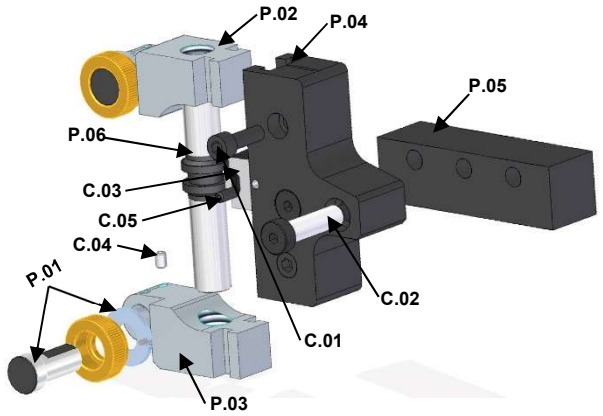


1 FEASIBLE PATTERNS

KNURLING PROFILE	KNURL		FEED (Drawing.3)	
	AXLE 1	AXLE 2	F	R
RAA	AA	AA	✓	✓
RGE 30°	BL 30°	BR 30°	✓	✓
RGE 45°	BL 45°	BR 45°	✓	✓

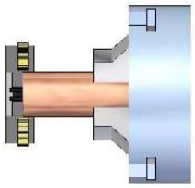
The M23-B form knurling tool is conceived for knurling on pieces with diameters between 6 and 50 mm.

2 CLAMPING AND SETTING THE TOOL TO THE MACHINE

First, make sure that the knurls turn freely. Smear graphite grease if necessary.

- Clamp the tool to the lathe turret.
- Turn the spindle with an Allen key until the distance between the knurling wheels is larger than the Ø of the workpiece.
- With the spindle turning very slowly move the tool forwards, to the workpiece, until place the knurls on the vertical axis of the workpiece.
- Once the knurls are aligned on the axis, close the arms and by turning the threaded spindle until the knurls touch the workpiece and start to rotate.
- With the workpiece rotating, turn the spindle further and close the arms making that the knurls mark the workpiece.
- Check that the thickness of the mark coincides with the total width of the knurls. If this is not the case, it means that the tool is not properly mounted on the lathe.
- If the width is correct, place the tool on the X=0 axis again and with the lathe chuck turning at the rpm indicated in the table 1, close the jaws progressively by rotating the spindle, until getting the desired knurling track.

It is essential that the tool and the workpiece are aligned as shown in drawing 2.



Drawing.2

3 KNURLING ON STEPPED WORKPIECES

Using this tool, no knurling should be performed closer to 0,5 mm from the shoulder itself.

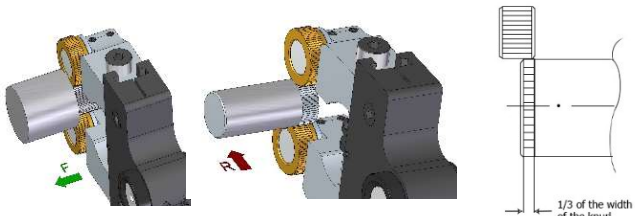
4 BEGINNING TO KNURL

While the chuck is rotating at the speed recommended, feed the tool so that 1/3 of the width of the knurling wheel gets in contact with the workpiece.

Press the knurls against the workpiece. The value of the radial feed must be according to the conditions recommended on the table 1.

After that, you will be able to feed longitudinally.

To calculate up to what diameter we must deepen with the knurl, we must take into account the height of the tooth (**in the case of standard knurls is always equal to half the step**) and the increase in diameter that suffers the material.



Drawing.3

5 BEAR IN MIND BEFORE AND WHILE WORKING PROCESS

Make sure that the knurl pins are firmly fastened.

Make sure that the axis of the knurl is aligned with the axis of the workpiece.

Always work plenty of coolant, lubricant or cutting oil.

The working direction, longitudinal advance, will always be against the tool.

6 TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
Double knurling	Too slow radial feed at the beginning of the knurling	Increase radial feed at the beginning of the knurling*
	The perimeter of the workpiece is not an exact multiple of the pitch	Turn a diameter so that the perimeter to be knurled is an exact multiple of the pitch*
Knurling wheels easily breakable	Knurling too deep	Reduce the depth to values according to the pitch
Knurling wheels wear out too fast	Knurling too deep	Reduce the depth to values according to the pitch
	Working conditions are not adequate	Check cutting speed and traverse feeding speeds

* Sometimes, it is not possible to increase radial feed or it just cannot be radially fed in the workpiece is too weak.

7 RECOMMENDED SETTINGS

MATERIAL	Ø WORKPIECE (mm)	Ø KNURL (mm)	CUTTING SPEED (m/min)	RADIAL FEED (mm/rev)	TRAVERSE FEED (mm/rev) PITCH (mm			
					0.3÷0.6	0.6÷1.2	1.2÷1.6	1.6÷2.0
Steel 600 N/mm²	10÷50	25	30÷60	0.05÷0.10	0.25	0.20	0.15	0.13
Steel 900 N/mm²	10÷50		25÷50	0.04÷0.08	0.20	0.15	0.10	0.08
Stainless steel	10÷50		25÷50	0.04÷0.08	0.20	0.15	0.10	0.08
Cast steel	10÷50		30÷50	0.05÷0.10	0.25	0.20	0.15	0.13
Aluminium	10÷50		35÷60	0.05÷0.10	0.25	0.20	0.15	0.13
Brass	10÷50		40÷65	0.05÷0.10	0.30	0.25	0.20	0.18

Table 1