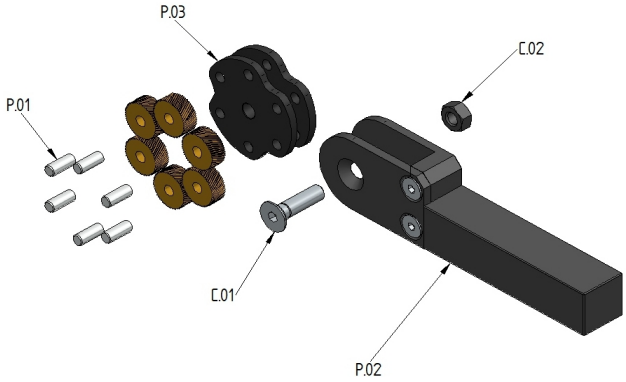
M2 INSTRUCTION MANUAL

1. TOOLS PARTS



Drawing 1

ITEM	CODE	REFERENCE	DESCRIPTION	ITEMS INCLUDED
SET.01	01990201	EM2-SET	Set with 6 HSS pins	P.01 (6x)
C.01	01900011	TAV M8-30	Screw DIN 7991 M8x30	C.01 + C.02
*C.02	-	TUER M8	Nut M8 DIN934	-
*P.01	-	EM2	HSS pins *	-
P.02	01982900	MM2	Shank M2	P.02+C.01+C.02
P.03	01993400	CM2	Knurl bearing reel	P.03 + C.01 + C.02

*This item is not sold individually

Table 1

2. FEASIBLE PATTERNS

The M2 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.

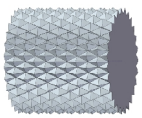
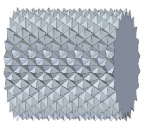
KNURLING PROFILE		DESCRIPTION	KNURLING WHEEL		FEED	
			AXIS L	AXIS R	AXIAL FEED	RADIAL FEED
	RAA	Right	AA Knurl	AA Knurl	✓	✓
	RGE 30º	30º Cross-knurl Diamond pattern male	BL30° Knurl	BL30° Knurl	✓	✓
	RGE 45º	45° Cross-knurl Diamond pattern male	BL45° Knurl	BL45° Knurl	✓	✓

Table 2

3. ASSEMBLING THE KNURLING WHEELS

First, loosen the C.01 screw and take out the reel. Place the knurls taking into account they need to be paired (BL+BR) according to **Drawing 2**.

When you introduce the pins, the beveled side comes first. Once the knurling wheels are installed and the pins inserted, the reel needs to be placed in the tool and the screw C.01 screwed, neither so tight the reel gets blocked nor so loose the reel rolls too easily. It needs to be tight in a way it can easily be turned with the hand.

4. CLAMPING AND SETTING THE TOOL TO THE MACHINE

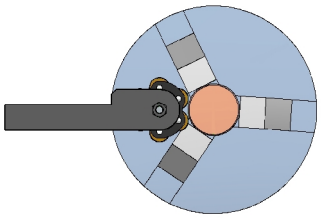
First, we need to make sure that the knurl rotates freely around the pin. Spread graphite grease if necessary.

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 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.

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



Drawing 2

5. 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 8 mm from the shoulder itself.

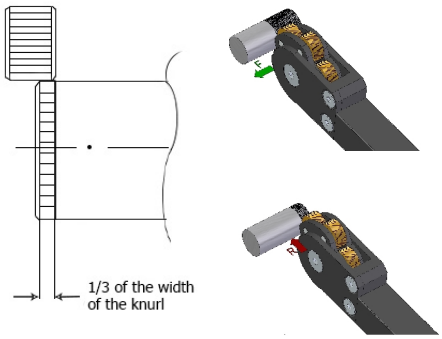
6. BEGINNING TO KNURL

While the chuck is rotating at the speed recommended at point 9, feed the tool so that 1/3 of the width of the knurling wheel gets in contact with the workpiece.

Press the wheels 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.

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



Drawing 3

7. BEFORE AND DURING THE WORKING PROCESS

- Make sure that the knurl pins are firmly fastened.
- Check that the knurls run free and lubricate them with graphite grease.
- 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.

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 that makes 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
Different knurling depth	Knurling wheels are not equally plunged into the workpiece.	Center the tool in relation to the workpiece

Table 3

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

9. RECOMMENDED SETTINGS

MATERIAL	Ø workpiece (mm)	ØKNURL (mm)	Cutting speed (m/min)	RADIAL FEED (mm/rev)	TRAVERSE FEED (mm/rev) FOR PITCHES (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							
Stainlees 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

www.integi.com

Marking the difference

INTEGI, S.A.

Autonomía Kalea, 5 - 48250 Zaldibar Bizkaia - Spain

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