

1 FEASIBLE PATTERNS

KNURLING PROFILE	KNURL			FEED (Drawing.3)	
	AXLE 1	AXLE 2	AXLE 3	F	R
RAA	AA	AA	AA	✓	✗
RGE 30°	BL30°	BR30°	BR30°	✓	✗
RGE 45°	BL45°	BR45°	BR45°	✓	✗

M17 form knurling tool is conceived for knurling on pieces:

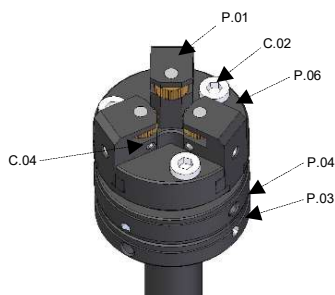
- With Ø10 mm knurls: diameters between 3 and 10 mm.
- With Ø20 mm knurls: diameters between 5 and 30 mm.

2 KNURLING ON STEPPED WORKPIECES

Using this tool, we must keep a safety distance of 2,5mm from the end of the knurled area to the shoulder.

3 KNURL ASSEMBLY

- Loosen C.02 screws.
- Turn P.04 nut up to a medium position.
- Loosen the stud of the knurl holder C.04
- Remove the axle
- Place the knurl in order that the center of it aligns to the axis of the axle.
- Put the axle back into its position and firmly tighten C.04 screw.
- Once the knurls placed, we adjust the opening distance of the knurl holders P.04 nut and we firmly tighten the screws of the breaks.



4 ADJUSTING THE POSITION OF THE KNURL HOLDERS

Position of the knurl holders P.06 can be adjusted by means of P.04 nuts. For it:

- Loosen the screws of the breaks C.02
- Turn P.04 nut to change the distance between the holders.
- Tighten the screws of the breaks.

9 RECOMMENDED SETTINGS

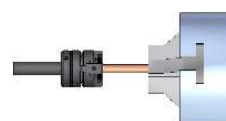
MATERIAL	Ø WORKPIECE (mm)	Ø KNURL (mm)	CUTTING SPEED (m/min)	RADIAL FEED (mm/rev)	TRAVERSE FEED (mm/rev)			
					PITCH (mm)			
					0.3÷0.6	0.6÷1.2	1.2÷1.6	1.6÷2.0
Steel 600 N/mm ²	<10	10	20÷50	0.05÷0.10	0.15	0.10	0.08	0.07
	10÷30	20	30÷60		0.20	0.15	0.13	0.10
Steel 900 N/mm ²	<10	10	20÷50	0.04÷0.08	0.12	0.08	0.05	0.04
	10÷30	20	20÷55		0.15	0.10	0.08	0.06
Stainless steel	<10	10	20÷40	0.04÷0.08	0.12	0.08	0.05	0.04
	10÷30	20	20÷45		0.15	0.10	0.08	0.06
Cast steel	<10	10	20÷40	0.05÷0.10	0.15	0.10	0.08	0.07
	10÷30	20	20÷45		0.20	0.15	0.13	0.10
Aluminium	<10	10	25÷60	0.05÷0.10	0.12	0.08	0.05	0.04
	10÷30	20	35÷70		0.20	0.15	0.10	0.06
Brass	<10	10	35÷75	0.05÷0.10	0.20	0.15	0.12	0.13
	10÷30	20	45÷90		0.25	0.20	0.18	0.15

Table 1

5 CLAMPING AND SETTING THE TOOL IN THE MACHINE

First, we should make sure that the knurl rotates freely around the pin.

- Clamp the tool to the turret of the lathe.
- Slightly loosen the nut that locks the shank P.03.
- Make the P.04 nut turn until the gap between the knurls is bigger than the diameter of the workpiece.
- Keeping the chuck rotating at very low speed, approach the tool to the workpiece until the axis of the tool and the workpiece are coincident.
- Once aligned, close the holders until the knurls begin to rotate.
- Tighten P.03 and P.04 nuts without moving the tool away.
- Keeping the workpiece rotating, close the gap between the holders until the knurls scratch the workpiece. Then, check that the width of the got print matches that of the knurls being used. If it weren't so, that would mean that the tool is not correctly mounted in the machine. In this case, you must go back to the first point on this chapter and start over.
- If the width is correct, then, tighten the holders around the workpiece until the desired depth is got. Normally, working depth is one quarter of the pitch of the knurl being used.
- After getting the desired width and depth, firmly tighten all the nuts and screws and move the tool away from the workpiece.



Drawing.3

6 BEGINNING TO KNURL

Keeping the chuck rotating at the speeds recommended on table 1, move the tool until the axis of the workpiece and the tool match. Then, feed (F) until knurling all the required length. Feeding data can be looked up on table 1.

Always work plenty of coolant, lubricant or cutting oil flowing order to sweep the swarf away, make knurling easier, lubricate knurls and cool where friction occurs.

7 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.

8 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