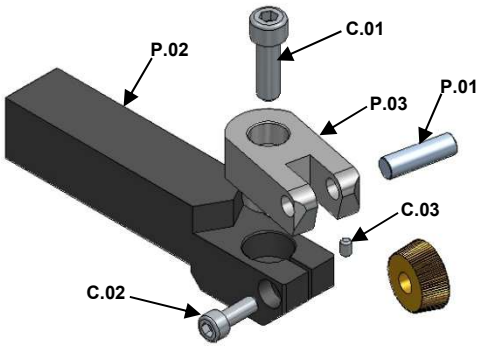


1 FEASIBLE PATTERNS

KNURLING PROFILE	KNURL	FEED (Drawing.4) F	FEED (Drawing.4) R
RKAA	KAA	×	✓
RKBL 30º	KBR30°	×	✓
RKBR 30º	KBL30°	×	✓

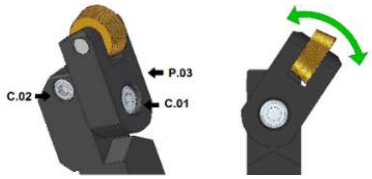
The deformation knurling tool M15 is designed for face knurling and knurling on conical surfaces on workpieces with diameters that vary depending on the knurl to be used:

- With Ø15 mm knurling wheels: diameters between 3 and 100 mm.
- With Ø25 mm knurling wheels: diameters between 3 and 100 mm.

2 HEAD ANGLE VARIATION

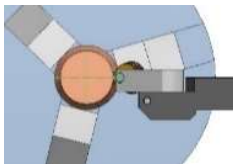
M15 tool is designed for knurling on conical surfaces or frontally, in both left hand and right-hand lathes.
To tilt the head P-03 just:

- Loosen the head locking screw C.02.
- Loosen the head blocking screw C.01.
- Tilt the head to the desired position.
- Firmly tighten C.01 and C.02 screws.



3 CLAMPING AND SETTING THE TOOL IN THE MACHINE

Clamp the tool to the turret of the lathe. While the chuck rotates very slowly, approach the tool to the workpiece until the knurl makes contact with the workpiece.
Approach the knurl to the workpiece following the 'F' direction up until the teeth plunge a little into it. Check out the resulted print. The printed width (h) must be equal to the width of the teeth on the knurl. If the width isn´t correct, change the clearance angle.



Drawing.3

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 knurl gets in contact with the workpiece.
Press the knurl 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.4

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	15	25÷55	0.05÷0.10	0.20	0.15	0.13	0.10
	200÷300	25	30÷60		0.25	0.20	0.15	0.13
Steel 900 N/mm²	10÷50	15	20÷45	0.04÷0.08	0.15	0.10	0.08	0.06
	200÷300	25	25÷50		0.20	0.15	0.10	0.08
Stainless steel	10÷50	15	20÷45	0.04÷0.08	0.15	0.10	0.08	0.06
	200÷300	25	25÷50		0.20	0.15	0.10	0.08
Cast steel	10÷50	15	25÷45	0.05÷0.10	0.20	0.15	0.13	0.10
	200÷300	25	30÷50		0.25	0.20	0.15	0.13
Aluminium	10÷50	15	30÷50	0.05÷0.10	0.20	0.15	0.10	0.06
	200÷300	25	35÷60		0.25	0.20	0.15	0.13
Brass	10÷50	15	35÷55	0.05÷0.10	0.25	0.20	0.18	0.15
	200÷300	25	40÷65		0.30	0.25	0.20	0.18

Table 1