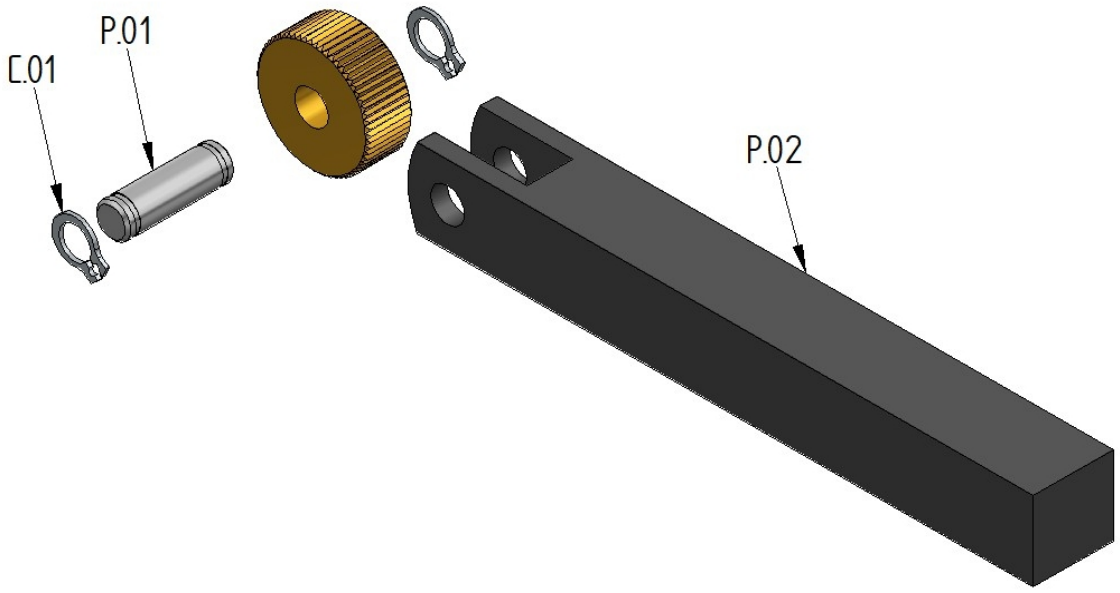
M1 INSTRUCTIONS MANUAL

1. TOOLS PARTS



Drawing 1

ITEM	CODE	REFERENCE	DESCRIPTION	ITEMS INCLUDED
SET.01	01990101	SET-CIRCLIP Ø6	Set with 10 circlip DIN 471 Ø6	C.01 (10x)
*C.01	-	AEE6	Circlip DIN 471 Ø6 (Item included in the SET 01990101)	-
P.01	01990100	EM1	Knurl pin	P.01 + C.01 (2x)
*P.02	-	MM1 20.08.14	14×14mm shank	-

*This item is not sold individually.

Table 1

2. FEASIBLE PATTERNS

The M1 form knurling tool is conceived for knurling on pieces with diameters between 8 and 200 mm.

The obtained pattern depends on the knurls used as shown below.

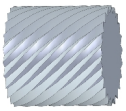
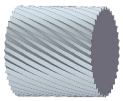
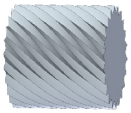
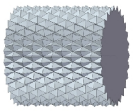
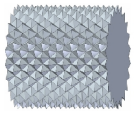
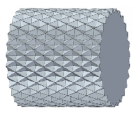
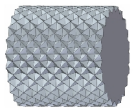
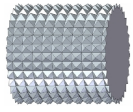
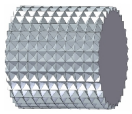
KNURLING PROFILE		DESCRIPTION	KNURLING WHEEL	FEED	
				AXIAL FEED	RADIAL FEED
	RAA	Right	AA knurl	✓	✓
	RBL 30º	30° Left helical	BR30º knurl	✓	✓
	RBL 45º	45° Left helical	BR45º knurl	✓	✓
	RBR 30º	30° Right helical	BL30º knurl	✓	✓
	RBR 45º	45° Right helical	BL45º knurl	✓	✓
	RGE 30º	30º diamond pattern male	GV30° knurl	✗	✓
	RGE 45º	45º diamond pattern male	GV45° knurl	✗	✓
	RGV 30º	30º diamond pattern female	GE30º knurl	✗	✓
	RGV 45º	45º diamond pattern female	GE45º knurl	✗	✓
	RKE	90º diamond pattern male	KV knurl	✗	✓
	RKV	90º diamond pattern male	KE knurl	✗	✓

Table 2

3. CLAMPING AND SETTING THE TOOL IN THE MACHINE

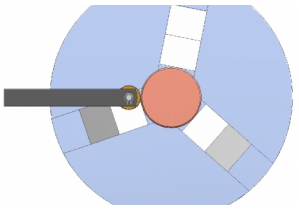
First, we need to make sure that the knurl rotates freely around the pin. Spread graphite grease if necessary.

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 knurling wheel 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.

The tool and the workpiece need to be aligned as shown on the Drawing 2.



Drawing 2

4. KNURLING ON STEPPED WORKPIECES

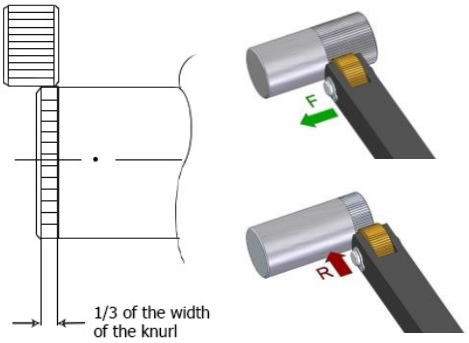
When knurling stepped workpieces, it is not possible to knurl up to a shoulder. Using this tool, no knurling should be performed closer to 6mm from the shoulder itself.

5. BEGINNING TO KNURL

While the chuck is rotating at the speed recomended at point 8, feed the tool so that 1/3 of the width of the knurling wheel 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 4 (next page). 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

That information is available at www.integi.com and in our catalog.

6. BEFORE AND DURING THE 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.
- Always apply plenty of coolant, lubricant or cutting oil flowing in order to sweep the swarf away.
- The working direction, longitudinal advance, will always be against the tool.

7. 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

Table 3

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

8. RECOMMENDED SETTINGS

MATERIAL	Ø workpiece (mm)	Ø KNURLING WHEEL (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÷50	20	25÷55	0.05÷0.10	0.20	0.15	0.13	0.10
	50÷100		30÷60		0.25	0.20	0.15	0.13
	100÷200							
Steel 900 N/mm^2	10÷50	20	20÷45	0.04÷0.08	0.15	0.10	0.08	0.06
	50÷100		25÷50		0.20	0.15	0.10	0.08
	100÷200							
Stainless steel	10÷50	20	20÷45	0.04÷0.08	0.15	0.10	0.08	0.06
	50÷100		25÷50		0.20	0.15	0.10	0.08
	100÷200							
Cast steel	10÷50	20	25÷45	0.05÷0.10	0.20	0.15	0.13	0.10
	50÷100		30÷50		0.25	0.20	0.15	0.13
	100÷200							
Aluminium	10÷50	20	30÷50	0.05÷0.10	0.20	0.15	0.10	0.06
	50÷100		35÷60		0.25	0.20	0.15	0.13
	100÷200							
Brass	10÷50	20	35÷55	0.05÷0.10	0.25	0.20	0.18	0.15
	50÷100		40÷65		0.30	0.25	0.20	0.18
	100÷200							

Table 4

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Marking the difference

INTEGI, S.A.

Autonomía Kalea, 5 - 48250 Zaldibar (Bizkaia) - Spain

+34 943 174 800 integi@integi.com www.integi.com