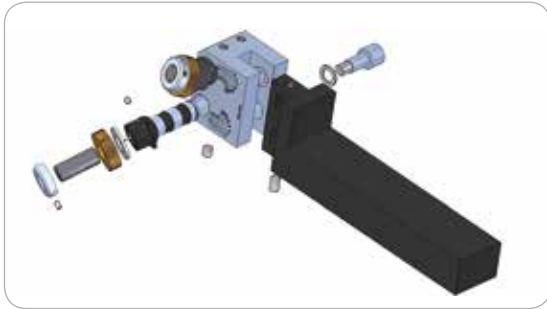
+ Características

- Recomendado para moleteados tipo RGE
- Ajuste de las moletas según diámetro a moletear mediante escala graduada (Fig. 3)
- Cabeza ajustable en altura para el alineamiento de las moletas (Fig. 1)
- Cabeza reversible para trabajar a derechas o izquierdas (Fig. 2)
- Ejes de metal duro



+ Features

- Recommended for RGE type knurling
- Easy setting to the workpiece diameter by means of a graduated scale (Fig. 3)
- Up&down tool head alignment for knurls centering (Fig. 1)
- Tool with reversible head able to fit on left-hand or right-hand lathes (Fig. 2)
- Carbide pins



+ Avance Feed



+ Formas de moleteados realizables Feasible knurling forms

| | R RGE 30° | R RGE 45° |
|-------------------------------------|--------------|---------------|
| Tipo de moleteado Knurling form | | |
| Con moleta tipo With knurl type | AA + AA | BL15° + BR15° |
| Avances permitidos Allowed feeds | F | F |

R Moleteados recomendados | Recommended knurling

| Herramienta Tool | | | | | |
|--------------------|-------------------------|--------------------|-----------------------|-----------------|----------|
| Código Code | Referencia Reference | Versión Version | Capacidad Capacity | Moleta Knurl | Kg Kg |
| 01240100 | MF 42.12.40 | R+L | Ø 100 ÷ 3000 | 42x12x18 | 9.0 |

| Repuesto Spare Part | |
|-----------------------|-------------------------|
| Código Code | Referencia Reference |
| 01240105 | EMMF 42 |





KIT DE MOLETEADORES DE CORTE CUT-KNURING KITS



KMF

+ Características

- Kit de moleteado por fresado compuesto por una herramienta doble para moleteados cruzados tipo RGE y una herramienta simple para moleteados rectos tipo RAA
- Varios tamaños disponibles
- Suministrado en una estuche de protección de PVD rígido
- Incluye llaves de servicio
- No incluye moletas

+ Features

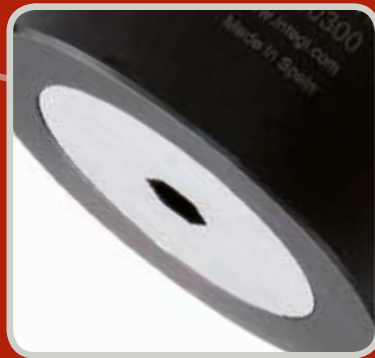
- Cut knurling kit consisting of a double tool for cross-knurling type RGE and a single tool for straight knurling type RAA
- Available in various sizes
- Supplied in a rigid PVD protection case
- Service keys included
- Knurls not included



| Herramienta Tool | | | |
|--------------------|-------------------------|--|-----------------------|
| Código Code | Referencia Reference | Herramientas incluidas Included tools | Capacidad Capacity |
| 01220400 | KMF 89-08 R | MF 89.25.08 R + MFS 89.25.08 R | Ø1,5-12 |
| 01220500 | KMF 89-08 L | MF 89.25.08 L + MFS 89.25.08 L | Ø1,5-12 |
| 01220600 | KMF 89-10 R | MF 89.25.10 R + MFS 89.25.10 R | Ø1,5-12 |
| 01220700 | KMF 89-10 L | MF 89.25.10 L + MFS 89.25.10 L | Ø1,5-12 |
| 01220800 | KMF 89-12 R | MF 89.25.12 R + MFS 89.25.12 R | Ø1,5-12 |
| 01220900 | KMF 89-12 L | MF 89.25.12 L + MFS 89.25.12 L | Ø1,5-12 |
| 01221000 | KMF1 14-12 R | MF1 14.53.12 + MFS1 14.53.12 R | Ø3-50 |
| 01221100 | KMF1 14-12 L | MF1 14.53.12 + MFS1 14.53.12 L | Ø3-50 |
| 01221200 | KMF1 14-14 R | MF1 14.53.14 + MFS1 14.53.14 R | Ø3-50 |
| 01221300 | KMF1 14-14 L | MF1 14.53.14 + MFS1 14.53.14 L | Ø3-50 |
| 01221400 | KMF1 14-16 R | MF1 14.53.16 + MFS1 14.53.16 R | Ø3-50 |
| 01221500 | KMF1 14-16 L | MF1 14.53.16 + MFS1 14.53.16 L | Ø3-50 |
| 01221600 | KMF 14-12 R | MF 14.53.12 R + MFS 14.53.12 | Ø3-50 |
| 01221700 | KMF 14-12 L | MF 14.53.12 L + MFS 14.53.12 | Ø3-50 |
| 01221800 | KMF 14-14 R | MF 14.53.14 R + MFS 14.53.14 | Ø3-50 |
| 01221900 | KMF 14-14 L | MF 14.53.14 L + MFS 14.53.14 | Ø3-50 |
| 01222000 | KMF 14-16 R | MF 14.53.16 R + MFS 14.53.16 | Ø3-50 |
| 01222100 | KMF 14-16 L | MF 14.53.16 L + MFS 14.53.16 | Ø3-50 |
| 01220200 | KMF 21-20 | MF 21.55.20 + MFS 21.55.20 | Ø5-250 |
| 01220300 | KMF 21-25 | MF 21.55.25 + MFS 21.55.25 | Ø5-250 |

BROCHADO ROTATORIO

ROTARY BROACHING





BROCHADO ROTATORIO ROTARY BROACHING



1. Introducción

El brochado rotatorio es un sistema sencillo, rápido y económico de mecanizar perfiles poligonales (cuadrados, hexagonales, hexalobulares, estriados...) tanto interiores, ciegos o pasantes, como exteriores sobre piezas de los más diversos materiales.

El principio de funcionamiento es simple. El eje del elemento de corte (punzón o matriz) está desviado 1° respecto del eje de giro de la pieza a mecanizar así como del eje del cabezal. Esta diferencia de ángulo hace que el elemento de corte gire ejecutando un movimiento oscilatorio que provoca un cizallado progresivo según se profundiza en la pieza. Ese cizallado reproduce fielmente sobre la pieza el perfil del elemento de corte utilizado.

El elemento de corte tiene un ángulo de desprendimiento de 1,5° de manera que corte solamente con la arista. Si el ángulo es igual o inferior a 1° el elemento de corte talona y no corta adecuadamente, lo que provoca una mala calidad de las caras de corte. Si por el contrario el ángulo es superior a 1,5° lo que hacemos es aumentar la fragilidad.



Brochado exterior
External broaching

1. Introduction

The rotary broaching is a simple, fast and economic system to machine polygonal shapes (square, hexagonal, six lobe, splined shafts ...) as much internal, blind or through, as external in a wide variety of materials.

The operating principle is simple. The axle of the broach is divert 1° from the axle of rotation of the workpiece. This angle difference makes the broach rotate executing an oscillatory movement which cut the material reproducing accurately the shape of the broach used.

The broach has a 1.5° clearance angle so it cuts only with the edge. If the angle is equal or lower than 1° the broach does not cut properly, causing poor quality of the faces. If the angle is greater than 1.5° the broach fragility increases.



Brochado interno
Internal broaching

2. Brochado en torno / En centro de mecanizado

El principio de brochado rotatorio se puede aplicar tanto en centros de mecanizado como en tornos o taladros. En un centro de mecanizado el elemento que gira es el cabezal mientras que el elemento de corte se queda fijo clavado en la pieza. En un torno el elemento de corte gira al clavarse este sobre la pieza que está girando, mientras en cabezal queda estático en la torreta. NO ES NECESARIO EL USO DE TORRETA MOTORIZADA.

3. Brochado de agujeros y/o brochado de ejes

Los cabezales de brochado modelo POLIPROFILE fabricados por INTEGI se pueden utilizar para la realización de brochados tanto internos (con un punzón) como externos (con una matriz) simplemente con la colocación de un portamatrices en la parte frontal.

2. Broaching in lathe or machining centre

The principle of rotary broaching can be apply to machining centers, lathes and drilling machines. On a machining center the broaching head rotates while the broach is fixed in the workpiece. On a lathe the broach rotates because it is nailed on the workpiece which is rotating, while the broaching head is static in the lathe turret. IT IS NOT NECESSARY LATHES WITH LIVE TURRET.

3. Internal and/or external broaching

The "POLIPROFILE" broaching heads made by INTEGI can be used to make both internal and external broaching, simply putting an adapter.

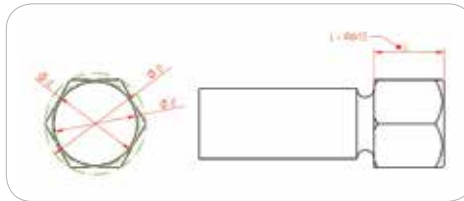


BROCHADO ROTATORIO ROTARY BROACHING



3.1 Brochado exterior (ejes)

- Hay que efectuar un torneado previo con un diámetro D igual al diámetro circunscrito de la figura a brochar.
- La longitud de brochado máxima no deberá exceder de 1.5 veces el diámetro interior (d).
- Mecanizar un chaflán a 45° en el extremo de la pieza de manera que el diámetro del fondo del chaflán (d') sea menor que el diámetro del fondo del brochado (d).

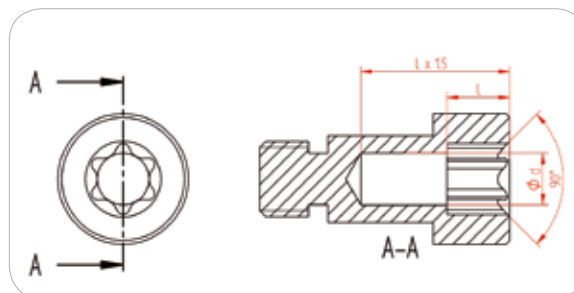


3.1 External broaching

- Turn the workpiece to D equal to the circumscribed diameter of the shape to broach.
- The maximum broaching length recommended should not exceed 1.5 times the inside diameter (d).
- A 45° chamfer at the frontal face of the workpiece so that the diameter at the bottom of the chamfer (d') to be smaller than the diameter of the bottom of broaching (d).

3.2 Brochado interior

- Hay que efectuar un taladrado previo con un diámetro D igual al diámetro inscrito de la figura a brochar. No obstante si la figura no necesita de una gran precisión de forma, o el material de la pieza a brochar es especialmente duro, el usuario puede según su criterio aumentar la medida del orificio previo, liberando así al conjunto máquina-cabezal de una parte importante del esfuerzo de trabajo.
- La longitud de brochado máxima recomendada no deberá exceder de 1.5 veces el diámetro inscrito (d).
- Mecanizar un chaflán a 45° en el extremo de la pieza para facilitar la correcta entrada y direccionalidad del punzón, y para que se clave con facilidad evitando que patine a inicio y marque la pieza. El diámetro interior del chaflán ha de ser menor que el diámetro inscrito (d).



3.2 Internal broaching

- Initially make a hole with diameter D equal to the inscribed diameter of the shape to broach. However D can be a bit greater if the shape does not need a high accuracy, or material of the broaching workpiece is hard.
- The maximum broaching length recommended should not exceed 1.5 times the inscribed diameter (d).
- A 45° chamfer at the frontal face of the workpiece to facilitate the correct input and directionality of the broach, to prevent marks at the frontal face of the workpiece. The inside diameter of the chamfer must be smaller than the inscribed diameter (d).
- For blind holes the depth of the prior bore has to be about 1.5 times the broaching depth, to prevent broach breakage due to the accumulation of chips at the bottom of the bore.

- En el caso de agujeros ciegos, la profundidad del orificio previo tiene que ser aproximadamente 1,5 veces la profundidad de brochado, para evitar que la acumulación del material cortado produzca la rotura del punzón.

4. Recomendaciones de rpm y Av.

La velocidad de giro no tiene mucha relevancia ya que la brocha gira junto con la pieza. Sin embargo, comenzar a brochar a altas revoluciones tiene a torner la entrada del agujero y puede llegar a dañar la brocha.

Se recomienda trabajar entre 800 – 2000 rpm.

Comenzar a trabajar a bajas revoluciones (300 rpm) y con un avance de 0.05 mm/rev, y una vez que la brocha se ha clavado y ha comenzado a girar junto con la pieza, incrementar la velocidad hasta un máximo de 2000 rpm.

4. Working speed and feed recommendations

The speed does not have much relevance because the broach rotates together with the workpiece. However, starting to broach at high speed may turn the material and can damage the broach.

We recommend a speed between 800 - 2000 rpm.

Start working at low speed (300 rpm) and with a feed of 0.05 mm/rev until the broach is touching the workpiece. Then increase the speed up to a maximum of 2000 rpm.



BROCHADO ROTATORIO ROTARY BROACHING



Respecto al avance es imperativo que el ángulo de la espiral de avance no exceda de 1°, que es el ángulo de oscilación del cabezal.

Si se avanza excediendo ese ángulo, el punzón o matriz no corta sino que arranca el material, dejando mala calidad y provocando un desgaste excesivo.

Para calcular el avance multiplicar el diámetro a brochar por 0.01. Por ejemplo para un brochado hexagonal de 8 mm e/c en avance máximo sería de $8 \times 0.01 = 0.08$ mm/vuelta.

Si bien es recomendable aplicar valores ligeramente inferiores sobre todo en materiales de difícil mecanización. En ningún caso se recomienda sobrepasar un avance de 0.15 mm/rev.

Es imperativo el uso de abundante refrigeración sobre la zona de trabajo aplicada directamente a la zona de corte. Este punto es muy importante en el caso de brochados interiores.

Regarding the feed, it is essential that the feed helix angle not exceed one degree, which corresponds to the oscillation angle of the broaching head.

Faster feeding makes the tool tends to tear the material instead of cutting it, causing poor quality and excessive wearing.

To calculate the feed we recommend to multiply the broaching diameter by 0.010. For example for a hexagonal broaching 8 mm a/f the maximum feed would be $8 \times 0.010 = 0.08$ mm/turn.

However it is better to use slightly lower values especially when broaching hard materials. In no case an advance of 0.15 mm/rev can be exceeded.

It is imperative to use any kind of coolant directly to the cutting zone. Very important for internal broaching.

5. Reglaje de la posición del elemento de corte.

Para que la ejecución del brochado sea correcta, con una buena calidad y precisión en la forma brochada, es muy importante que la posición del elemento cortante (punzón o matriz) sea la correcta para cada tipo de cabezal.

La distancia entre la cara frontal de la herramienta (cara de trabajo) y el morro del cabezal ha de ser la marcada en la siguiente tabla:

5. Adjusting the position of the broach

For a correct execution of the broaching, with good quality and a precise broached profile, it is very important a correct position of the cutting element (punch or die) for each type of broaching head.

The distance between the front face of the tool (working face) and the broaching head nose must be as follows:



| Cabezal Broaching Head | A |
|---------------------------|-------|
| Poliprofile 1 | 15 mm |
| Poliprofile 2 | 15 mm |
| Poliprofile 3 | 22 mm |
| Poliprofile 4 | 25 mm |



Posición de la matriz. Cota "A"
External broach position. "A" size



Posición de la brocha. Cota "A"
Internal broach position. "A" size



BROCHADO ROTATORIO ROTARY BROACHING



Si la distancia no es la correcta (ya sea por exceso como por defecto) la herramienta no cortará bien pudiendo dar problemas de perfiles poco precisos, demasiado empuje sobre la pieza, agujeros más grades de lo debido, generación de una hélice conforme el brochado avanza.

En el caso de brochado interior (trabajando con punzón) la regulación de la posición del punzón se hace actuando sobre el espárrago roscado que hay en el fondo del orificio del portapunzón.

Si la distancia es mayor de la requerida, habrá que introducir más el espárrago roscado para que la distancia se acorte.

Si por el contrario la distancia es inferior a la requerida, entonces habrá que girar el espárrago roscado en sentido anti horario para que salga y así aumentar la distancia.

If the distance is not correct (either by excess or by default) the tool will not cut well, and this can give problems of excessive pressure force over the workpiece, oversize holes, spiralling.

In case of internal broaching (working with a broach) the adjustment of the position of the tool is made by acting on the threaded stud placed in the bottom of the hole of the broach holder.

If the distance is greater than the required, it will be necessary to introduce more the threaded stud to reduce that distance.

On the other hand, if the distance is smaller than the required, then the threaded stud must be rotated anticlockwise so that it comes out and increase the distance.

6. Reafilado de los elementos de corte (Punzón / matriz)

Debido al uso, las aristas de los punzones o matrices se gastan y pierden filo, lo que provoca que el cabezal tenga que realizar un mayor esfuerzo para cizallar la pieza. Estos elementos se pueden reafilar frontalmente para recuperar las aristas cortantes.

Hay que tener en cuenta que las caras laterales tienen un ángulo de 1.5°, por lo que al afilarlas frontalmente estas pierden medida. Los punzones estándar se fabrican con sobremedida para que se puedan realizar varios afilados sin que afecte a la funcionalidad del punzón. La disminución de medida entre caras es la siguiente:

- Punzón: Disminución de 0,005 mm por cada 0,1 mm de afilado frontal.
- Matriz: Incremento de 0,005 mm por cada 0,1 mm de afilado frontal.

6. Re-shapening the broach

Due to the use, the edges of the broaches wear out losing efficiency. This means the broaching head has to make a greater pressure to cut the workpiece. The broaches can be re-sharpened frontally to recover the cutting edges.

Keep in mind that the side faces have a 1.5° angle, so the frontal sharpen reduces a/f size.

Tolerance of the standard broaches are positive, so that they can be re-sharpened several times without affecting their functionality. The reduction of a/f size is as follows:

- Internal broach: Reduction of 0,005 mm per 0,1 mm of frontal re-sharpening.
- External broach: Increase of 0,005 mm per 0,1 mm of frontal re-sharpening.



BROCHADO ROTATORIO ROTARY BROACHING



7. Utilización del portamatrices para el brochado de ejes

Para realizar brochados en ejes, se ha de utilizar un portamatrices donde se fija la matriz con la figura a brochar. La cara cortante "C" de la matriz deberá quedar rasante con la cara frontal "C1" del soporte porta-matriz quedando de esta manera exactamente definida la cota "A" necesaria para que la matriz corte correctamente. Al modificarse la distancia "A" a consecuencia de los sucesivos afilados de la matriz, la recuperación de la misma se consigue calzando la matriz cortante mediante arandelas de suplemento.

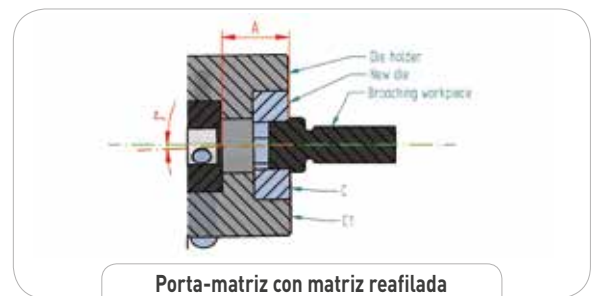


Porta-matriz con matriz nueva
Adapter with new external broach

7. Use of adapter for broaching shafts

An adapter attached to fit the external broach is what is needed for broaching shafts. For a proper function of the broaching tool, the cutting face "C" of the external broach must be in line with the front face "C1" of the adapter.

As the distance "A" changes due to successive sharpening of the external broach, it can be adjusted by using complementary washers.



Porta-matriz con matriz reafilada
Adapter with re-sharpened external broach

8. Brochados con punzón o matriz posicionada

Cuando la geometría de la pieza a brochar requiere de un concreto posicionamiento de la brocha, se ha de utilizar una varilla de tope o posicionado, que se suministra con el cabezal.

La varilla se ha de utilizar en los siguientes casos:

- a) Orientar la figura a brochar respecto de alguna referencia de la pieza de trabajo.
- b) Evitar las desviaciones tipo hélice al brochar agujeros profundos.
- c) Facilitar la iniciación del trabajo de brochado, particularmente al utilizar brochas de pequeña sección, y muy especialmente sobre piezas de material blando.

Además de la varilla de posicionado, se ha de colocar también un tope en el plato del torno o en la mesa del centro de mecanizado de manera que la varilla contacte con el tope justo antes de que el punzón entre en contacto con la pieza, frenando así la rotación del punzón en un punto concreto de la pieza.

8. Broaching with broach positioned

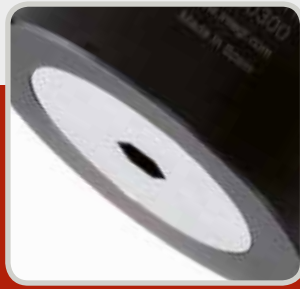
When the geometry of the piece requires a concrete positioning of the broach, then the use of an auxiliary lever is needed. This lever is supplied with the broaching head.

The auxiliary lever is used in the following cases:

- a) Positioning the profile to be broached in relation to the workpiece.
- b) Preventing "rippling" effect when broaching deep holes.
- c) When using broaches with a small section or on soft materials.

In addition to the auxiliary lever, it is also required to put a stop on the lathe chuck or at the table of the machining center so that the lever contact with the stop just before the broach comes into contact with the workpiece, braking thus the rotation of the broach at a particular point of the workpiece.





BROCHADO ROTATORIO · CABEZALES Y PUNZONES ROTARY BROACHING HEADS & TOOLS

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Broaches



BROCHADO ROTATORIO · CABEZALES ROTARY BROACHING · TOOLS



➤ MANGO CILÍNDRICO · CYLINDRICAL SHANK

+ Características generales

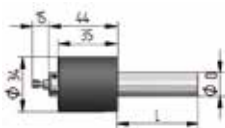
- Utilizable tanto en tornos como en centros de mecanizado y/o taladros
- Minimiza el esfuerzo de brochado gracias al sistema oscilatorio
- Rodamientos de alta gama que garantizan una larga vida de la herramienta
- Cuerpo estanco para evitar que las virutas penetren en la zona de los rodamientos
- Regulación de la posición del punzón mediante un tope regulable situado en el fondo del alojamiento del portabrochas
- Posibilidad de montar un portamatrix frontal para la realización de brochados externos

+ Features

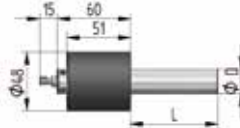
- Usable in all types of lathes, machining centers, milling machines or drilling machines
- Minimizes broach load thanks to the pendular system
- High quality bearings to ensure a long tool life
- Tight body to prevent chips from entering the bearing area
- Adjustment of the position of the broach by an adjustable stop located at the bottom of the broachholder
- Possibility to fit a frontal die-holder for external broaching



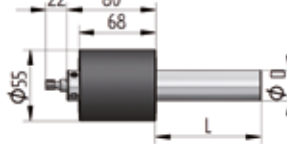
> POLIPROFILE 1



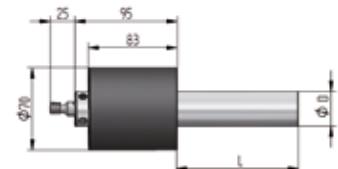
> POLIPROFILE 2



> POLIPROFILE 3



> POLIPROFILE 4



Herramienta | Tool

| Código Code | Referencia Reference | Capacidad Capacity | Punzón Broach | Ø D | L | Kg | |
|----------------|-------------------------|-----------------------|------------------|------|----------|-------|-----|
| 06010106 | POLIPROFILE1+C10 | ■ <5 | ● <6 mm | POL2 | 10 mm | 40 mm | 0,3 |
| 06010104 | POLIPROFILE1+C12 | ■ <5 | ● <6 mm | POL2 | 12 mm | 40 mm | 0,3 |
| 06010103 | POLIPROFILE1+C16 | ■ <5 | ● <6 mm | POL2 | 16 mm | 70 mm | 0,4 |
| 06010102 | POLIPROFILE1+C19.05 | ■ <5 | ● <6 mm | POL2 | 19.05 mm | 70 mm | 0,5 |
| 06010107 | POLIPROFILE1+C20 | ■ <5 | ● <6 mm | POL2 | 20 mm | 70 mm | 0,5 |
| 06010203 | POLIPROFILE2+C16 | ■ <8 | ● <10 mm | POL2 | 16 mm | 70 mm | 0,8 |
| 06010204 | POLIPROFILE2+C20 | ■ <8 | ● <10 mm | POL2 | 20 mm | 70 mm | 1 |
| 06010225 | POLIPROFILE2+C2040 | ■ <8 | ● <10 mm | POL2 | 20 mm | 40 mm | 0,8 |
| 06010303 | POLIPROFILE3+C16 | ■ <10 | ● <14 mm | POL3 | 16 mm | 70 mm | 1,3 |
| 06010304 | POLIPROFILE3+C20 | ■ <10 | ● <14 mm | POL3 | 20 mm | 70 mm | 1,4 |
| 06010305 | POLIPROFILE3+C25 | ■ <10 | ● <14 mm | POL3 | 25 mm | 90 mm | 1,5 |
| 06010403 | POLIPROFILE4+C25 | ■ <16 | ● <24 mm | POL4 | 25 mm | 90 mm | 2,2 |
| 06010404 | POLIPROFILE4+C32 | ■ <16 | ● <24 mm | POL4 | 32 mm | 90 mm | 2,5 |
| 06010405 | POLIPROFILE4+C40 | ■ <16 | ● <24 mm | POL4 | 40 mm | 90 mm | 2,7 |

Portamatrix para brochado externo Die holder for external broaching

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 06060100 | POL1-PTM |
| 06060200 | POL2-PTM |
| 06060300 | POL3-PTM |
| 06060400 | POL4-PTM |





BROCHADO ROTATORIO · CABEZALES ROTARY BROACHING · TOOLS



WELDON DIN 1835-B

+ Características generales

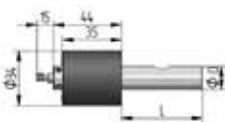
- Utilizable tanto en tornos como en centros de mecanizado y/o taladros
- Minimiza el esfuerzo de brochado gracias al sistema oscilatorio
- Rodamientos de alta gama que garantizan una larga vida de la herramienta
- Cuerpo estanco para evitar que las virutas penetren en la zona de los rodamientos
- Regulación de la posición del punzón mediante un tope regulable situado en el fondo del alojamiento del portabrochas
- Posibilidad de montar un portamatriz frontal para la realización de brochados externos

+ Features

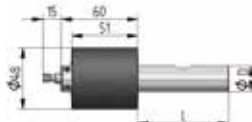
- Usable in all types of lathes, machining centers, milling machines or drilling machines
- Minimizes broach load thanks to the pendular system
- High quality bearings to ensure a long tool life
- Tight body to prevent chips from entering the bearing area
- Adjustment of the position of the broach by an adjustable stop located at the bottom of the broachholder
- Possibility to fit a frontal die-holder for external broaching



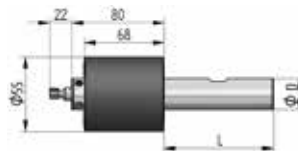
> POLIPROFILE 1



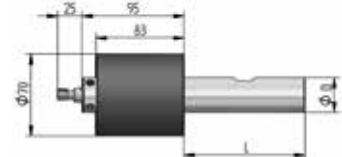
> POLIPROFILE 2



> POLIPROFILE 3



> POLIPROFILE 4



Herramienta | Tool

| Código Code | Referencia Reference | Capacidad Capacity | Punzón Broach | Ø D | L | Kg | |
|----------------|-------------------------|-----------------------|------------------|---------|-------|-------|-----|
| 06010109 | POLIPROFILE1+W10 | ■ <5 | ● <6 mm | POL2-XX | 10 mm | 36 mm | 0,3 |
| 06010108 | POLIPROFILE1+W12 | ■ <5 | ● <6 mm | POL2-XX | 12 mm | 41 mm | 0,3 |
| 06010105 | POLIPROFILE1+W16 | ■ <5 | ● <6 mm | POL2-XX | 16 mm | 44 mm | 0,4 |
| 06010110 | POLIPROFILE1+W20 | ■ <5 | ● <6 mm | POL2-XX | 20 mm | 46 mm | 0,5 |
| 06010205 | POLIPROFILE2+W16 | ■ <8 | ● <10 mm | POL2-XX | 16 mm | 52 mm | 0,8 |
| 06010206 | POLIPROFILE2+W20 | ■ <8 | ● <10 mm | POL2-XX | 20 mm | 52 mm | 1 |
| 06010306 | POLIPROFILE3+W20 | ■ <10 | ● <14 mm | POL3-XX | 20 mm | 52 mm | 1,4 |
| 06010307 | POLIPROFILE3+W25 | ■ <10 | ● <14 mm | POL3-XX | 25 mm | 59 mm | 1,5 |
| 06010406 | POLIPROFILE4+W25 | ■ <16 | ● <24 mm | POL4-XX | 25 mm | 59 mm | 2,2 |
| 06010407 | POLIPROFILE4+W32 | ■ <16 | ● <24 mm | POL4-XX | 32 mm | 63 mm | 2,5 |

Portamatriz para brochado externo Die holder for external broaching

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 06060100 | POL1-PTM |
| 06060200 | POL2-PTM |
| 06060300 | POL3-PTM |
| 06060400 | POL4-PTM |





BROCHADO ROTATORIO · CABEZALES ROTARY BROACHING · TOOLS



MORSE DIN 228

+ Características generales

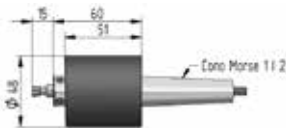
- Utilizable tanto en tornos como en centros de mecanizado y/o taladros
- Minimiza el esfuerzo de brochado gracias al sistema oscilatorio
- Rodamientos de alta gama que garantizan una larga vida de la herramienta
- Cuerpo estanco para evitar que las virutas penetren en la zona de los rodamientos
- Regulación de la posición del punzón mediante un tope regulable situado en el fondo del alojamiento del portabrochas
- Posibilidad de montar un portamatrix frontal para la realización de brochados externos

+ Features

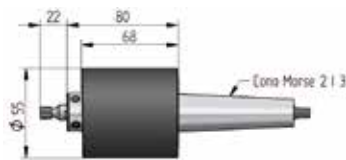
- Usable in all types of lathes, machining centers, milling machines or drilling machines
- Minimizes broach load thanks to the pendular system
- High quality bearings to ensure a long tool life
- Tight body to prevent chips from entering the bearing area
- Adjustment of the position of the broach by an adjustable stop located at the bottom of the broachholder
- Possibility to fit a frontal die-holder for external broaching



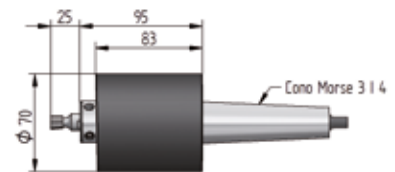
> POLIPROFILE 2



> POLIPROFILE 3



> POLIPROFILE 4



| Herramienta Tool | | | | | |
|--------------------|-------------------------|-----------------------|------------------|---------|-----|
| Código Code | Referencia Reference | Capacidad Capacity | Punzón Broach | Mango | Kg |
| 06010201 | POLIPROFILE2+M1 | ■ <8 ● <10 mm | POL2-XX | MORSE 1 | 0,9 |
| 06010202 | POLIPROFILE2+M2 | ■ <8 ● <10 mm | POL2-XX | MORSE 2 | 1 |
| 06010301 | POLIPROFILE3+M2 | ■ <10 ● <14 mm | POL3-XX | MORSE 2 | 1,4 |
| 06010302 | POLIPROFILE3+M3 | ■ <10 ● <14 mm | POL3-XX | MORSE 3 | 1,6 |
| 06010401 | POLIPROFILE4+M3 | ■ <16 ● <24 mm | POL4-XX | MORSE 3 | 2,1 |
| 06010402 | POLIPROFILE4+M4 | ■ <16 ● <24 mm | POL4-XX | MORSE 4 | 2,4 |

Portamatrix para brochado externo Die holder for external broaching

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 06060200 | POL2-PTM |
| 06060300 | POL3-PTM |
| 06060400 | POL4-PTM |





BROCHADO ROTATORIO · CABEZALES ROTARY BROACHING · TOOLS



VDI DIN 69880

+ Características generales

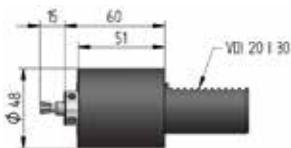
- Utilizable tanto en tornos como en centros de mecanizado y/o taladros
- Minimiza el esfuerzo de brochado gracias al sistema oscilatorio
- Rodamientos de alta gama que garantizan una larga vida de la herramienta
- Cuerpo estanco para evitar que las virutas penetren en la zona de los rodamientos
- Regulación de la posición del punzón mediante un tope regulable situado en el fondo del alojamiento del portabrochas
- Posibilidad de montar un portamatriz frontal para la realización de brochados externos

+ Features

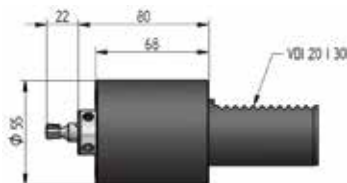
- Usable in all types of lathes, machining centers, milling machines or drilling machines
- Minimizes broach load thanks to the pendular system
- High quality bearings to ensure a long tool life
- Tight body to prevent chips from entering the bearing area
- Adjustment of the position of the broach by an adjustable stop located at the bottom of the broachholder
- Possibility to fit a frontal die-holder for external broaching



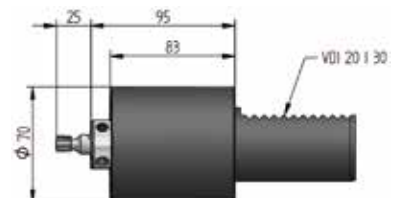
> POLIPROFILE 2



> POLIPROFILE 3



> POLIPROFILE 4



Herramienta | Tool

| Código Code | Referencia Reference | Capacidad Capacity | Punzón Broach | Ø D | Kg |
|----------------|-------------------------|-----------------------|------------------|-------|-----|
| 06010207 | POLIPROFILE2+VDI20 | ■ <8 ◆ <10 mm | POL2-XX | 20 mm | 1 |
| 06010208 | POLIPROFILE2+VDI30 | ■ <8 ◆ <10 mm | POL2-XX | 30 mm | 1,2 |
| 06010308 | POLIPROFILE3+VDI20 | ■ <10 ◆ <14 mm | POL3-XX | 20 mm | 1,4 |
| 06010309 | POLIPROFILE3+VDI30 | ■ <10 ◆ <14 mm | POL3-XX | 30 mm | 1,6 |
| 06010408 | POLIPROFILE4+VDI30 | ■ <16 ◆ <24 mm | POL4-XX | 30 mm | 2,5 |
| 06010409 | POLIPROFILE4+VDI40 | ■ <16 ◆ <24 mm | POL4-XX | 40 mm | 2,7 |

Portamatriz para brochado externo Die holder for external broaching

| Código Code | Referencia Reference |
|----------------|-------------------------|
| 06060200 | POL2-PTM |
| 06060300 | POL3-PTM |
| 06060400 | POL4-PTM |





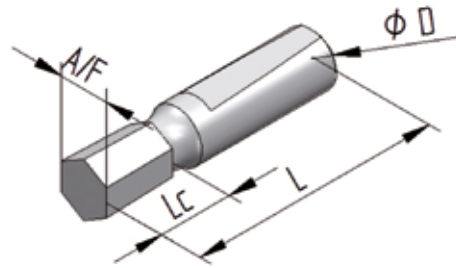
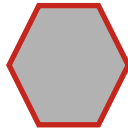
BROCHADO ROTATORIO · PUNZONES

ROTARY BROACHING · BROACHES



PUNZONES HEXAGONALES

HEXAGONAL BROACHES



| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|------|-------|---------|------------------------------------|
| 06050221 | POL2-PH1.2 | 1.2 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 1.8 mm | POLIPROFILE 1 & 2 |
| 06050222 | POL2-PH1.5 | 1.5 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 2.3 mm | POLIPROFILE 1 & 2 |
| 06050223 | POL2-PH2 | 2 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 3 mm | POLIPROFILE 1 & 2 |
| 06050224 | POL2-PH2.5 | 2.5 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 3.8 mm | POLIPROFILE 1 & 2 |
| 06050225 | POL2-PH3 | 3 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 4.6 mm | POLIPROFILE 1 & 2 |
| 06050226 | POL2-PH4 | 4 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 6 mm | POLIPROFILE 1 & 2 |
| 06050227 | POL2-PH5 | 5 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 8.6 mm | POLIPROFILE 1 & 2 |
| 06050228 | POL2-PH6 | 6 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 9 mm | POLIPROFILE 1 & 2 |
| 06050229 | POL2-PH7 | 7 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 10 mm | POLIPROFILE 1 & 2 |
| 06050230 | POL2-PH8 | 8 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 10.8 mm | POLIPROFILE 1 & 2 |
| 06050231 | POL2-PH9 | 9 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 13.2 mm | POLIPROFILE 1 & 2 |
| 06050232 | POL2-PH10 | 10 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 11.8 mm | POLIPROFILE 1 & 2 |

| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|-------|----|------|------------------------------------|
| 06050321 | POL3-PH1.2 | 1.2 mm | +0.10 / +0.12 mm | 10 mm | 45 | 1.8 | POLIPROFILE 3 |
| 06050322 | POL3-PH1.5 | 1.5 mm | +0.10 / +0.12 mm | 10 mm | 45 | 2.3 | POLIPROFILE 3 |
| 06050323 | POL3-PH2 | 2 mm | +0.10 / +0.12 mm | 10 mm | 45 | 3 | POLIPROFILE 3 |
| 06050324 | POL3-PH2.5 | 2.5 mm | +0.10 / +0.12 mm | 10 mm | 45 | 3.8 | POLIPROFILE 3 |
| 06050325 | POL3-PH3 | 3 mm | +0.10 / +0.12 mm | 10 | 45 | 4.6 | POLIPROFILE 3 |
| 06050326 | POL3-PH4 | 4 mm | +0.10 / +0.12 mm | 10 | 45 | 6 | POLIPROFILE 3 |
| 06050327 | POL3-PH5 | 5 mm | +0.10 / +0.12 mm | 10 | 45 | 8 | POLIPROFILE 3 |
| 06050328 | POL3-PH6 | 6 mm | +0.10 / +0.12 mm | 10 | 45 | 9 | POLIPROFILE 3 |
| 06050329 | POL3-PH7 | 7 mm | +0.10 / +0.12 mm | 10 | 45 | 10 | POLIPROFILE 3 |
| 06050330 | POL3-PH8 | 8 mm | +0.10 / +0.12 mm | 10 | 45 | 12.4 | POLIPROFILE 3 |
| 06050331 | POL3-PH9 | 9 mm | +0.10 / +0.12 mm | 10 | 45 | 13.4 | POLIPROFILE 3 |
| 06050332 | POL3-PH10 | 10 mm | +0.10 / +0.12 mm | 10 | 45 | 15 | POLIPROFILE 3 |
| 06050333 | POL3-PH11 | 11 mm | +0.10 / +0.12 mm | 10 | 45 | 15.4 | POLIPROFILE 3 |
| 06050334 | POL3-PH12 | 12 mm | +0.10 / +0.12 mm | 10 | 45 | 16.4 | POLIPROFILE 3 |
| 06050335 | POL3-PH14 | 14 mm | +0.10 / +0.12 mm | 10 | 45 | 15.6 | POLIPROFILE 3 |

| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|-------|-------|---------|------------------------------------|
| 06050421 | POL4-PH2.5 | 2.5 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 4 mm | POLIPROFILE 4 |
| 06050422 | POL4-PH3 | 3 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 4.6 mm | POLIPROFILE 4 |
| 06050423 | POL4-PH4 | 4 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 6 mm | POLIPROFILE 4 |
| 06050424 | POL4-PH5 | 5 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 8 mm | POLIPROFILE 4 |
| 06050425 | POL4-PH6 | 6 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 9.4 mm | POLIPROFILE 4 |
| 06050426 | POL4-PH8 | 8 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 13 mm | POLIPROFILE 4 |
| 06050427 | POL4-PH10 | 10 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 15.4 mm | POLIPROFILE 4 |
| 06050428 | POL4-PH12 | 12 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 17 mm | POLIPROFILE 4 |
| 06050429 | POL4-PH14 | 14 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 18.6 mm | POLIPROFILE 4 |
| 06050430 | POL4-PH16 | 16 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 19 mm | POLIPROFILE 4 |
| 06050431 | POL4-PH17 | 17 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 22 mm | POLIPROFILE 4 |
| 06050432 | POL4-PH18 | 18 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 22 mm | POLIPROFILE 4 |
| 06050433 | POL4-PH19 | 19 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 19.7 mm | POLIPROFILE 4 |
| 06050434 | POL4-PH22 | 22 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 20 mm | POLIPROFILE 4 |
| 06050435 | POL4-PH24 | 24 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 20.6 mm | POLIPROFILE 4 |

| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|-------|----|------|------------------------------------|
| 07030101 | P-1255-H1.5 | 1.5 mm | +0,02 / +0,05 mm | 12 mm | 55 | 2.3 | - |
| 07030102 | P-1255-H2 | 2 mm | +0,02 / +0,05 mm | 12 mm | 55 | 3 | - |
| 07030103 | P-1255-H2.5 | 2.5 mm | +0,02 / +0,05 mm | 12 mm | 55 | 3.8 | - |
| 07030104 | P-1255-H3 | 3 mm | +0,02 / +0,05 mm | 12 mm | 55 | 4.6 | - |
| 07030105 | P-1255-H4 | 4 mm | +0,02 / +0,05 mm | 12 mm | 55 | 6 | - |
| 07030106 | P-1255-H5 | 5 mm | +0,04 / +0,07 mm | 12 mm | 55 | 8 | - |
| 07030107 | P-1255-H6 | 6 mm | +0,04 / +0,07 mm | 12 mm | 55 | 9 | - |
| 07030108 | P-1255-H7 | 7 mm | +0,04 / +0,07 mm | 12 mm | 55 | 10 | - |
| 07030109 | P-1255-H8 | 8 mm | +0,04 / +0,07 mm | 12 mm | 55 | 12.4 | - |
| 07030110 | P-1255-H9 | 9 mm | +0,04 / +0,07 mm | 12 mm | 55 | 13.4 | - |
| 07030111 | P-1255-H10 | 10 mm | +0,05 / +0,09 mm | 12 mm | 55 | 15 | - |
| 07030112 | P-1255-H11 | 11 mm | +0,05 / +0,09 mm | 12 mm | 55 | 15.4 | - |
| 07030113 | P-1255-H12 | 12 mm | +0,05 / +0,09 mm | 12 mm | 55 | 16.4 | - |
| 07030114 | P-1255-H13 | 13 mm | +0,05 / +0,09 mm | 12 mm | 55 | 17.4 | - |
| 07030115 | P-1255-H14 | 14 mm | +0,05 / +0,09 mm | 12 mm | 55 | 18.6 | - |
| 07030116 | P-1255-H15 | 15 mm | +0,05 / +0,09 mm | 12 mm | 55 | 19 | - |
| 07030117 | P-1255-H16 | 16 mm | +0,05 / +0,09 mm | 12 mm | 55 | 19 | - |



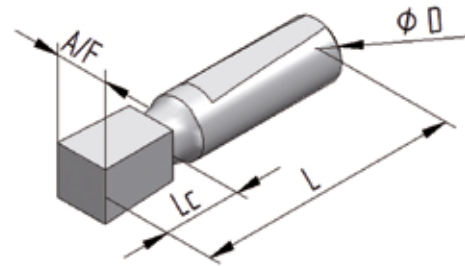
BROCHADO ROTATORIO · PUNZONES

ROTARY BROACHING · BROACHES



PUNZONES CUADRADOS

SQUARE BROACHES



| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|------|-------|---------|------------------------------------|
| 06050201 | POL2-PC1.2 | 1.2 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 1.8 mm | POLIPROFILE 1 & 2 |
| 06050202 | POL2-PC1.5 | 1.5 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 2.3 mm | POLIPROFILE 1 & 2 |
| 06050203 | POL2-PC2 | 2 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 3 mm | POLIPROFILE 1 & 2 |
| 06050204 | POL2-PC3 | 3 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 4.6 mm | POLIPROFILE 1 & 2 |
| 06050205 | POL2-PC4 | 4 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 6 mm | POLIPROFILE 1 & 2 |
| 06050206 | POL2-PC5 | 5 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 8.6 mm | POLIPROFILE 1 & 2 |
| 06050207 | POL2-PC6 | 6 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 9 mm | POLIPROFILE 1 & 2 |
| 06050208 | POL2-PC7 | 7 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 10 mm | POLIPROFILE 1 & 2 |
| 06050209 | POL2-PC8 | 8 mm | +0.10 / +0.12 mm | 8 mm | 28 mm | 10.8 mm | POLIPROFILE 1 & 2 |

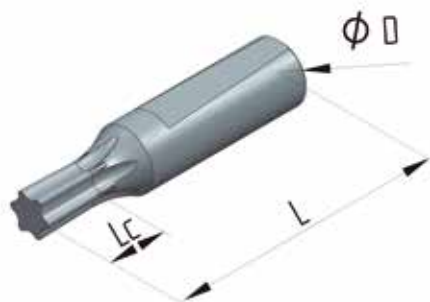
| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|-------|-------|---------|------------------------------------|
| 06050301 | POL3-PC1.2 | 1.2 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 1.8 mm | POLIPROFILE 3 |
| 06050302 | POL3-PC1.5 | 1.5 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 2.3 mm | POLIPROFILE 3 |
| 06050303 | POL3-PC2 | 2 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 3 mm | POLIPROFILE 3 |
| 06050304 | POL3-PC2.5 | 2.5 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 3.8 mm | POLIPROFILE 3 |
| 06050305 | POL3-PC3 | 3 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 4.6 mm | POLIPROFILE 3 |
| 06050306 | POL3-PC4 | 4 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 6 mm | POLIPROFILE 3 |
| 06050307 | POL3-PC5 | 5 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 8 mm | POLIPROFILE 3 |
| 06050308 | POL3-PC6 | 6 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 9 mm | POLIPROFILE 3 |
| 06050309 | POL3-PC7 | 7 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 10 mm | POLIPROFILE 3 |
| 06050310 | POL3-PC8 | 8 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 12.4 mm | POLIPROFILE 3 |
| 06050311 | POL3-PC9 | 9 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 13.4 mm | POLIPROFILE 3 |
| 06050312 | POL3-PC10 | 10 mm | +0.10 / +0.12 mm | 10 mm | 45 mm | 15 mm | POLIPROFILE 3 |

| Código Code | Referencia Reference | A/F | Tolerancia Tolerance | D | L | Lc | Para cabezal For broaching head |
|----------------|-------------------------|--------|-------------------------|-------|-------|---------|------------------------------------|
| 06050401 | POL4-PC2.5 | 2.5 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 3.8 mm | POLIPROFILE 4 |
| 06050402 | POL4-PC3 | 3 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 4.6 mm | POLIPROFILE 4 |
| 06050403 | POL4-PC4 | 4 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 6 mm | POLIPROFILE 4 |
| 06050404 | POL4-PC5 | 5 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 8 mm | POLIPROFILE 4 |
| 06050405 | POL4-PC6 | 6 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 9.4 mm | POLIPROFILE 4 |
| 06050406 | POL4-PC8 | 8 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 13 mm | POLIPROFILE 4 |
| 06050407 | POL4-PC10 | 10 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 15.4 mm | POLIPROFILE 4 |
| 06050408 | POL4-PC12 | 12 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 17 mm | POLIPROFILE 4 |
| 06050409 | POL4-PC14 | 14 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 18.6 mm | POLIPROFILE 4 |
| 06050410 | POL4-PC16 | 16 mm | +0.10 / +0.12 mm | 16 mm | 50 mm | 19.3 mm | POLIPROFILE 4 |

BROCHADO ROTATORIO · PUNZONES ROTARY BROACHING · BROACHES



PUNZONES HEXALOBULARES HEXALOBULAR BROACHES



| Código Code | Referencia Reference | E | D | Lt | Lc | Para cabezal For broaching head |
|----------------|-------------------------|---------|------|-------|--------|------------------------------------|
| 06050241 | POL2-PT6 | TORX 6 | 8 mm | 28 mm | 3 mm | POLIPROFILE 1 & 2 |
| 06050242 | POL2-PT8 | TORX 8 | 8 mm | 28 mm | 3.8 mm | POLIPROFILE 1 & 2 |
| 06050243 | POL2-PT10 | TORX 10 | 8 mm | 28 mm | 4.6 mm | POLIPROFILE 1 & 2 |
| 06050244 | POL2-PT15 | TORX 15 | 8 mm | 28 mm | 5.4 mm | POLIPROFILE 1 & 2 |
| 06050245 | POL2-PT20 | TORX 20 | 8 mm | 28 mm | 6.2 mm | POLIPROFILE 1 & 2 |

| Código Code | Referencia Reference | E | D | Lt | Lc | Para cabezal For broaching head |
|----------------|-------------------------|---------|-------|-------|--------|------------------------------------|
| 06050341 | POL3-PT6 | TORX 6 | 10 mm | 45 mm | 3 mm | POLIPROFILE 3 |
| 06050342 | POL3-PT8 | TORX 8 | 10 mm | 45 mm | 3.8 mm | POLIPROFILE 3 |
| 06050343 | POL3-PT10 | TORX 10 | 10 mm | 45 mm | 4.6 mm | POLIPROFILE 3 |
| 06050344 | POL3-PT15 | TORX 15 | 10 mm | 45 mm | 5.4 mm | POLIPROFILE 3 |
| 06050345 | POL3-PT20 | TORX 20 | 10 mm | 45 mm | 6.2 mm | POLIPROFILE 3 |
| 06050346 | POL3-PT25 | TORX 25 | 10 mm | 45 mm | 6.5 mm | POLIPROFILE 3 |
| 06050347 | POL3-PT30 | TORX 30 | 10 mm | 45 mm | 7 mm | POLIPROFILE 3 |
| 06050348 | POL3-PT40 | TORX 40 | 10 mm | 45 mm | 8 mm | POLIPROFILE 3 |
| 06050349 | POL3-PT45 | TORX 45 | 10 mm | 45 mm | 9 mm | POLIPROFILE 3 |

| Código Code | Referencia Reference | E | D | Lt | Lc | Para cabezal For broaching head |
|----------------|-------------------------|---------|-------|-------|--------|------------------------------------|
| 06050441 | POL4-PT10 | TORX 10 | 16 mm | 50 mm | 4.6 mm | POLIPROFILE 4 |
| 06050442 | POL4-PT15 | TORX 15 | 16 mm | 50 mm | 5.4 mm | POLIPROFILE 4 |
| 06050443 | POL4-PT20 | TORX 20 | 16 mm | 50 mm | 6.2 mm | POLIPROFILE 4 |
| 06050444 | POL4-PT25 | TORX 25 | 16 mm | 50 mm | 6.5 mm | POLIPROFILE 4 |
| 06050445 | POL4-PT30 | TORX 30 | 16 mm | 50 mm | 7 mm | POLIPROFILE 4 |
| 06050446 | POL4-PT40 | TORX 40 | 16 mm | 50 mm | 8 mm | POLIPROFILE 4 |
| 06050447 | POL4-PT45 | TORX 45 | 16 mm | 50 mm | 9 mm | POLIPROFILE 4 |





www.integi.com



Autonomía, 5
E-48250 · Zaldibar · Bizkaia · Spain

Tel: +34 943 17 48 00

integi@integi.com



Miembro de / Member of:

