

2012 Knurling Catalog Inch/Metric

# **EXAMPLE 10 EXAMPLE 10 EXAM**



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The Possibilities Are Endless

# With Dorian Tool Knurling Tools











#### **Knurling Tool Applications Form**

For help fill in the information sho	wn below and fax	to: (979) 282-2951	Quote Number Purchase Order Number
Company		Name	
Address		Phone ()	
City		Fax ( )	
StateZip		Email	
Knurl Type Examples		Customer to complete	e section below
60º Diamond Pattern* Straig	ht Pattern	D - Diameter Range	Type of Machine
Shoulderless		From To	
	<u>+</u> 	D1 - Diameter Range	
		From To	Type of Mat'l
$\downarrow$		L - Length of Knurl	□ Solid
shoulder		From To	□ Tubing
⊧t+  ⊧+	L	A° - Angle	
			Material Hardness
		Type of Knurl	□ HRC
L	L	□ Shoulderless □ Taper	□ BHN
		Face     Internal	
Face		□ Band	One of Dorto Boing Knurk
	The second secon	Knurl Pattern	
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	~~~~~	Straight     Diamond Male	
		Diamond Female	
	T I	Diagonal	
		Pitch Style	Tool Shank Size
Flat		□ Circular pitch (TPI)	
+		ם Diametral (שט) Diametral (שר)	
		Pitch Size	Right hand or Left hand
Internal		ТЫ	□ Right hand - chuck rotation
			is counterclockwise.
		IVIETIC	

\*60° Diamond pattern is standard. Other diamond patterns are available by request.



Comments:



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Knurl	Knurling Tool Recommendation			ation
Application	Best	Good	Fair	Not Recommended
Diamond Shoulderless	CNC-1 CNC-2 CNC-3	CNC109 KTW109	SCK	SSCK
Diamond To a Shoulder	CNC109-4 KTW109-4	CNC-6 SSCK	SFKT	SCK
Band	SCKN HDSCK	FKT HDFKT	CNC-5 SWFKT HDSWFKT	CNC-1 CNC-2 CNC-3
Small Diameter Diamond Shoulderless	CNC-7 SCNC-7	CNC109 KTW109	CNC-1 SCNC-1	SCK
Small Diameter Diamond To a Shoulder	CNC109-4 KTW109-4	-	SSCK	-
Internal Diamond or Straight Diamond to a Shoulder	IKT	-	-	-

#### Consult these tables below for the **Best Tool** for your application.

knurl		Knurling Too	Recommend	ation
Application	Best	Good	Fair	Not Recommended
Straight Shoulderless	107ST SWFKT	CNC109 KTW109	SCK	SSCK
Straight to a Shoulder	SSWFKT	CNC-109-4 KTW109-4	CNC-6 SSCK	SFKT
Band	CNC-5 SWFKT HDSWFKT	SCKN HDSCK	FKT HDFKT	107ST
Small Diameter Straight Shoulderless	CNC-7 SCNC-7	CNC109 KTW109	107ST	SCK
Small Diameter Straight To a Shoulder	CNC109-4 KTW109-4	-	SSWFKT	-
Flat Face Diamond or Straight	ММКТ	-	-	-

#### Table below indicates what the Tool Can Do, NOT what is best for the application as shown in the above table.

Tool	Page	What the Knurling Tool Can do							
Description	No.	To The Shoulder	Shoulderless	Center Height Adjustment	Fixed Center Height	Straight Pattern	Diamond Pattern	Up to 3/4"	3/4" & Over
SCNC-1	23		•	•			•	•	
SCNC-6	23	•		•		•	•	•	•
SCNC-7	23		•	•		•	•	•	
CNC-1	20		•	•			•	•	
CNC-2	20		•	•			•		•
CNC-3	20		•	•			•		•
CNC-4	21		•	•		•	•		•
CNC-5	21		•	•		•	•		•
CNC-6	21	•		•		•	•		•
CNC-7	21		•	•		•	•	•	•
107ST	24		•	•		•			•
CNC109-4	35	•		•		•	•	•	•
CNC109-M	35		•	•		•	•	•	•
3SHKT	25		•	•		•	•		•
SWFKT	26		•		•	•	•		•
HDSWFKT	26		•		•	•	•		•
SSWFKT	26	•			•	•	•		•
FKT	27		•		•	•	•		•
SFKT	27	•			•	•	•		•
SCKN	28		•	•		•	•		•
SSCK	28	•		•		•	•		•
HDFKT	27		•		•	•	•		•
HDSCK	28		•	•		•	•		•
MMKT	30		•		•	•	•		
IKT	29		•		•	•	•	•	•
SIKT	29	•			•	•	•	•	•
KTW109-4	33	•		•		•	•	•	•
KTW109-M	33		•	•		•	•	•	•
3WKT	37	•			•	•	•	•	•
SWFKT-B	40		•		•	•	•	•	•
DWFKT-B	40		•		•	•	•	•	•
SSWTCFKT	41	•			•	•	•	•	•
SDWTCFKT	41	•			•	•	•	•	•

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#### Applications

Knurling has a wide variety of applications in day to day use. It is most commonly used for decorative purposes and for serrating surfaces where components are locked or keyed together in unit assemblies.

The term "knurling" designates both the process and the knurled portion of the work.

Knurling is obtained by displacement of the material when the knurl is pressed against the surface of a rotating work blank. A knurled tooth is "V" shaped.

Knurling tools are used for producing STRAIGHT, DIAGONAL, OR DIAMOND patterns, having teeth of uniform pitch on cylindrical surfaces.

#### **Knurling and Pitch Systems**

The CIRCULAR PITCH SYSTEM knurling is related to the distance between the teeth on the circumference of the work blank. It is usually expressed in terms of the number of teeth per inch (TPI), although sometimes erroneously referred to as Pitch.

The DIAMETRAL PITCH SYSTEM knurling is designed to permit work blank diameters of standard fractional stock sizes ranging from 3/32" - 1".

#### **In-Feed Knurling**

Straight or diamond knurling can be produced by using either one or two knurls mounted in a holder in the front or rear of the cross slide which applies direct pressure to the work.

Diamond knurls require greater pressure than straight or diagonal knurls, sometimes placing prohibitive loads on both machine and work, causing damage to the machine.

For a better knurling, Adjustable Floating Straddle Type Holders with two knurls are used. The two opposed knurls form the knurling as they are fed onto the blank. Side pressure on the work and the machine spindle is reduced with the straddle type holders, as most of the pressure required for knurling is absorbed in the holder.

#### **End-Feed Knurling**

Straight, diagonal, or diamond knurling may be produced with end-feed type knurling holders mounted on the compound or turret.

Knurls used for end-feed knurling should have beveled edges. Only straight and diagonal knurls can be used with the end-feeding holders.

When producing diagonal and diamond knurling, the straight knurls are swiveled in the holder to obtain the diagonal and diamond knurling as the knurls are fed over the blank.

Straight knurling may be produced with end-feeding holders using either straight or diagonal knurls.

End-feedin knurling method permits easier starting of the knurls with uniform raise up of material, resulting in high quality knurling.

#### **Speed and Feeds**

For in-feed knurling, the knurl should be fed toward the work gradually until contact is made with the blank. This can be completed within 5 to 25 work revolutions.

For end-feed knurling, the feeds used with the turret vary considerably and are dependent on the pitch of the knurl, the material, the diameter of the work blank, and the hardness being knurled.

#### Two Ways to Achieve Knurling

#### (1) Forming

Knurl forming is achieved by pushing the knurl wheels against the blank while rotating. This will cause the material to be displaced in cold form, reproducing the same wheel pattern on the blank circumference. The blank is increased accordingly to the T.P.I. The force applied through forming is increased in larger diameters making knurling difficult and slow.

#### (2) Cutting

Knurl cutting is achieved by using knurl wheels to actually cut instead of forming the blank. The knurl wheels are set at an angle, making the knurling edges of the knurl wheels cut into the blank. Pressure is minimized while speed and feed is increased.

#### For Best Results

- 1. Diameter of part being knurled should be turned to size for concentricity and quality of knurl.
- 2. Knurl wheels must be exactly in center line with the work-piece for an even knurl pattern.
- 3. Knurl wheels are to run freely and the knurl pin must be secured on the tool holder.
- 4. Use heavy flow of coolant to keep the knurl wheels cool and clean.
- 5. There is not an exact formula for knurling. Before starting production, follow the instructions and with trial and error the best results will be achieved.

#### When Ordering a Knurling Tool, Specify:

- 1. Knurl pattern
- 2. Pitch style
- 3. Type of knurl
- 4. Diameter range
- 5. Type of material

#### Knurling Tools Available:

- 1. Metric System
- 2. Inches System

Example: FKT20 = Metric System = 20 mm Shank FKT75 = Inches System = 3/4 in Shank

For Metric Conversion see page 59.

6. Qty. of parts being knurled

9. Right hand or Left hand

7. Tool center height

8. Tool shank size

#### **Knurling Pattern**



#### **Tooth Form**

A knurled tooth is V-shaped and the depth of the tooth is less than the depth of a theoretical V-form. The tooth has a rounded root and crest. The relationship between the actual depth of tooth to the theoretical V varies with the pitch of the teeth. On finer pitches, the tooth is a smaller proportion of the theoretical V-depth than coarser pitches. Also, female diamond patterns have shallower tooth depth than male diamond patterns.



#### The Circular Pitch System

Circular pitch knurling is related to the distance between the teeth on the circumference of the work blank. It is usually expressed in terms as the number of teeth per inch, TPI, although sometimes erroneously referred to as pitch.



#### Number of Teeth per Inch - TPI

TPI refers to the number of teeth per inch measured on the circumference of the work blank diameter. The approximate TPI, however, may be measured on the outside diameter of the knurling for reference purposes. TPI is used and is measured perpendicular to the teeth or helix angle.



- **TPI system** is the number of teeth per inch (measured on a linear inch).
- Circular pitch Inch system is the distance from tooth to tooth, or is derived from 1" divided by the number of teeth per inch.
- Circular pitch metric system is the distance from tooth to tooth.
- Diametral pitch system is derived by the number of teeth on the work divided by the theoretical work blank diameter.

#### Straight Knurling



#### **Diagonal or Diamond Knurling**



#### TPI and Circular Pitches (Relation Chart) For Straight, Diagonal, and Diamond Knurling

Straight Knu	ırling	*Diagonal and Diamond Knurling				
TPI	TPI		PI	Circular Pitch		
(No. of Teeth Per Inch)	Pitch	Normal (TPI <sub>n</sub> )	Transverse (TPI <sub>t</sub> )	Normal (P)	Transverse (P <sub>t</sub> )	
08	.1250	08	6.93	.1250	.1443	
10	.1000	10	8.66	.1000	.1155	
12	.0833	12	10.39	.0833	.0962	
16	.0625	16	13.86	.0625	.0722	
20	.0500	20	17.32	.0500	.0577	
25	.0400	25	21.65	.0400	.0462	
30	.0333	30	25.98	.0333	.0385	
35	.0286	35	30.31	.0286	.0330	
40	.0250	40	34.64	.0250	.0289	
50	.0200	50	43.30	.0200	.0231	
80	.0125	80	69.28	.0125	.0144	

\*30° Helix Angle Table 1



#### **TPI and Circular Pitch Calculations**

The formula for finding the Transverse Teeth Per Inch  $(TPI_i)$ , if the Normal Teeth Per Inch  $(TPI_p)$  is known, is shown below.

TPI<sub>1</sub>=TPI<sub>n</sub> x Cos 30° (.86603)

The formula for finding the Transverse Circular Pitch (P,), if the Circular Pitch (P) is known, is shown below.



#### **TPI and Circular Pitch Examples**

Find the Transverse Pitch if the Normal Pitch is 20 TPI.

TPI, = TPI, x Cos 30° = 20 x .86603 = 17.32 TPI,

Find the Transverse Circular Pitch if the Normal Circular Pitch is .0500.

Where .0500 is the Normal Circular Pitch of 20 TPI.

 $P_t = P_n \div Cos \ 30^\circ = .0500 \div .86603 = .0577$  Circular Transverse Pitch

#### **Straight Knurl - Tooth and Pitch Calculations**

$$P = \frac{1.000}{TPI}$$
  $N_w = \frac{3.1416 \times D_w}{P}$ 

$$D_{w} = \frac{P \times N_{w}}{3.1416}$$

Where:

D<sub>w</sub>=Theoretical work blank diameter. N<sub>w</sub>=Number of teeth on work. P=Circular pitch. TPI=Number of teeth per inch measured on circumference of blank diameter.

TPI= <u>3.1416 x D</u>



#### Diagonal & Diamond Knurl Tooth & Pitch Calculations





# Dimensioning of Diametral and Circular Pitch Knurling

Uniform drafting practice is desirable and dimensioning should include length and knurled diameter of the knurling and specifications of the teeth. The method of dimensioning diameters and tooth specifications is important as improper use of dimensions may result in considerable confusion.

Always specify the **tooth pattern** of the knurling, stating whether it is **straight**, **diagonal**, or **diamond pattern**. Mention whether the diagonal knurling is **right** or **left** hand, and indicate the **angle** of the helix.



#### **General Purpose Knurling**

For general purpose knurling, only limited dimensions are necessary.

- TPI (Teeth Per Inch)
- · Work Blank Diameter



#### **Precision Knurling**

Knurled diameters and the circular pitch of the knurl are related. The circumference of the work blank should be an approximate multiple of the circular pitch for straight knurling and transverse circular pitch for diagonal and diamond knurling. Blank diameters vary with the circular pitch of the knurling selected, and should only be specified after the proper diameter of blank is determined by experimentation.







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#### **Standard Diametral Pitches**

The four standard diametral pitches available are 64, 96, 128, and 160. The 96 and 160 diametral pitches are for blank diameters having fractional increments of 1/32" and the 64 and 128 diametral pitches are for blank diameters having fractional diameters of 1/64". The American Standard recommends that the use of the 64 diametral pitch should be avoided as much as possible, and for simplification of tools, preference be given to the use of 96 diametral pitch.

The term diametral pitch applies to the quotient of the total number of teeth in the circumference of the work divided by the basic diameter of the work blank. The diametral pitch is the ratio of the number of teeth on the work to the number of inches of basic work blank diameter and equals the number of teeth to each inch of basic blank diameter.

$$P = \frac{N_w}{D_w}$$

Where: P=Diametral Pitch  $N_w$ =Number of teeth on work, or P x D<sub>w</sub> D<sub>w</sub>=Theoretical work blank diameter or  $\frac{N}{2}$ 

The diametral pitch and the number of teeth are always measured in a transverse plane which is perpendicular to the axis of rotation for diagonal as well as straight knurling.

A comparison of diametral pitches, TPI, and circular pitches is shown below.

Diagonal and diamond knurling on work blank may be accomplished by setting the axis of straight knurls at an angle to the work axis.

When using straight knurls to produce diagonal and diamond knurling by end-feeding, the transverse diametral pitch that is produced on the work will not be the same as that of the knurl. The diametral pitch in such instances refers to the diametral pitch on the knurl rather than the knurling produced on the work.

Chaight and Diagonary increase of analysis							
Diametral	**Teeth Per Inch	**Circular	Approx. Depth of Tooth or Increase in Knurled Diameter		Min. No. of Teeth in Knurled	Wor Dia	k Blank meters
Pilch	Approx.	Plich	Straight	Diagona I	Circumference	Range	Diameter Increments
64	20.4	.0491	.024	.021	24	3/8 - 1	1/64
96	30.6	.0327	.016	.014	24	1/4 - 1	1/32
128	40.7	.0245	.012	.010	18	9/64 - 1	1/64
160	50.9	.0196	.009	.008	15	3/32 - 1	1/32

#### Approximate Increase of Blank Diameter

\*\* Refers to transverse TPI and transverse circular pitch on diagonal knurling. Table 2

#### Equivalent Normal TPI of Diametral Pitch Knurls

All Diametral Pitch Knurls made to American Standards (ASA B5.30 1958). Diametral Pitch Knurls produce the D.P. number of teeth per inch of diameter. Rolled Circular Pitch Knurls, produce the TPI number of teeth per inch of circumference measured normal to the teeth.

Diamatral Ritab	Teeth Per Inch (TPI)				
Diametral Filon	Straight	30º Diagonal			
64	20.4	23.6			
96	30.6	35.3			
128	40.7	47.0			
160	50.9	58.8			

Table 3

#### Work Blank Diameters

The formula for theoretical work blank diameters are as follows:

$$D_w = \frac{N_w}{P}$$

P=Diametral Pitch N<sub>w</sub>=Number of teeth on work, or P x D<sub>w</sub>

 $D_w$ =Theoretical work blank diameter or  $\frac{N_v}{D_w}$ 

For end-feed knurling with straight tooth knurls: Where:

Where:



P=Diametral Pitch  $N_w$ =Number of teeth on work, or P x D<sub>w</sub> D<sub>w</sub>=Theoretical work blank diameter or  $\frac{N_w}{P}$ ¥=Angle between knurl axis and work axis. (cos 30°=.86603)



The number of teeth produced on the work blank is measured in the transverse plane and may be determined with the following formula for diagonal knurling.

$N_{w}$ =Number of teeth on work, or P x D <sub>w</sub>	$N_{w} = D_{w} \times P \times \cos 4$ $N_{w} = Number of teeth on work, or P \times D_{w}$ $D_{w} = Theoretical work blank diameter or \frac{N_{w}}{P}$	Where:	P-Diametral Pitch	
	$N_w = D_w \times P \times \cos \Psi$ $D_w = Theoretical work blank diameter or \frac{N_w}{P}$		$N_w$ =Number of teeth on work, or P x D <sub>w</sub>	

#### For Example:

If 30° diagonal knurling were to be produced on 1" stock with a 96 diametral pitch straight knurl.

N<sub>w</sub> = 1.000 x 96 x .86603 = 83.14 teeth

Note: .86603 equals cosine of 30°

Increasing the angle between the knurl axis to approximately 30 1/4° would provide good tracking of the knurl and make it possible to obtain an even 83 teeth instead of 83.14.

By reducing the diameter of the work blank to a decimal size, good tracking of the knurl can be obtained for  $30^{\circ}$  diagonal knurling according to the following formula:

$$D_{w} = \frac{N_{w}}{P x \cos 4} = \frac{83}{96 x .86603} = .998$$
 inch

The tolerance for work blank diameters vary with the knurling requirements. For general purpose knurling the tolerances generally range between 5 to 8% of the circular pitch and for precise knurling, approximately 2 to 4% of the circular pitch.

#### **Request for Diametral Blank Diameters**



#### **Knurled Diameters**

The approximate increase in blank diameters for different teeth per inch with straight, diagonal, and diamond pattern knurling is shown below. The amount of increase shown is based on knurling soft steels and should be used as a guide only. The amount of increase varies slightly with different materials.

When the full depth of the knurl is not required (no sharp points), penetrate the work blank to displace at least 75% of the knurl tooth depth. This insures proper tracking of the knurl on the work.

Care should be exercised not to specify knurled diameters with too few teeth. Consideration should be also given to the length of the knurling and the pressure required to force the knurl into the work. The greatest pressures are exerted by the coarser pitches with in-feed knurling using single knurls. Wide knurls require more pressure than narrow knurls. The following tabulation may be used as a guide in selecting the smallest knurled diameters to use for knurling with different number of teeth per inch (TPI) and widths of knurl faces.

	Minimum Kr	nurled Diameters		
For In-feed	Rolling with Circular	Pitch Knurls on Gene	eral Applications	
* + TDI	Standard Width of Knurl Face			
IFI	3/16	1/4	3/8	
16	-	13/32	1/2	
20	5/16	11/32	7/16	
25	1/4	9/32	3/8	
30	7/32	1/4	5/16	
35	3/16	7/32	9/32	
40	5/32	3/16	1/4	
50	1/8	5/32	7/32	
80	5/64	7/64	11/64	
*Based on rolling supported. † Refe	conditions satisfactory for rs to normal TPI on diag	r knurling and work being onal knurling.	g right and properly	

Table 4

	A	pproximate	Diameter Increase	of Blank
		with Star	ndard Circular Pitch Knu	rls
*TPI Straight Diagonal** **Diamond (on pa				d (on part)
Circular Pitch		-	Male	Female
8	.042	.042	.046	-
10	.038	.038	.042	-
12	.034	.034	.038	.023
16	.025	.025	.029	.017
20	.020	.020	.023	.014
25	.016	.016	.018	.011
30	.013	.013	.015	.009
35	.011	.011	.013	.007
40	.009	.009	.010	.006
50	.009	.009	.010	.006
80	.005	.005	.006	.004
Diametr	al Pitch		Male	Female
64	.024	.021	0.024	0.015
96	.016	.014	0.016	0.01
128	.012	.010	0.012	0.007
160	.009	.008	0.009	0.005

\*Refers to normal teeth per inch on diagonal and diamond knurling.\*\*With 30° helix angle. Table 5

#### **Tooth Depth**

Depth of tooth is in direct relationship with circular pitch knurl with approximate percentages which will vary, accordingly to material, speed, and feed used in knurling.

Tool Depth wit			
Type of Knurl	Percentage of Depth of	Knurl	
Straight Tooth	35% of Circular Pitch	(P)	Where circular pitch=
Diagonal	35% of Normal Circular Pitch	(Pn)	1.000
Diamond	40% of Normal Circular Pitch	(Pn)	TPI
Diamond Female	25% of Normal Circular Pitch	(Pn)	
Table 6			

#### Tooth Depth Examples

Find the circular pitch and depth of tooth for a straight tooth knurl and has 20 TPI.

 $P = \frac{1.000}{20 \text{ TPI}} = .0500 \text{ Circular Pitch} \quad \text{Tool Depth} = .0500 \text{ x } 35\% = .0175$ The resulting depth is per side, multiply x2 for depth on diameter.

#### **Tracking Calculations**

Follow the **steps 1-10** below to prepare the proper diameter to turn your diameter before knurling in order to improve the success of knurling without double tracking.

Step 1: Diameter of the part after knurl: \_\_\_\_\_\_\_ (skip to step 3 if the diameter before knurl is only diameter specified.)

Step 2: Growth of material after knurling based on TPI: \_\_\_\_\_\_ (see table 5)

Step 3: Diameter before knurl \_\_\_\_\_\_\_\_\_ (step 1 - step 2, or use diameter given on print if starting here at this step)

Step 4: Quick calculator value: \_\_\_\_\_-(see knurl wheel pages for your exact wheel. Example: shown below .0330)

Step 5: Calculate number of teeth on part after knurl: \_\_\_\_\_\_ (diameter of part before knurl from step 3 / quick calculator value, example: 1.138 dia / .033 = 34.5 teeth on part after knurl)

Step 6: Understand value in step 5

(fractional values can lead to double tracking. In the above example, there will be 34 teeth on the part with .5 of a tooth left over. This 1/2 tooth overtravel will most likely double track. To solve this continue to step 7)

Step 7: Round to closest whole number \_\_\_\_\_\_ (in the above example either 34 or 35 can be used)

**Step 8:** Calculate new diameter to turn material before knurl: \_\_\_\_\_ (quick calculator value x rounded number of teeth from step 7, example:  $.033 \times 34 = 1.122$  diameter of the part before knurl to track properly.)

Step 9: Calculate diameter after knurl based on new tracking diameter: \_\_\_\_\_\_ (add growth value from step 2 to new tracking diameter from step 8)

Circular Knurl

Step 10: Verify against print tolerances : \_\_\_\_

#### Example for Step 4:



onound		Included			onaight	
Pit Inch	ch Metric	Tooth Angle	Knurl Pattern	R Series Knurl Wheel	Cobalt TiN Coated	
10 (TPI)	2,5mm	90°	Course	Description Tracking Data Standard	RS-10-C 23T (0330" 26502 26533	,
				Beven	20000	

For knurl wheels see pages 46-58

#### Traditional Formula for Step 5:

• · · · ·		
Correction Factor	*TPI	**Approx. Value of C.F.
	12-19	.010
	20-29	.007
	30-39	.005
	40-49	.003
	50-80	.002
	Table 7	

\*\* This value is affected somewhat by machine speeds, material hardness, relative diameters of knurl and blank.

Straight

Teeth (on blank) = Teeth (on knurl tool) x Diameter (Blank)

Diameter (wheel) + Correction Factor

\* Note: These formulae apply accurately only to knurls In-Fed from the cross-slide.



Knurling is ordinarily performed at the same speeds used as cutting operations. Use the same SFM used for high speed and cobalt tool bits to calculate speeds and feeds. However, where spindle speeds can be reduced without loss of production, it is recommended that spindle speeds be lowered as much as possible to increase knurl life.

For in-feed knurling, the knurl should be fed toward the work gradually until contact is made with the blank, and from there on, the feed should be progressive until the feed is at the high point of the cam. As few work revolutions as possible should be allowed for feeding the knurl into the work. The knurl should be fed to full depth as rapidly as permissible without causing undue pressure on the work, the tools, and the equipment. Too many revolutions may result in a roughened or slivered tooth surface and destruction of the knurl and the knurling tool.

The rate of feed is governed by the type of material being knurled, diameter and rigidity of the work, and the width and pitch of the knurl. Faster feeds are used for the softer materials and slower feeds for harder materials.

 $RPM = \frac{12 \text{ x SFM}}{\pi \text{ x DIA}}$ 

#### SFM Formula

Cuesda and Feeda

Speeds a	and ree	us	
	alar Pitch h & mm) 	9	
Description	Material Specs	ТРІ	Metric Pitch
Low carbon steel	1018 1117	>14	>1,8
	1215 etc.	16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>
Alloy Steel Tool steels	4130 4140	>14	>1,8
	D2 etc.	16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>
Stainless Steel	304 17-4	>14	>1,8
	etc.	16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>
Aluminum Brass	6061 C360	>14	>1,8
Plastic	Delrin etc.	16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>

<	<b>↑</b>	
End	In Frank	:
Feed	Feed	Smaller 🔆 WI
0.006" [,15mm]	.001003" [,025-,075mm]	
0.008" [,20mm]	.002004" [,050-,100mm	50
0.010" [,25mm]	.002004" [,050-,100mm]	[15-

**Knurl Forming** 

End	In .	Speed
Feed	Feed	Smaller 🤆 Wheel dia>Larger
0.006" [,15mm]	.001003" [,025-,075mm]	_
0.008" [,20mm]	.002004" [,050-,100mm	50-70 SFM
0.010" [,25mm]	.002004" [,050-,100mm]	[15-21 m/min]
0.012" [,30mm]	.002004" [,050-,100mm]	
0.004" [,10mm]	.001002" [,025-,050mm]	
0.005" [,13mm]	.001003" [,025-,075mm]	35-50 SFM
0.007" [,18mm]	.001003" [,025-,075mm]	[10-15 m/min]
0.009" [,23mm]	.001003" [,025-,075mm]	
0.004" [,10mm]	.001002" [,025-,050mm]	
0.005" [,13mm]	.001003" [,025-,075mm]	35-50 SFM
0.007" [,18mm]	.001003" [,025-,075mm]	[10-15 m/min]
0.009" [,23mm]	.001003" [,025-,075mm]	-
0.008" [,20mm]	.002004" [,050-,100mm]	
0.010" [,25mm]	.003005" [,075-,125mm]	90-130 SFM
0.013" [,33mm]	.003005" [,075-,125mm]	[27-40 m/min]
0.017" [.43mm]	.003005" [.075125mm]	

Although the knurling should be normally completed within 10 to 25 work revolutions, the ability of many machine cross slides to operate at the desired high speeds prohibits the use of the preferred revolutions, especially when high work spindle speeds are used.

The cam rise must be continuous with no dwell or backing away until the high point is reached. It is desirable to have a slight dwell on the cam at the completion of the feeding which allows several revolutions of the work with the knurl at full tooth depth. The amount of dwell depends upon the nature of the work and the material. The knurl should be then withdrawn from the work quickly.

The feeds used for end-feed knurling with the turret vary considerably and are dependent upon the pitch of the knurl, material being knurled, and the nature and diameter of the work.

-WARNING- Speeds and feeds information in the catalog are for reference only. If the operator does not feel safe using our speeds and feeds, the operator should use what he or she is comfortable with. Dorian tool is not responsible for any injuries that may occur.

Knurl Cutt	ing	
<		
End	In	Speed
Feed	Feed	Smaller 🤆 Wheel dia> Larger
0.009" [,23mm]	.001003" [,025-,075mm]	
0.011" [,28mm]	.002004" [,050-,100mm]	100-140 SFM
0.013" [,33mm]	.002004" [,050-,100mm]	[30-42 m/min]
0.015" [,38mm]	.002004" [,050-,100mm]	
0.007" [,18mm] 0.008"	.001002" [,025-,050mm] .001003"	
[,20mm] 0.010" [.25mm]	[,025-,075mm] .001003" [.025075mm]	70-100 SFM [21-30 m/min]
0.012" [,30mm]	.001003" [,025-,075mm]	
0.007" [,18mm]	.001002" [,025-,050mm]	
0.008" [,20mm]	.001003" [,025-,075mm]	70-100 SFM
0.010" [,25mm]	.001003" [,025-,075mm]	[21-30 m/min]
0.012" [,30mm]	.001003" [,025-,075mm]	
0.011" [,28mm]	.002004" [,050-,100mm]	
[,33mm]	[,075-,125mm]	110-140 SFM
[,40mm]	[,075-,125mm]	[33-42 m/mm]
[,50mm]	[,075-,125mm]	

Table 8



#### **Common Knurling Problems**

Problem	Cause	Solution
Knurling double tracking	<ol> <li>Circumference around blank is not an approximate multiple of the pitch of the knurl</li> <li>Shallow depth</li> </ol>	<ol> <li>Force knurl in harder the first revolution</li> <li>Change blank diameter +/005</li> <li>Try slightly different pitch knurl</li> <li>Grind or stone approcimately .003 off the diameter of the knurl wheel</li> <li>Order special knurl</li> </ol>
Knurling flaking or slivered	<ol> <li>Knurling on stock material with scale</li> <li>Over-rolling stock material</li> <li>Knurl wheels too deep in the part</li> </ol>	<ol> <li>Turn off scale</li> <li>Reduce number of revolutions the wheel is in contact with part</li> <li>Reduce the depth of the knurl wheels</li> </ol>
Knurl destruction	<ol> <li>Knurl wheels too deep in the part</li> <li>Over-rolling stock material</li> <li>RPM too fast causing wheels to seize</li> </ol>	<ol> <li>Reduce the depth of the knurl wheels</li> <li>Reduce number of revolutions the wheel is in contact with part</li> <li>Reduce speed and improve flow of coolant</li> </ol>
Knurl wheel's poor tool life	<ol> <li>Knurling on stock material with scale</li> <li>Over-rolling stock material</li> <li>Knurling Stainless steel (302, 303, 304, 316, &amp; 174ph)</li> <li>Rolling semi-hardenned steels</li> <li>Stock run out excessive</li> <li>Knurl wheels improperly hardened or of poor quality</li> <li>Poor lubrication</li> <li>Knurl wheels too deep in the part</li> </ol>	<ol> <li>Turn off scale</li> <li>Reduce number of revolutions the wheel is in contact with part</li> <li>Slow speeds and feeds</li> <li>Use cobalt titanium nitrating knurl wheels</li> <li>Machine parts concentric</li> <li>Change knurl wheels</li> <li>Increase lubrication</li> <li>Reduce the depth of the knurl wheels</li> </ol>
Uneven depth of knurl	1. Center height not set	1. Adjust center height with shim or adjustment screws if the tool is adjustable
Twisted knurl pattern	<ol> <li>Center height not set</li> <li>Knurl wheels not held square to part.</li> </ol>	<ol> <li>Adjust center height with shim or adjustment screws if the tool is adjustable</li> <li>Indicate wheels during setup to make sure they are square to the part</li> </ol>



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12 Call: 979-282-2861 Fax: 979-282-2951
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#### 1. Mounting instructions:

Clamp the shank at right angles to the axial center line of the machine.



2. Center Height: Center height is not as critical on a single wheel tool as the wheel contact at all positions. Although too much difference may make it harder to judge depth engagement when feeding into the part.

3. Knurling setup: With the spindle rotating slowly, In Feed (Plunge) the tool slowly until the wheel starts to move. Set this position as your zero point.

4. Starting the knurl: Start the machine and position the knurl. If the knurl is starting on the end of the part, position the wheel 1/8" on the end. Then, In Feed (Plunge) to the full depth calculated using the formulas on the previous pages. If knurling a straight pattern the tool can then be fed longitudinally (end feed) with automatic feed. If knurling a diamond pattern, this type of tool is plunge only (in feed), longitudinal (end feed) is not recommended. See the Speed and Feed for approximate feed rates. IMPORTANT, ALWAYS USE A STEADY FLOW OF COOLANT TO KEEP THE WHEEL COOL AND FREE OF CHIPS.

#### For double wheel fixed knurling tool

1. Mounting instructions: Clamp the shank at right angles to the axial center line of the machine.



2. Center Height: Center height is

critical on a double wheel tool as the eye can see even the smallest variance when producing a cosmetic knurl. This style of tool is recommended for machines that have a means to adjust center height. It may be used on a CNC, but will be cumbersome during setup to shim to center.

3. Knurling setup: With the spindle rotating slowly, In Feed (Plunge) the tool slowly until both wheels starts to move at the same time. Set this position as your zero point.

4. Starting the knurl: Start the machine and position the knurl. If the knurl is starting on the end of the part, position the wheel 1/8" on the end. Then, In Feed (Plunge) to the full depth calculated using the formulas on the previous pages. The tool can then be fed longitudinally (end feed) with automatic feed. See the Speed and Feed for approximate feed rates. IMPORTANT, ALWAYS USE A STEADY FLOW OF COOLANT TO KEEP THE WHEELS COOL AND FREE OF CHIPS.

#### **Beveled versus Full Faced.**

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When knurling longitudionally (End Feed) beveled edge knurl wheels should be used during form knurling, allowing the knurling wheel to gradually form the knurled part without chipping the edge of the wheel, and create a cleaner and smoother knurled pattern.



When plunge knurling (In Feed) a beveled or full faced knurl wheel may be used according the required width.

#### For double wheel self centering knurling tool

#### 1. Mounting instructions:

Clamp the shank at right angles to the axial center line of the machine.



#### 2. Center Height:

Center height is critical on a double wheel tool as the eye can see even the smallest variance when producing a cosmetic knurl. This style of tool is recommended for most machines because of its eas to setup. There is no need to adjust center height.

3. Knurling setup: With the spindle rotating slowly, In Feed (Plunge) the tool slowly until the top wheel touches. The top wheel will always touch because of gravity. Continue feeding until the head pivots and the bottom wheel starts to move. Set this position as your zero point.

4. Starting the knurl: Start the machine and position the knurl. If the knurl is starting on the end of the part, position the wheel 1/8" on the end. Then, In Feed (Plunge) to the full depth calculated using the formulas on the previous pages. The tool can then be fed longitudinally (end feed) with automatic feed. See the Speed and Feed for approximate feed rates. IMPORTANT, ALWAYS USE A STEADY FLOW OF COOLANT TO KEEP THE WHEELS COOL AND FREE OF CHIPS.

#### For Straddle Style Knurl Tools

1. Mounting instructions: Clamp the shank at right angle to the axial center line of the machine

2. Center Height: Dorian straddle style tools have some floatation to allow centering during setup.



3. Knurling setup: Dorian straddle knurling tools are adjusted using one screw that moves both arms. The screw is slightly shorter than the body to allow some floating. Knurling is performed with the set screws locked to hold the arms rigid.

#### The tool is adjusted and setup as follows:

- A. Loosen locking screws on the side of the holder
- B. Insert a wrench into the head and turn screw to open the arms larger than the part.
- C. Calculate the diameter required for the depth of the knurls using the formulas provided earlier in the text.
- D. Place a piece of raw material into the chuck and turn it to the diameter determined above.
- E. Jog the tool to place the wheels above and below the part on centerline.
- F. Turn the adjustment screw until both wheels touch the material.
- G. Lock the locking screws over the arms only. Tightening the other screws will bend the protective shim.
- H. The tool is now set on center and at depth to knurl the actual part.

4. Starting the knurl: Start the machine and position the knurl. If the knurl is starting on the end of the part, position the wheel 1/8" on the end. Then, In Feed (Plunge) to the centerline of the part. The tool can then be fed longitudinally (end feed) with automatic feed. See the Speed and Feed for approximate feed rates. IMPORTANT, ALWAYS USE A STEADY FLOW OF COOLANT TO KEEP THE WHEELS COOL AND FREE OF CHIPS.



13



#### Mounting to the Machine

Clamp the shank at right angles to the axial center line of the machine. The knurl wheels of the knurling tool head should be set exactly on center.

#### To adjust center-height:

- 1. Loosen the lock screws.
- 2. Turning the adjustment screw adjusts the head up or down.
- 3. Turn adjustment screw until the center height is aligned.
- 4. Lock head back in place by tightening the lock screws.

#### **Knurling Adjustment Set Up**

With the machine spindle rotating slowly, In Feed (Plunge) the tool to make a slight impression for the full width of the cutter. This impression should be equal on both wheels when using Diamond Knurling Head. Misaligned patterns can be corrected by turning the fine adjustment screw in opposite directions. (See Knurling Adjustments)

#### **Knurling Head Adjustments**



R.H. Spiral

L.H. Spiral

- Knurl tool is too low.
  Top wheel is cutting R.H. Diagonal Knurl
  - Top wheel is cutting a deeper R.H. Diagonal Knurl
    Turn the Fine Center
    - Adjustment Screw until both wheels are on center and touching simultaneously.
  - Knurl tool is too high.
  - Bottom wheel is cutting a deeper L.H. Diagonal Knurl.
  - Turn Fine Center Adjustment Screw until both wheels are on center and touching simultaneously.
    - Tool is center.
    - Both wheels are touching simultaneously, cutting a perfect Diamond Knurl.

#### Starting the Knurl

Start the machine, In Feed (Plunge) so that the full depth of knurl is being cut 1/8" on the part to full knurl which is 35% of the circular pitch (see formula). Then, continue longitudinally (end feed) with automatic feed. See the Speed and Feed for approximate feed rates. IMPORTANT, ALWAYS USE A STEADY FLOW OF COOLANT TO KEEP THE WHEELS COOL AND FREE OF CHIPS.



#### **Full Faced Cutting Knurl Wheel**

When cut knurling, a full faced knurl wheel must be used. The edge of the knurl wheel will be cut into the material to be knurled. A sharp edge must be kept to cut a clean and smooth knurl pattern. The knurl wheel can be reground once the edge is dull or chipped.

#### **Edge Prep**

Full Faced

#### Wheel Grinding (For cutting style tools only)

When the cutting edges of the knurl wheel become dull, resharpen them by grinding the cutting face of both wheels evenly.



**R & M STYLE KNURL WHEEL** 

SW STYLE KNURL WHEEL





4 Call: 979-282-2861





Often, parts require knurling on conical, concave, convex, or radial surfaces, either for functional or decorative purposes. With proper tools and application, a clean, well-formed knurl or serrations can be produced.

One of the most frequent mistakes made is illustrated in Figure 1. In this case, usually for convenience, the knurling tool and the part are set with parallel axis. This is similar to running a pair of bevel gears the wrong way. As the cone angle increases, the results become worse.

Figure 2 while technically not correct, is better than Figure 1, and has the advantage of being a substantially lower cost tool. This method is satisfactory on relatively large diameters when the cone angle is small.

Figure 3 illustrates the proper method of rolling conical surfaces to produce a clean knurl with maximum tool life. With proper designed tools, and using this method, it is possible to roll tapered serrations with a controlled number of teeth.

For proper tracking at both ends of the piece, it is necessary to establish the geometrical relationship between the part and the tool with consideration given to the space available for tooling. It is sometimes advantageous to use a shank-type knurl, as shown in Figure 4 where clearance is not available for the conventional style knurl holder.

In certain cases, parts may be knurled with radial teeth on the end of parts, by using a conical knurl of the proper design. Here again, the results depend primarily on establishing the geometrical relationship between the part and the tool (See Figure 5).

A tracking correction factor is usually applied to the calculated diameter because of the many variables involved, such as hardness of material, elasticity of machine tools and tool holders, etc. This factor is necessarily empirical.

It is geometrically impossible to knurl a perfect concave or convex part with conventional knurls. The problem is illustrated in Figure 6. If the pitch on the tool or part changes by more than 25% from the middle to the edges, poor results can be expected on the finished part. A change of less than 10% in the pitch should produce a clean looking part.







SEE FIGURE 3 WB1 WB2

101	
*KT1	- *KT2

\* Correction Factor Less Tracking











н	L1	L2	Р	т	T1





# CNC Modular Knurling Tools With the Flexibility of Multiple Knurling Applications!



#### Versatility

The CNC Modular Knurling Tool is a tooling system which combines exceptional versatility, rigidity, ease of handling, and simplicity. An unlimited number of knurl wheels, heads, and shanks can be combined to provide a large number of different tools for a wide range of applications.

- · Small diameter diamond pattern knurl cutting action
- · Heavy duty diameter diamond pattern knurl cutting action
- Extra heavy duty diameter diamond pattern knurl cutting action
- Double Wheel forming knurling head
- Straight pattern knurl forming action
- · Shoulder knurl forming action
- Small diameter, long parts, and special application knurl forming action

#### **Modular**

The CNC Modular Knurling Tool includes three (Inch) shank and three (metric) shank sizes and seven standard knurling heads to create any knurling tool combination.

#### **Adjustable**

The dovetail mounting of the shank and head insures that the tool will be rigid and adjustable yet easy to use. By turning the adjustment screw clockwise or counterclockwise the center height of the head can be adjusted. Each eighth turn of the screw, which is marked on the screw, moves the head .004". After the desired center height has been reached, tightening the lock screws ensures that the head will remain in position while knurling a part.

#### Two Ways to Achieve Knurling With This Tool

#### Forming (four heads available)

Knurl forming action (material displacement by means of rolling) is generally for special application. It creates a better quality of knurl pattern, but speeds and feeds are sacrificed for this quality. The force applied through forming is increased in larger diameters making knurling difficult and slow.

#### Cutting (three heads available)

Knurl cutting action cuts a perfect knurl pattern 10 to 20 times faster than any conventional knurling tool. It is engineered to knurl any material, including thin wall tubing, with minimum stress to the spindle and compound lathe. Knurl cutting action speeds up knurling enough to become applicable for CNC use.





CNC-100-3-M used for examples.





#### LD 60<sup>o</sup> Diamond Cutting Knurling TOOL - Small Cutting Range 5/16" to 1-1/2" (8mm to 38mm)



Metric	LIPC No	Shank	Inch	UPC No	Shank	Tool	Knurl Wheel	Knur	l Pin Set	Modular Head
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
CNC-20-1-2	20405	20	CNC-75-1-2	20410	3/4"	5 7/8"	SW2			
CNC-25-1-2	20415	25	CNC-100-1-2	20420	1"	5 7/8"	SW2	PSW-2.0S	29005	CNCKH-1-2
CNC-32-1-2	20425	32	CNC-125-1-2	20430	1 1/4"	6 3/8"	SW2			

Supplied with a set of straight high speed TiN coated knurl wheels, 30 TPI for a male diamond pattern.

#### H.D. 60° Diamond Cutting Knurling TOOL - Medium Cutting Range 1.0" to 5" (25mm to 125mm)



	Motric		Shank	Inch		Shank	Tool	Knurl	Knurl	Pin Set	Modular Hoad
	Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
	CNC-20-2-R	20505	20	CNC-75-2-R	20510	3/4"	5 7/8"	R			
b	CNC-25-2-R	20515	25	CNC-100-2-R	20520	1"	5 7/8"	R	KPS-25- 87-C	28925	CNCKH-2-R
	CNC-32-2-R	20525	32	CNC-125-2-R	20530	1 1/4"	6 3/8"	R			

Supplied with a set of straight high speed knurl wheels, 25 TPI for a male diamond pattern.

#### 3 Extra H.D. 60º Diamond Cutting Knurling TOOL - Large Cutting Range 2.0" & up (50mm & up)



Metric		LIPC No Shank	Oharah	le ch				Knurl	Knurl	Pin Set	Madular Lload	
	Description	0PC No. 733101-	Shank Size mm	Description	0PC No. 733101-	Shank Size	Length	Style	Description	UPC No. 733101-	Description	
	CNC-20-3-M	20605	20	CNC-75-3-M	20610	3/4"	6"	м				
	CNC-25-3-M	20615	25	CNC-100-3-M	20620	1"	6"	м	KPS-31-100-C	28945	CNCKH-3-M	
	CNC-32-3-M	20625	32	CNC-125-3-M	20630	1 1/4"	6 1/2"	м			l	
	Supplied with a	set of straigh	t high speed	TiN coated knurl	wheels 25 TP	I for a mal	e diamond r	attern				

#### 4 Double Wheel Forming Knurling TOOL - Diameter Range: 5/16" & up (8mm & up)



Metric	LIPC No.	Shank	Inch	LIPC No.	Shank	Tool	Knurl Wheel	Knurl Pin Set		Modular Head
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
CNC-20-4-M	20640	20	CNC-75-4-M	20646	3/4"	6"	М			
CNC-25-4-M	20642	25	CNC-100-4-M	20648	1"	6"	М	KPS-31-125-C	28950	CNCKH-4-M
CNC-32-4-M	20644	32	CNC-125-4-M	20650	1 1/4"	6 1/2"	М			

Supplied with a set of diagonal high speed beveled TiN coated knurl wheels, 25 TPI for a male diamond pattern.

#### 5 Single Wheel Forming Knurling TOOL - Straight Bump Unlimited Diameter

1 0	-	
- /	9	
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		t.

Motric		Shank	Inch		Shank	Knurl Knurl Pi		Pin Set	Modular Hoad	
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
CNC-20-5-0	20705	20	CNC-75-5-0	20710	3/4"	5 3/4"	0			
CNC-25-5-0	20715	25	CNC-100-5-O	20720	1"	5 3/4"	0	KPS-31-125-C	28950	CNCKH-5-O
CNC-32-5-0	20725	32	CNC-125-5-0	20730	1 1/4"	6 1/4"	0			

Supplied with one straight high speed beveled TiN coated knurl wheel, 25 TPI for a straight pattern.

#### 6 Shoulder Forming Knurling TOOL - Diameter Range: 5/16" & up (8mm & up)

1	-	
- 6	- 6	
	0000	ming
	50	Eo.
U		

							Knurl	Knurl	Pin Set	
Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Wheel Style	Description	UPC No. 733101-	Modular Head Description
CNC-20-6-4	20775	20	CNC-75-6-4	20780	3/4"	5 3/4"	SW4			
CNC-25-6-4	20785	25	CNC-100-6-4	20790	1"	5 3/4"	SW4	SW4.0P-2S	29085	CNCKH-6-4
CNC-32-6-4	20795	32	CNC-125-6-4	20800	1 1/4"	6 1/4"	SW4			

Supplied with a set of diagonal high speed beveled TiN coated knurl wheels, 25 TPI for a male diamond pattern.

#### Straddle Forming Knurling TOOL - Diameter Range: up to 1" (25mm)



Motrio			Inch		Shank	Tool	Knurl	Knurl Pin Set		Modular Hood	
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description	
CNC-20-7-R	20905	20	CNC-75-7-R	20910	3/4"	6 3/8"	R				
CNC-25-7-R	20915	25	CNC-100-7-R	20920	1"	6 3/8"	R	KPS-25-62-C	28915	CNCKH-7-R	
CNC-32-7-R	20925	32	CNC-125-7-R	20930	1 1/4"	6 7/8"	R				

Supplied with a set of diagonal high speed beveled TiN coated knurl wheels, 30 TPI for a male diamond pattern.

Three CNC Modular Knurling Tool Shank Sizes





	CNC Modular Knurling Tool Shank													
											Adjustme	nt Screw	Lock Scree	w Set of 3
Metric	UPC No.	C.H. & S	Inch	UPC No.	C.H. & S							UPC No.		UPC No.
Description	733101-	mm	Description	733101-	inch	G	Н	L1	L2	Т	Description	733101-	Description	733101-
CNC-20	21005	20	CNC-75	21010	3/4"	0.250	2.000	3.500	3.875	1.000				
CNC-25	21015	25	CNC-100	21020	1.0"	0.000	2.000	3.500	3.875	1.000	CNC-1175	28505	CNC-1024	28515
CNC-32	21025	32	CNC-125	21030	1-1/4"	0.000	2.250	4.000	4.375	1.000				

Supplied with Lock Screw and Adjustment Screws.

#### Seven CNC Modular Knurling Tool Heads



ITTT



<b>4</b> C	Doub	le Whee	el Forming K	nurlii	ng He	ad				Knurl	Pin Set	
Head Descript	l tion	UPC No. 733101-	Dia. Range	E	L	Ρ	S	т	Knurl Wheel Style	Description	UPC No. 733101-	Set Screw
CNCKH-	4-M	28947	.312" & up 8mm & up	0.265	1.250	M*	KPS-31-125-0	C 28950	M5x.8			
* Supplie	d with	a set of dia	gonal high speed	bevele	d TiN c	oated	knurl			Resulting	Knurl Pattern	
wheels, 2 Warning, pressure	25 TPI may c on larg	for a male o ause deflec ge diameter	diamond pattern. ction on small diar rs.	neters,	and to	o muc	h		Straigh with str	nt pattern aight wheel.	Male 60° diamond with diagonal whee	pattern II.



P۰

Set Screw

5	Sing	le Wheel	Forming Kn	urlin	g He	ad					Knurl Pin S	Set	
He Desci	<b>ad</b> iption	UPC No. 733101-	Dia. Range	E	L	Ρ	S	т	Knurl Wheel Style	Desc	ription	UPC No. 733101-	Set Screw
CNCK	H-5-0	21050	Unlimited	0.312	1.250	O*	KPS-3	1-125-C	28950	M4x.7			
* Supp	lied with	n one straigh	t high speed beve	led TiN	l coate	d knur	l wheel	, 25		Res	ulting Knur	l Pattern	
TPI for	a straig	iht pattern.	ction on small diar	neters	and to		h		Straight p	attern	Female pat	60º Diamond tern <b>Male</b>	pattern
pressu	Warning, may cause deflection on small diameters, and too much pressure on large diameters.											Hool. With	



6	Shou	Ider For	ming K	nurli	ng He	ead				Kourl	Knurl	Pin Set	
Head Descrip	Head UPC No Description 733101-			E	L	Р	S	т	T1	Wheel Style	Description	UPC No. 733101-	Set Screw
CNCKH-6-4 21056 5/16" & up 8mm & up 0.250 1.875 0.050 2.000 1.250 1.500										SW4*	SW4.0P-2S	29085	M5x.8
* Supplie	ed with	a set of dia	igonal high	speed	bevele			Resulting I	Knurl Pattern				
Warning pressure	, may c e on lar	ause deflec ge diameter	ction on sn rs.	nall diar	neters,		Straigh with str	nt pattern raight wheel.	Male 60° diamond with diagonal whee	oattern I.			

	7 Stra	ddle Fori	ning Knurlin	g Head					Knurl	Pin Set	
Forming Set Dia. Adj	ustment Screw Head Description	UPC No. 733101-	Dia. Range	ΕL	Ρ	S	т	Knurl Wheel Style	Description	UPC No. 733101-	Set Screw
Knurl Wheel	T CNCKH-7-R	21060	up to 1.0" up to 25mm	0.120 2.500	0.175	2.875	1.250	R*	KPS-25-62-0	28915	M4x.7
E	*Supplied with	n a set of diag	onal high speed l	Develed TiN (			Resulting I	Knurl Pattern			
Knurl Pin Set	G Snim wheels, 30 TF     The tool has t     Warning, phys not be possible     S	Pl for a male of the capability applyir applyir le.	diamond pattern. to adjust the whee ng a knurl on the s	Straigl with str	nt pattern aight wheel.	Male 60° diamond with diagonal whee	pattern II.				
L											

Call 979-282-2861	Fax: 979-282-2951	Visit:www.doriantool.com	E-mail:sales@doriantool.com	Г
Gall. 979-202-2001	Fax. 313=202=2301	visit.www.uonantool.com		



#### Three SMALL CNC Modular Knurling Tool Shank Sizes

- Center height adjustment.
- Easy set-up.
- High productivity.
- · Best knurl quality.
- Long knurl wheel life.
- · Low production cost.
- Specifically designed for the CNC Lathe.
- · Precision square shank with preset center height.
- Right or Left hand applications.
- · Shanks and heads are all interchangeable.
- High Speed knurl wheels (TiN coated).
- Carbide knurl pin.





	SMALL CNC Modular Knurling Tool Shank														
			Adjustme	nt Screw	Lock Scr	ew Set									
Metric	UPC No.	C.H. & S			UPC No.		UPC No.								
Description	733101-	mm	Description	733101-	inch	G	Н	L1	L2	Т	Description	733101-	Description	733101-	
SCNC-10	20305	10	SCNC-37	20310	3/8"	0.125	1.000	2.500	2.685	0.750					
SCNC-12	20315	12	SCNC-50	20320	1/2"	0.000	1.000	2.750	2.937	0.750	SCNC-875	28510	SCNC-832	28520	
SCNC-162	20325	16	SCNC-162	20325	5/8"	0.000	1.125	2.750	2.937	0.750					

Supplied with Lockung Screws and Adjustment Screws.



#### SMALL Light Duty 60º Diamond Cutting Knurling TOOL - Small Cutting Range 5/16" to 1-1/2" (8mm to 38mm)

Cutting

Formin

Formin

Motrio	UPC No. SI		Inch		Shopk	Tool	Knurl	Knu	ırl Pin Set	Modular
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
SCNC-10-1-2	20005	10	SCNC-37-1-2	20010	3/8"	4.000"	SW2*			
SCNC-12-1-2	20015	12	SCNC-50-1-2	20020	1/2"	4-1/4"	SW2*	PSW-2.0S	29005	SCNCKH-1-2
SCNC-162-1-2	20025	16	SCNC-162-1-2	20025	5/8"	4-1/4"	SW2*			

Supplied with a set of straight high speed TiN coated knurl wheels, 30 TPI for a male diamond pattern.

#### SMALL Shoulder Forming Knurling TOOL - Diameter Range: 1/4" & up (6,4mm & up)

Motrio		Shopk	Inch		Shopk	Tool	Knurl	Knu	ırl Pin Set	Modular
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
SCNC-10-6-2	20105	10	SCNC-37-6-2	20110	3/8"	4.000"	SW2			
SCNC-12-6-2	20115	12	SCNC-50-6-2	20120	1/2"	4-1/4"	SW2	SW2.0P-2S	29055	SCNCKH-6-2
SCNC-162-6-2	20125	16	SCNC-162-6-2	20125	5/8"	4-1/4"	SW2			

Supplied with a set of diagonal high speed beveled TiN coated knurl wheels, 30 TPI for a male diamond pattern.

#### SMALL Straddle Forming Knurling TOOL - Diameter Range: up to 1/2" (up to 12,7mm)

Motrio		Shopk	Inch		Shopk	Tool	Knurl	Knu	rl Pin Set	Modular
Description	733101-	Size mm	Description	733101-	Size	Length	Style	Description	UPC No. 733101-	Description
SCNC-10-7-D	20205	10	SCNC-37-7-D	20210	3/8"	4-1/2 <b>"</b>	D			
SCNC-12-7-D	20215	12	SCNC-50-7-D	20220	1/2"	4-3/4"	D	KPS-18-50-C	28905	SCNCKH-7-D
SCNC-162-7-D	20225	16	SCNC-162-7-D	20225	5/8"	4-3/4"	D			

Supplied with a set of diagonal high speed beveled TiN coated knurl wheels, 30 TPI for a male diamond pattern.

#### Three SMALL CNC Modular Knurling Tool Heads



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	UPC	No.			UPC	No.														Knur	l Pin	Set		
Motric	733	101-	CH	Inch	733	101-	CH	Dia											Knurl				Set S	crew
Description	R.H.	L.H.	mm	Description	R.H.	L.H.	inch	Range	Е	н	L	L1	L2	L3	Ρ	т	T1	T2	Style	Desc.		733101-	No. 1	No. 2
107ST-12-R-RH/LH	21105	21205	12	107ST-50-R-RH/LH	21110	21210	0.500	Unlimited	.375	1.375	3.875	3.000	1.250	0.875	.125	0.500	1.500	1.000	RDL*	KPS-25-10	00-C	28930	M4x.7	M5x.8
107ST-162-R-RH/LH	21115	21215	16	107ST-162-R-RH/LH	21115	21215	0.625	Unlimited	.375	1.500	3.875	3.000	1.250	0.875	.125	0.625	1.625	1.000	RDL*	KPS-25-10	00-C	28930	M4x.7	M5x.8
107ST-20-M-RH/LH	21125	21225	20	107ST-75-M-RH/LH	21130	21230	0.750	Unlimited	.480	1.625	4.500	3.250	1.250	1.250	.190	0.750	2.000	1.250	MDL**	KPS-31-12	25-C	28950	M47	M58
107ST-25-M-RH/LH	21135	21235	25	107ST-100-M-RH/LH	21140	21240	1.000	Unlimited	.480	1.875	5.500	4.250	1.250	1.250	.190	1.000	2.250	1.250	MDL**	KPS-31-12	25-C	28950	M47	M58
107ST-32-M-RH/LH	21145	21245	32	107ST-125-M-RH/LH	21150	21250	1.250	Unlimited	.480	2.125	6.000	4.750	1.250	1.250	.190	1.250	2.500	1.250	MDL**	KPS-31-12	25-C	28950	M47	M58
Supplied with one dia	agonal h	igh spee	d TiN	coated knurl wheel, *	30 TPI,	** 25 TF	Pl. War	<mark>ning</mark> , may	cause	deflec	tion on	small	diame	ters, an	d too	much	pressu	ire on	large di	ameters.				



Supplied with one diagonal high speed TiN coated knurl wheel, \* 30 TPI, \*\* 25 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters.





#### Revolving Knurling Tool & Face Knurling Tool



\* Supplied with three sets of diagonal right and diagonal left high speed beveled TiN coated knurl wheels, 20 TPI, 30 TPI, 40 TPI \*\* Supplied with 3 sets of diagonal right and diagonal left high speed beveled TiN coated knurl wheels, 16 TPI, 25 TPI, 35 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters.



FACEKT-20-4 21635 20 FACEKT-75-4 21640 0.750 Unlimited 1.250 4.500 4.100 1.500 0.405 0.050 0.750 1.780 SW4 \*\* SW4.0P-1S 29080 M5x.8 1.500 0.405 0.050 SW4.0P-1S FACEKT-25-4 21645 25 FACEKT-100-4 21650 1.000 Unlimited 1.500 5.500 5.100 1.000 2.000 SW4 \*\* 29080 M5x.8 Supplied with one straight high speed TiN coated knurl wheel, \* 30 TPI, \*\* 25 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters





														Knurl	Knurl Pin	Set	
Metric	UPC No.	CH & S	Inch	UPC No.	CH & S	Dia.								Wheel		UPC No.	Set
Description	733101-	mm	Description	733101-	inch	Range	E	н	L	L1	L2	Р	Т	Style	Description	733101-	Screw
SWFKT-831-B	21705	8	SWFKT-831-B	21705	0.312	Unlimited	.0800	0.500	2.625	2.000	0.625	0.030	0.500	В*	KPS-12-38	28800	M3x.5
SWFKT-10-D	21715	10	SWFKT-38-D	21720	0.375	Unlimited	0.150	0.625	3.375	2.500	0.875	0.060	0.500	D *	KPS-18-50	28805	M3x.5
SWFKT-12-D	21725	12	SWFKT-50-D	21730	0.500	Unlimited	0.150	0.750	3.625	2.750	0.875	0.060	0.500	D *	KPS-18-50	28805	M3x.5
SWFKT-162-D	21765	16	SWFKT-162-D	21765	0.625	Unlimited	0.150	0.875	4.000	3.000	1.000	0.060	0.625	D *	KPS-18-62	28810	M3x.5
SWFKT-20-M	21735	20	SWFKT-75-M	21740	0.750	Unlimited	0.250	1.250	4.750	3.250	1.500	0.190	0.750	M **	KPS-31-75	28840	M3x.5
SWFKT-25-O	21745	25	SWFKT-100-O	21750	1.000	Unlimited	0.280	1.500	5.500	4.000	1.500	0.190	1.000	O **	KPS-31-100	28845	M4x.7
SWFKT-32-O	21755	32	SWFKT-125-O	21760	1.250	Unlimited	0.300	1.750	6.500	5.000	1.500	0.190	1.250	0 **	KPS-31-125	28850	M5x.8
HDSWFKT-20-O	21805	20	HDSWFKT-75-O	21810	0.750	Unlimited	0.260	1.250	4.750	3.250	1.500	0.190	1.000	0 **	KPS-31-100-C	28945	M4x.7
HDSWFKT-25-P	21815	25	HDSWFKT-100-P	21820	1.000	Unlimited	0.300	1.500	5.875	4.000	1.875	0.225	1.250	P **	KPS-50-125-C	28955	M5x.8
HDSWFKT-32-P	21825	32	HDSWFKT-125-P	21830	1.250	Unlimited	0.300	1.750	6.750	5.000	1.750	0.225	1.250	P **	KPS-50-125-C	28955	M5x.8
Supplied with one	straight hi	iah speed	beveled TiN coated	knurl whee	1 * 30 TP	** 25 TPI	Warning r	nav cause	deflection	on small (	liameters	and too m	uch press	ure on lar	ne diameters		

SSWFKT - Single Shoulder Wheel Fixed Knurling Tool

- · Precision square shank with preset center height.
- Designed to knurl against a square shoulder.
- Single wheel knurling tool for general purposes.
- Knurl wheel is mounted on a thrust washer to ensure a
- smooth and even rotation of the knurl while knurling is performed.

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Supplied with one set of diagonal high speed beveled TiN coated knurl wheels, \* 30 TPI, \*\* 25 TPI. . Warning, may cause deflection on small diameters, and too much pressure on large diameters

#### SFKT - Shoulder Fixed Knurling Tool

- · Precision square shank with preset center height.
- Designed to knurl against a square shoulder.
- Twin knurl wheels for Straight and Diamond pattern TiN coated.
- Knurl wheels are mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.
- · Can be reversed for right or left hand operation.
- Supplied with SW series knurl wheels.





Straight pattern

with straight wheel.

Male 60° diamond pattern with diagonal wheel. For best results, u wheels. In Feed th into the blank until is generated, then

For best results, use beveled knurl wheels. In Feed the knurling tool into the blank until the right pattern is generated, then End Feed.

**Recommended Use:** 





															Knurl	Knurl P	Pin Set	
Metric	UPC No.	CH & S	Inch	UPC No.	CH & S	Dia.									Wheel		UPC No.	Set
Descriptio	n 733101-	mm	Description	733101-	inch	Range	E	Н	L	L1	L2	Р	Т	T1	Style	Description	733101-	Screw
SFKT-10-2	22005	10	SFKT-38-2	22010	0.375		0.265	1.000	3.125	2.500	0.625	0.050	0.500	0.765	SW2 *	SW2.0P-2S	29055	M3x.5
SFKT-12-2	22015	12	SFKT-50-2	22020	0.500	1/4" & up	0.265	1.000	3.375	2.750	0.625	0.050	0.500	0.765	SW2 *	SW2.0P-2S	29055	M3x.5
SFKT-162-2	22055	16	SFKT-162-2	22055	0.625	0,411111 & up	0.265	1.125	4.000	3.250	0.750	0.050	0.625	0.890	SW2 *	SW2.0P-2S	29055	M3x.5
SFKT-20-4	22025	20	SFKT-75-4	22030	0.750	5/408.0	0.410	2.000	4.375	3.250	1.125	0.050	0.750	1.160	SW4 **	SW4.0P-2S	29085	M5x.8
SFKT-25-4	22035	25	SFKT-100-4	22040	1.000	5/16" & up	0.410	2.000	5.125	4.000	1.125	0.050	1.000	1.410	SW4 **	SW4.0P-2S	29085	M5x.8
SFKT-32-4	22045	32	SFKT-125-4	22050	1.250	onin a up	0.410	2.500	6.375	5.000	1.375	0.050	1.250	1.660	SW4 **	SW4.0P-2S	29085	M5x.8
Supplied wit	n one set of d	iagonal hi	gh speed bevele	d TiN coate	d knurl whe	els, * 30 TPI,	, ** 25 TP	I. Warnin	g, may ca	use defle	ction on s	mall diam	eters, and	d too muc	h pressu	re on large diar	neters.	







SCKN-20-DW-M 22116 20 SCKN-75-DW-M 22121 0.750 211 2.250 5.625 3.25 2.375 .170 0.750 1.312 M \*\* KPS-31-100 28845 M3x.5 M8x1.25 M6x.1 5/16" & up M3x.5 M8x1.25 M6x.1 STBL-25 28530 SCKN-25-DW-M 22126 25 SCKN-100-DW-M 22131 1.000 .211 2.250 6.375 4.00 2.375 .170 1.000 1.312 M \*\* KPS-31-100 28845 8mm & up SCKN-32-DW-M 22136 32 SCKN-125-DW-M 22141 1.250 .211 2.250 7.375 5.00 2.375 .170 1.250 1.312 M \*\* KPS-31-100 28845 M3x.5 M8x1.25 M6x.1 STBL-25 .437 2.750 5.875 3.25 2.625 .200 0.750 1.250 0 \*\* M4x.7 M8x1.25 M6x.1 STBL-25 28530 HDSCK-20-DW-O 22405 HDSCK-75-DW-O 22410 KPS-31-125-C 28950 20 0.750 3/4" & up 19mm & up 0 \*\* HDSCK-25-DW-O 22415 25 HDSCK-100-DW-O 22420 1 000 .437 2.750 6.625 4.00 2.625 .200 1.000 1.250 KPS-31-125-C 28950 M4x.7 M8x1.25 M6x.1 STBL-25 28530 HDSCK-25-DW-P 22425 25 HDSCK-100-DW-P 22430 1.000 1.0" & up .375 3.250 6.875 4.00 2.875 .125 1.000 1.250 P \*\* KPS-50-125-C 28955 M4x.7 M8x1.25 M6x.1 STBL-25 25mm & up .375 3.250 7.875 5.00 2.875 .125 1.250 1.250 P\*\* KPS-50-125-C 28955 M4x.7 M8x1.25 M6x.1 STBL-25 28530 HDSCK-32-DW-P 22435 HDSCK-125-DW-P 22440 32 1 250

Supplied with one set of diagonal high speed beveled knurl wheels, \* 30 TPI, \*\* 25 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters



															Knurl		n Set		Set Screv	v		UPC
Metric	UPC No.	CH & S	Inch	UPC No.	CH & S	Dia.									Wheel		UPC No.				Spring &	No.
Description	733101-	mm	Description	733101-	inch	Range	Е	Н	L	L1	L2	Ρ	Т	T1	Style	Description	733101-	#1	#2	#3	Ball Set	733101-
SSCK-10-DW-2	22205	10	SSCK-38-DW-2	22210	0.375	4 / 411 0	.265	1.375	3.875	2.50	1.375	.050	0.500	1.015	SW2 *	SW2.0P-2S	29055	M3x.5	M6x1.0	M5x.8	STBL-18	28525
SSCK-12-DW-2	22215	12	SSCK-50-DW-2	22220	0.500	1/4" & Up	.265	1.375	4.125	2.75	1.375	.050	0.625	1.015	SW2 *	SW2.0P-2S	29055	M3x.5	M6-1.0	M5x.8	STBL-18	28525
SSCK-162-DW-2	2 22218	16	SSCK-162-DW-2	22218	0.625	o,-inin a up	.265	1.375	4.375	3.00	1.375	.050	0.625	1.015	SW2 *	SW2.0P-2S	29055	M3x.5	M6x1.0	M5x.8	STBL-18	28525
SSCK-20-DW-4	22235	20	SSCK-75-DW-4	22240	0.750	E/401 0	.410	2.250	5.375	3.25	2.125	.050	0.750	1.660	SW4 **	SW4.0P-2S	29085	M5x.8	M8x1.25	6 M6x.1	STBL-25	28530
SSCK-25-DW-4	22245	25	SSCK-100-DW-4	22250	1.000	5/16" & up	.410	2.250	6.125	4.00	2.125	.050	1.000	1.660	SW4 **	SW4.0P-2S	29085	M5x.8	M8x1.25	M6x.1	STBL-25	28530
SSCK-32-DW-4	22255	32	SSCK-125-DW-4	22260	1.250	ommorup	.410	2.250	7.125	5.00	2.125	.050	1.250	1.660	SW4 **	SW4.0P-2S	29085	M5x.8	M8x1.25	M6x1.	STBL-25	28530
Supplied with or	ne set of d	liagonal h	nigh speed bevele	d TiN coat	ed knurl v	wheels, * 30	TPI, *	* 25 TI	PI. Wa	ning,	may ca	use de	flection	n on sm	all diam	eters, and too	o much pre	essure	on large	diamete	rs.	



28530

28530



#### **Internal Knurling Tools**



						Dia F	Range				Knurl	Knurl P	in Set	
Metric	UPC No.	S	Inch	UPC No.	S		tungo	1			Wheel		UPC No.	
Description	733101-	mm	Description	733101-	inch	in	mm	E	L	Р	Style	Description	733101-	Set Screw
TIKT-12-B	22601	12	TIKT-50-B	22611	0.500	Min. 0.562	Min.14,3	0.100	4.000	0.030	B *	KPS-12-38	28800	M3x.5
TIKT-20-D	22616	20	TIKT-75-D	22621	0.750	Min. 1.000	Min. 25,4	0.115	6.125	0.060	D *	KPS-18-50	28805	M3x.5
TIKT-25-R	22626	25	TIKT-100-R	22631	1.000	Min. 1.190	Min. 30,3	0.170	8.000	0.090	R **	KPS-25-87	28825	M4x.7
TIKT-32-M	22636	32	TIKT-125-M	22641	1.250	Min.1.500	Min. 38,1	0.190	10.000	0.110	M **	KPS-31-75	28840	M4x.7

Knurl Wheel

Supplied with one straight high speed beveled TiN coated knurl wheel, \* 30 TPI, \*\* 25 TPI





Knurl Wheel Screw Dia. Range

						Dia F	Rande				Knurl	Knurl F	Pin Set	
Metric	UPC No.	S	Inch	UPC No.	S	Did. 1	tungo				Wheel		UPC No.	]
Description	733101-	mm	Description	733101-	inch	in	mm	E	L	Р	Style	Description	733101-	Set Screw
SIKT-12-2	22605	12	SIKT-50-2	22610	0.500	Min. 0.562	Min.14,3	0.265	4.000	0.050	SW2 *	SW2.0P-1S	29050	M3x.5
SIKT-20-4	22615	20	SIKT-75-4	22620	0.750	Min. 1.125	Min. 28,6	0.410	6.125	0.050	SW4 **	SW4.0P-1S	29080	M5x.8
SIKT-25-4	22625	25	SIKT-100-4	22630	1.000	Min. 1.125	Min. 28,6	0.410	8.000	0.050	SW4 **	SW4.0P-1S	29080	M5x.8
SIKT-32-4	22635	32	SIKT-125-4	22640	1.250	Min. 1.375	Min. 35,0	0.410	10.000	0.050	SW4 **	SW4.0P-1S	29080	M5x.8

Supplied with one straight high speed beveled TiN coated knurl wheel, \* 30 TPI, \*\* 25 TPI







													Knurl	Knurl P	in Set	1
Metric	UPC No.	S	Inch	UPC No.	S	Dia.							Wheel		UPC No.	1
Description	733101-	mm	Description	733101-	inch	Range	E	н	L	L1	L2	P	Style	Description	733101-	Set Screw
MMKT-10-D	22505	10	MMKT-38-D	22510	0.375	N/A	0.235	0.625	2.375	1.500	0.875	0.060	D *	KPS-18-62	28810	M3x.5
MMKT-12-R	22515	12	MMKT-50-R	22520	0.500	N/A	0.340	0.875	3.125	2.000	1.125	0.100	R **	KPS-25-87	28825	M3x.5
MMKT-20-O	22525	20	MMKT-75-O	22530	0.750	N/A	0.312	1.000	4.000	2.500	1.500	0.190	O **	KPS-31-100	28845	M3x.5
MMKT-25-O	22535	25	MMKT-100-O	22540	1.000	N/A	0.437	1.250	4.750	3.000	1.750	0.190	O **	KPS-31-125	28850	M4x.7
MMKT-32-P	22545	32	MMKT-125-P	22550	1.250	N/A	0.500	1.500	5.625	3.500	2.125	0.125	P **	KPS-50-150	28860	M4x.7
Supplied with o	one straight h	nigh spee	ed beveled TiN c	oated knurl	wheel, * 3	0 TPI, ** 2	5 TPI									

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Intercha	ngeable W1	09 Arms Sets	for <b>1.5</b> Dia	ameter Capac	ity Tools		
Heavy Duty	Style Set					Heavy Duty	Shoulder
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws	Style	Style
W109-3-15-M	22844	M*	KPS-31-100	28845	M58	R.	
Shoulder Sty	vle Set						
Description	Part No. 733101-	Knurl WheelStyle	Knurl PinSet	Part No.733101-	All Set Screws	Co	
W109-3-15-4	22846	SW4*	SW4.0P-2S	29085	M58		

Intercha	ngeable W1	09 Arms Sets	for <mark>2.5</mark> Dia	meter Capac	ity Tools		
Heavy Duty	Style Set					Heavy Duty	Shoulder
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws	Style	Style
W109-3-25-M	22848	M*	KPS-31-100	28845	M58		
Shoulder Sty	rle Set						
Description	Part No. 733101-	Knurl WheelStyle	Knurl PinSet	Part No.733101-	All Set Screws	6	
W109-3-25-4	22849	SW4*	SW4.0P-2S	29085	M58		

Intercha	ngeable W1	09 Arms Sets	for <b>4.0</b> Dia	meter Capaci	ity Tools		
Heavy Duty	Style Set					Heavy Duty	Shoulder
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws	Style	Style
W109-3-40-0	22855	O*	KPS-31-125	28850	M58	N. Contraction	
Shoulder Sty	rle Set						
Description	Part No. 733101-	Knurl WheelStyle	Knurl PinSet	Part No.733101-	All Set Screws	100	
W109-3-40-4	22856	SW4*	SW4.0P-2S	29085	M58		

\* Knurl wheels sold separately.





Diametral Knurling Tools A diametral adjustment screw regulates the depth of the knurl pattern and the diameter size. The floating head will allow the knurl wheel to self adjust on the work piece - even when the work piece is not perfectly concentric. However, the tool can be used for twin wheel applications or single wheel knurling applications. This tool comes with a square shank to

be used on open slot tool holders, or on a Square Index Turret, with a preset center height adjustment which will meet the fixed center height of the C.N.C. and the Turret Lathe. Body and shank is made of Heat Treated precision ground alloy steel. The dovetail guide ensures the most precise accuracy and rigidity for infinite diameter settings.

#### Heavy Duty Style Knurling Tool



Straddle application is best when pressure and deflection are a problem. The knurling arms are able to "float" somewhat and center on the workpiece, compensating for any off-centering. It has been developed to make a perfect knurling pattern without putting any pressure on the spindle or on the lathe compound.

Bump application is best for narrow knurling applications. The knurling arms are moved closer together so that the tool can "bump" against the side of the working part with two wheels touching the part.







Uses 2 wheels for straight pattern

Uses 2 wheels for 60° diamond pattern 1 Diag. Lt. 1 Diag. Rt.

Knurl wheels are supported in a flanged nest to offer best rigidity to handle heavy duty knurling. The knurl wheels are mounted between thrust washers to insure a smooth and even rotation while knurling is performed.



Single wheel application is best for narrow and quick knurling setup. The knurling arms are moved up so that the bottom knurling wheel is locked on center and can "bump" against the side of the working part. With one wheel touching the part, this configuration allows for a quicker setup and knurling of narrow knurling applications.

#### **Shoulder Style Knurling Tool**



Straddle application is best when pressure and deflection are a problem. The knurling arms are able to "float" somewhat and center on the workpiece, compensating for any off-centering. It has been developed to make a perfect knurling pattern without putting any pressure on the spindle or on the lathe compound.







Designed to knurl against a square shoulder. The knurl wheels are mounted on a thrust washer to insure a smooth and even rotation while knurling is performed. The wheels are held at a slight pitch to the work part for better "end feeding" (feeding across the part towards the chuck)







#### **Diametral Knurling Tools**





KTW109-25-40-O	22867	25	KTW109-100-40-O	22869	1.000	.63-4.00"	0.250	2.173	6.347	9.875	5.000	4.875	0.188	1.25	2.00	O*	W109-3-40-O	W109-3-40-4	M58
KTW109-32-40-O	22868	32	KTW109-125-40-O	22870	1.250	16-100mm	0.250	1.923	6.347	9.875	5.000	4.875	0.188	1.25	2.00	O*	W109-3-40-O	W109-3-40-4	M58
* Supplied with a se	et of diagor	nal high	speed beveled TiN c	oated knu	Irl wheels	s, 25 TPI. T	he tool h	has the d	capabilit	y to adju	ist the w	heels to	touching	g (Ø Dia	i.). But, p	ohysicall	ly applying a kn	url on the smalle	əst
diameters may not	be possible	e. ** SE	E PAGE 31 for option	al arms a	ind speci	fications.													



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#### **Diametral Knurling Tools**





CNC109-32-25-4-RH/LH 21484 32 CNC109-125-25-4-RH/LH 21487 21490 1.25 <sup>1.20</sup> 1.25 <sup>1.20</sup> 1.188 4.875 6.812 1.812 0.050 1.25 1.500 2.75 SW4\* W109-3-25-4 W109-3-25-M M5-8 \* Supplied with a set of diagonal high speed beveled TiN coated knurl wheels, 25 TPI. The tool has the capability to adjust the wheels to touching (Ø Dia.). But, physically applying a knurl on the smallest diameters may not be possible. \*\* SEE PAGE 31 for optional arms and specifications.



## Infinite Lengths with Diameters as Small as .085" [2,16mm]



#### Features:

- Minimum diameter .085" [2,16mm]
- Maximum diameter 1-1/2" [38,1mm]
- For straight and diamond knurl
- Infinite lengths
- · Precise scroll gear
- · Infinite diameter adjustment
- · Dial allows for visual diameter adjustment
- Knurl to the shoulder
- · Self-adjust to parts and tool misalignment
- Easy to setup
- Simple to operate
- Manual knurl diameter release for manual lathes

#### **Tool properties**

#### 1. For small diameters

When side pressure does not allow the use of a one or two wheel knurling tool.

#### 2. For long lengths

When support or live center is not permissible. The part would deflect if a standard one or two wheel knurling tool is used.

#### 3. For high precision knurling

When the finished diameter of the knurled part demands close tolerance. The three wheel knurling system applies less pressure per wheel controlling the displacement and the form of the material. This makes the knurl uniform and precise.

#### 4. For high production

When high performance and quality need not sacrifice high production.

#### 5. For automation

When cost is a factor. The high performance of this tool will keep the manufacturing cost lower.

#### 6. Which machine to use on

Automatic Screw Machines, CNC Lathes, and Turret Lathes











**Optional 3WSKT Square Shank** 



H Use to Adjust the knurl Dia		Round
	Square Shank < →	

	3 Whe	els Knurling To	ol Head	Specifi	cation			Optior	nal Square	Shank			Option	al Roun	d Shar	ık
	Dort No.			Knurl	Kourl Din	Dort No	]		Dort No	Shan	k Size			Dort No.	Shan	k Size
Desc.	733101-	Capacity	н	Style	Set	733101-		Desc.	733101-	Square	Length		Desc.	733101-	Dia.	Leng
							]	3WSKT-06-12	23096	12mm	75mm		3WRKT-06-12	23105	12mm	75m
								3WSKT-06-50	23095	.500"	3.00"	:	3WRKT-06-50	23110	.500"	3.0
2W///T 00 2	22004	2.16mm to 6.4mm	44.5mm	SW2 *	SW2.0P-3S	29060		2WSKT-06-162	22007	16mm	88mm		2WPKT-06-162	22106	16mm	88m
3WK1-06-2	23004	.085" to 0.250"	1.75"					3W3K1-00-102	23097	.625"	3.50"		3WKK1-00-102	23100	.625"	3.5
								3WSKT-06-20	23098	20mm	100mm		3WRKT-06-20	23107	20mm	100r
								3WSKT-06-75	23099	.750"	4.00"		3WRKT-06-75	23111	.750"	4.0
							]			16mm	88mm				16mm	88m
								3WSKT-12-162	23082	.625"	3.50"	1	3WRKT-12-162	23115	.625"	3.5
0) N///T 40 0	00000	2.16mm to 12.7mm	57.2mm	SW2 *	SW2.0P-3S	29060		3WSKT-12-20	23100	20mm	100mm		3WRKT-12-20	23116	20mm	100r
3WK1-12-2	23009	.085" to 0.50"	2.25"					3WSKT-12-75	23102	.750"	4.00"	:	3WRKT-12-75	23112	.750"	4.0
								3WSKT-12-25	23101	25mm	125mm		3WRKT-12-25	23117	25mm	125r
								3WSKT-12-100	23078	1.00"	5.00"	:	3WRKT-12-100	23114	1.00"	5.0
							]	3WSKT-25-20	23103	20mm	100mm		3WRKT-25-20	23125	20mm	100r
		3.2mm to 25.4mm	76.2mm	SW2 *	SW2 0P-3S	29060		3WSKT-25-75	23079	.750"	4.00"	3	3WRKT-25-75	23130	.750"	4.0
3WKT-25-2	23024	0.125" to 1.00"	3.00"			20000		3WSKT-25-25	23104	25mm	125mm		3WRKT-25-25	23126	25mm	125r
								3WSKT-25-100	23080	1.00"	5.00"		3WRKT-25-100	23124	1.00"	5.0
		4.75mm to 38.1m	108mm	SW2 *	SW2.0P-3S	29060	]	3WSKT-40-25	23113	25mm	125mm		3WRKT-40-25	23135	25mm	125r
3WKT-40-2	23034	.187" to 1.50"	4.25"			20000		3WSKT-40-100	23081	1.00"	5.00"	:	3WRKT-40-100	23140	1.00"	5.0

Knurl Tool Head and Optional Shanks are Sold Seperately. Supplied with 1 set of diagonal high speed beveled knurl wheels, 30 TPI



Length 75mm 3.00" 88mm 3.50" 100mm 4.00" 88mm 3.50" 100mm 4.00" 125mm 5.00" 100mm 4.00" 125mm 5.00" 125mm 5.00"

# Swiss Screw Machine Knurling Tools

Featuring The New Jet-Stream™ Thru Coolant System









SWTCFKT\_B : Single wheel thru coolant fixed knurling tool for swiss screw machines Page 40



Knurl Wheel Style B



SDWTCFKT : Shoulder double wheel thru coolant fixed knurling tool for swiss screw machines Page 41



Knurl Wheel Style SW2



DWTCFKT\_B : Double wheel thru coolant fixed knurling tool for swiss screw machines Page 40



Knurl Wheel Style B



SMSCNC-7-D-0CL : Straddle CNC- Forming knurling tool with a symmetrical center Line for swiss screw machines Page 42



Knurl Wheel Style D



SSWFTCFKT : Shoulder single wheel fixed thru coolant knurling tool for swiss screw machines Page 41



Knurl Wheel Style SW2



SMSCNC 7-2-0CL : Straddle CNC-Shoulder knurling tool with a symmetrical center line for swiss screw machines Page 43



Knurl Wheel Style SW2







Specifically designed for Swiss style screw machines

- · Single wheel knurling tool for general purpose applications.
- · Knurl wheel is mounted between thrust washers to ensure a smooth and even rotation of the knurl while knurling is performed.





Straight pattern

**Resulting Knurl Pattern** 

Male 60º diamond



Female 60º diamond



**Recommended Use:** 

Best for straight pattern







	UPC										Knurl	Knurl P	'in Set	
Description	No. 733101-	S mm	S inch	Dia. Range	Е	L	L1	Tool Stop L2	Р	т	Wheel Style	Desc.	UPC No. 733101-	Set Screw
SWTCFKT-8-B	22925	8	0.315	Unlimited	0.08"	3.740"	2.953"	0.787"	0.040"	0.472"	В*	KPS-12-38-C	28900	M2.5x.45
SWTCFKT-10-B	22926	10	0.394	Unlimited	0.08"	3.937"	2.953"	0.984"	0.040"	0.472"	В*	KPS-12-38-C	28900	M2.5x.45
SWTCFKT-12-B	22927	12	0.472	Unlimited	0.08"	3.937"	2.953"	0.984"	0.040"	0.472"	В*	KPS-12-38-C	28900	M2.5x.45
SWTCFKT-16-B	22928	16	0.630	Unlimited	0.08"	3.937"	2.953"	0.984"	0.040"	0.625"	B *	KPS-12-38-C	28900	M2.5x.45

Supplied with one straight beveled TiN coated knurl wheel, \* 30 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters.







	UPC											Knurl	Knurl P	in Set	
	No.	S	S	Dia.					Tool Stop			Wheel		UPC No.	Set
Description	733101-	mm	inch	Range	E	Н	L	L1	L2	P	Т	Style	Desc.	733101-	Screw
DWTCFKT-8-B	22935	8	0.315	118" &	0.08"	0.650"	3.740"	2.953"	0.787"	0.040"	0.472"	В*	KPS-12-38-C	28900	M2.5x.45
DWTCFKT-10-B	22936	10	0.394	up	0.08"	0.650"	3.937"	2.953"	0.984"	0.040"	0.472"	В*	KPS-12-38-C	28900	M2.5x.45
DWTCFKT-12-B	22937	12	0.472	up	0.08"	0.650"	3.937"	2.953"	0.984"	0.040"	0.472"	В*	KPS-12-38-C	28900	M2.5x.45
DWTCFKT-16-B	22938	16	0.630		0.08"	0.650"	3.937"	2.953"	0.984"	0.040"	0.625"	В*	KPS-12-38-C	28900	M2.5x.45

Supplied with a set of beveled diagonal TiN coated knurl wheels , \* 30 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters.





	UPC										Knurl	Knurl P	'in Set	
	No.	S	S	Dia.				Tool Stop			Wheel		UPC No.	Set
Description	733101-	mm	inch	Range	Н	L	L1	L2	P	Т	Style	Desc.	733101-	Screw
SSWTCFKT-10-2	22945	10	0.394	Unlimited	0.500"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-1S	29050	M3x.5
SSWTCFKT-12-2	22946	12	0.472	Unlimited	0.500"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-1S	29050	M3x.5
SSWTCFKT-16-2	22947	16	0.630	Unlimited	0.630"	3.937"	2.953"	0.984"	0.050"	0.630"	SW2	SW2.0P-1S	29050	M3x.5

Supplied with one straight beveled TiN coated knurl wheel, \* 30 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters.



	U	PC										Knurl	Knurl F	Pin Set	
	N	No.	S	S	Dia.				Tool Stop	-	-	Wheel	_	UPC No.	Set
Descripti	on 733	5101-	mm	Inch	Range	н	L	L1	LZ	Р	1	Style	Desc.	733101-	Screw
SDWTCFK	Г-10-2 22	955	10	0.394	.250" & up	0.984"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-2S	29055	M3x.5
SDWTCFK	Г-12-2 22	956	12	0.472	6,4mm & up	0.984"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-2S	29055	M3x.5
SDWTCFK	Г-16-2 22	957	16	0.630		0.984"	3.937"	2.953"	0.984"	0.050"	0.630"	SW2	SW2.0P-2S	29055	M3x.5

Supplied with a set of beveled diagonal TiN coated knurl wheels, \* 30 TPI. Warning, may cause deflection on small diameters, and too much pressure on large diameters.





• Straddle style application best for very small diameters where the opposing wheels offer more support on the part.



					1								Kasal	Dia O et	1	1
	UPC	C.H.	C.H.									Knurl	Knuri	Pin Set	Set	Set
	No.	& S	& S						Tool Stop			Wheel		UPC No.	Screw	Screw
Description	733101-	mm	inch	Dia. Range	E	Н	L	L1	L2	Р	Т	Style	Desc.	733101-	#1	#2
SMSCNC-10-7-D-0CL	20230	10	0.39		0.125"	2.062"	4.500"	2.500"	2.000"	0.098"	.750"	D *	KPS-18-50-C	28905	M4x.7	M3x.5
SMSCNC-12-7-D-0CL	20235	12	0.47	up to .500"	0.125"	2.062"	4.750"	2.750"	2.000"	0.098"	.750"	D *	KPS-18-50-C	28905	M4x.7	M3x.5
SMSCNC-16-7-D-0CL	20240	16	0.63	up to 12mm	0.125"	2.062"	4.750"	2.750"	2.000"	0.098"	.750"	D *	KPS-18-50-C	28905	M4x.7	M3x.5
SMSCNC-20-7-D-0CL	20245	20	0.787		0.125"	2.062"	4.750"	2.750"	2.000"	0.098"	.750"	D *	KPS-18-50-C	28905	M4x.7	M3x.5

\* Supplied with a set of diagonal beveled TiN coated knurl wheels, 30 TPI. The tool has the capability to adjust the wheels to touching (Ø Dia.). But, physically applying a knurl on the smallest diameters may not be possible.









Knurl Wheel

Set Screw #1





Diamater Adjustment Screw

	UPC	C.H.	C.H.								Knurl	Knurl Pir	n Set	Set	Set
	No.	& S	& S					Tool Stop			Wheel		UPC No.	Screw	Screw
Description	733101-	mm	inch	Dia. Range	Н	L	L1	L2	Р	Т	Style	Desc.	733101-	#1	#2
SMSCNC-10-7-2-0CL	20255	10	0.394		2.047"	4.500"	2.500"	2.000"	0.050"	.750"	SW2 *	SW2.0P-2S	29055	M4x.7	M3x.5
SMSCNC-12-7-2-0CL	20260	12	0.472	up to .500"	2.047"	4.750"	2.750"	2.000"	0.050"	.750"	SW2 *	SW2.0P-2S	29055	M4x.7	M3x.5
SMSCNC-16-7-2-0CL	20265	16	0.630	up to 12mm	2.047"	4.750"	2.750"	2.000"	0.050"	.750"	SW2 *	SW2.0P-2S	29055	M4x.7	M3x.5
SMSCNC-20-7-2-0CL	20270	20	0.787		2.047"	4.750"	2.750"	2.000"	0.095"	.750"	SW2 *	SW2.0P-2S	29055	M4x.7	M3x.5

\* Supplied with a set of diagonal beveled TiN coated knurl wheels, 30 TPI. The tool has the capability to adjust the wheels to touching (Ø Dia.). But, physically applying a knurl on the smallest diameters may not be possible.



1 AL

<b>Knurling Wheel Style</b>	S			
Straight Tooth	30º Diaognal	l Helix Angle	60º Diamo	ond Angle
Straight 100th	R.H.	L.H.	Male	Female
0		9	0	9
Resulting Knurl Patte	ern			
Straight *	L.H. Knurl Pattern	R.H. Knurl Pattern	Female Diamond **	Male Diamond **
Pattern	Or Male Diamond Pattern Whe	n R.H. & L.H are used in pairs*	Knurl Pattern	Knurl Pattern

\*In Feed and End Feed knurling application. \*\*In Feed knurling application only.

<b>Circular Pitc</b>	h Inch a	nd Metri	с									
Knurl Pattern			Course				Mediu	ım		Fi	ne	
TPI	8	10	12	14	16	20	25	30	35	40	50	80
Tooth Angle	90°	90°	90°	90°	90°	90°	90°	90°	90°	90°	70°	70°
Circular Pitch Inch	0.125	0.100	0.083	0.071	0.063	0.050	0.040	0.033	0.029	0.025	0.020	0.013
Circular Pitch mm	3.2	2.5	2.1	1.8	1.6	1.3	1.0	0.8	0.7	0.6	0.5	0.3
<b>Diametral Pit</b>	tch											
					DP	64		96	1:	28	10	60
				Тос	oth Angle	80°		80°	8	0°	8	0°

• TPI system is the number of teeth per inch (measured on a linear inch).

• Circular pitch Inch system is the distance from tooth to tooth, or is derived from 1" divided by the number of teeth per inch.

• Circular pitch metric system is the distance from tooth to tooth.

• Diametral pitch system is derived by the number

of teeth per inch on the work divided by the theoretical work blank diameter.





#### **Knurl Wheel Technology**

Dorian knurl wheels are engineered and manufactured with the highest Quality Standards and precise workmanship, to meet and exceed industry requirements in working performance and tool life expectancy.



All knurl wheels are available in High Speed Tool Steel or 8.5% Cobalt content Tool Steel.

#### **Knurl Wheel Material**

#### **High Speed Wheels:**

The high speed tool steel knurl wheels, are tough and shock resistant.

**First Choice**: to knurl hard to machine materials such as; Carbon Steel, Alloy Steel, and Stainless Steel. Every knurl wheel is individually hob cut, heat treated, and ground to precise tolerance. The teeth are lapped to a smooth surface finish in order to create a hard and precise tooth.



The knurl wheels are TiN coated to improve the working performance and generate a smooth and clean surface of the knurled part.

#### **Cobalt Wheels:**

The 8.5% content tool steel wheels, are hard and wear resistant

**First Choice:** to knurl abrasive and soft materials such as; Free Machining Steel, Aluminum, and Non Ferrous Materials

#### **Knurl Wheel Edge Prep**

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used.

#### **Knurl Forming Versus Knurl Cutting**

#### **Knurl Forming**

The force applied through knurl forming is increased with harder materials, larger knurled diameter parts and larger knurl pitch, making knurling slow and difficult. The excessive pressure applied in form knurling may damage the spindle of the machine

#### First Choice;

Small diameter parts under 1.0" or 25 mm Larger diameters of soft material as; Aluminum and low Carbon Steel When high surface finished is required

When high precision knurl pitch is required

Knurling to square shoulder

Band in center of the part

Manual Lathe

#### Knurl Cutting

The force applied through knurl cutting versus knurl forming is decreased to the same level of a turning operation because the knurl wheels cut instead of forming the blank, making knurling faster and easier, with no damage to the spindle of the machine

#### First Choice;

Diameter parts over 1/2" or 12 mm Larger diameters of any material When high surface finish is not required When high precision knurl pitch is not required Knurling to open diameter Cosmetic Knurling High production CNC Turning Center

#### SFM Knurling

SFM Knurl Forming For speed and feed, See Page 13 SFM Knurl Cutting For speed and feed, See Page 13





#### **A Series**

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Knurl wheels are TiN coated to reduce the co-efficient of friction when knurling, increasing the quality and the force of knurling as well as the life of the knurl wheels.

Circular K	nurl Pitch				Stra	night	Diagon	al Right	Diagor	nal Left	Diar	nond
		Included		A Carian							Male	Female
Inch	Metric	100th Angle	Rnuri	A Series	High Speed	Cobalt TiN Costed	High Speed	Cobalt TiN Costed	High Speed	Cobalt TiN Coated	High Speed	High Speed
	Metho	7 trigic	1 attoin	Description	AS-08-HS	AS-08-C	ADR-08-HS	ADR-08-C			AM-08-HS	AF-08-HS
				Tracking Data	19T / .0400"	19T / .0400"	16T / .0475"	16T / .0475"	16T / .0475"	16T / .0475"	16T / .0475"	16T / .0475"
08 (TPI)	3,2mm	90°		Full Faced	23500	23566	23632	23698	23764	23830	-	-
				Beveled	23533	23599	23665	23731	23797	23863	-	-
				Description	AS-10-HS	AS-10-C	ADR-10-HS	ADR-10-C	ADL-10-HS	ADL-10-C	AM-10-HS	AF-10-HS
10 (TPI)	2.5mm	90°		Tracking Data	23T / .0330"	23T / .0330"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"
- ( )	<b>,</b> -			Full Faced	23502	23568	23634	23700	23766	23832	-	-
			-	Beveled	23535	23601		23733	23/99	23865	- AM 12 US	-
				Tracking Data	28T / 0271"	28T / 0271"	25T / 0304"	25T / 0304"	25T / 0304"	25T / 0304"	25T / 0304"	25T / 0304"
12 (TPI)	2,0mm	90°	Course	Full Faced	23504	23570	23636	23702	23768	23834	23900	-
				Beveled	23537	23603	23669	23735	23801	23867	23933	-
			1	Description	AS-14-HS	AS-14-C	ADR-14-HS	ADR-14-C	ADL-14-HS	ADL-14-C	AM-14-HS	AF-14-HS
14 (TPI)	1 8mm	90°		Tracking Data	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"
	1,01111			Full Faced	23506	23572	23638	23704	23770	23836	23902	23968
			-	Beveled	23539	23605	23671	23737	23803	23869	23935	24001
				Description	AS-16-HS	AS-16-C	ADR-16-HS	ADR-16-C	ADL-16-HS	ADL-16-C	AM-16-HS	AF-16-HS
16 (TPI)	1,6mm	90°		Full Faced	23508	23574	23640	23706	23772	23838	23904	23970
				Beveled	23541	23607	23673	23739	23805	23871	23937	24003
				Description	AS-20-HS	AS-20-C	ADR-20-HS	ADR-20-C	ADL-20-HS	ADL-20-C	AM-20-HS	AF-20-HS
	4.0	0.00		Tracking Data	47T / .0161"	47T / .0161"	41T / .0185"	41T / .0185"	41T / .0185"	41T / .0185"	41T / .0185"	41T / .0185"
20 (191)	1,∠mm	90-		Full Faced	23510	23576	23642	23708	23774	23840	23906	23972
			-	Beveled	23543	23609	23675	23741	23807	23873	23939	24005
				Description	AS-25-HS	AS-25-C	ADR-25-HS	ADR-25-C	ADL-25-HS	ADL-25-C	AM-25-HS	AF-25-HS
25 (TPI)	1,0mm	90°	Medium	Tracking Data	59T / .0128"	59T / .0128"	51T / .0148"	51T / .0148"	51T / .0148"	51T / .0148"	51T / .0148"	51T / .0148"
				Full Faced	23512	23578	23644	23710	23776	23842	23908	23974
				Description	AS-30-HS	AS-30-C	ADR-30-HS	ADR-30-C	ADL-30-HS	ADL-30-C	AM-30-HS	AF-30-HS
				Tracking Data	71T / .0106"	71T / .0106"	61T / .0124"	61T / .0124"	61T / .0124"	61T / .0124"	61T / .0124"	61T / .0124"
30 (TPI)	0,8mm	90°		Full Faced	23514	23580	23646	23712	23778	23844	23910	23976
				Beveled	23547	23613	23679	23745	23811	23877	23943	24009
				Description	AS-35-HS	AS-35-C	ADR-35-HS	ADR-35-C	ADL-35-HS	ADL-35-C	AM-35-HS	AF-35-HS
35 (TPI)	0,7mm	90°		Tracking Data	82T / .0092"	82T / .0092"	71T / .0106"	71T / .0106"	71T / .0106"	71T / .0106"	71T / .0106"	71T / .0106"
` '	,			Full Faced	23616	23582	23648	23714	23780	23846		23978
			-	Description	23549 AS-40-HS	23615 AS-40-C	23681 ADR-40-HS	23747 ADR-40-C	23813 ADI -40-HS	23879 ADL-40-C	- AM-40-HS	24011 AF-40-HS
				Tracking Data	94T / .0080"	94T / .0080"	81T / .0093"	81T / .0093"	81T / .0093"	81T / .0093"	81T / .0093"	81T / .0093"
40 (TPI)	0,6mm	90°		Full Faced	23518	23584	23650	23716	23782	23848	23914	23980
			Fine	Beveled	23551	23617	23683	23749	23815	23881	23947	24013
			Fille	Description	AS-50-HS	AS-50-C	ADR-50-HS	ADR-50-C	ADL-50-HS	ADL-50-C	AM-50-HS	AF-50-HS
50 (TPI)	0.5mm	70°		Tracking Data	117T / .0064"	117T / .0064"	102T / .0074"	102T / .0074"	102T / .0074"	102T / .0074"	102T / .0074"	102T / .0074"
	- / -			Full Faced	23520	23586	23652	23718	23784	23850	23916	23982
				Beveled	23553	23619	23685	23751		23883	23949 AM-80-HS	24015
				Tracking Data	189T / .0040"	189T / .0040"	163T / .0046"	163T / .0046"	163T / .0046"	163T / .0046"	163T / .0046"	163T / .0046"
80 (TPI)	0,3mm	70°		Full Faced	23522	23588	23654	23720	23786	23852	23918	-
				Beveled	23555	23621	23687	23753	23819	23885	23951	-
Diametr	al Pitch											
				Description	AS-64-HS	AS-64-C	ADR-64-HS	ADR-64-C	ADL-64-HS	ADL-64-C	AM-64-HS	AF-64-HS
64	1.2mm	80°		Tracking Data	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156
	,			Full Faced	23524	23590	23656	23722	23788	23854	23920	23986
			Medium	Description	23557	23623	23089	23755		23887	23953	24019 AE-96-HS
				Tracking Data	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"
96	0,8mm	80°		Full Faced	23526	23592	23658	23724	23790	23856	23922	23988
				Beveled	23559	23625	23691	23757	23823	23889	23955	24021
				Description	AS-128-HS	AS-128-C	ADR-128-HS	ADR-128-C	ADL-128-HS	ADL-128-C	AM-128-HS	AF-128-HS
128	0.6mm	800		Tracking Data	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"
120	0,01111	00		Full Faced	23528	23594	23660	23726	23792	23858	-	23990
			Fine	Beveled	23561	23627	23693	23759	23825	23891	-	24023
				Description	AS-160-HS	AS-160-C	ADK-160-HS	AUR-160-C	ADL-160-HS	AUL-160-C	AM-160-HS	AF-160-HS
160	0,5mm	80°		Full Faced	23530	23596	23662	23728	23794	23860	-	23992
				Beveled	23563	23629	23695	23761	23827	23893	-	24025
								-				

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#### **B** Series

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For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	light	Diagon	al Right	Diagor	nal Left	Dian	nond
Inch	Metric	Included Tooth Angle	Knurl Pattern	B Series Knurl Wheel	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	Male High Speed TiN Coated	Female High Speed TiN Coated
				Description	BS-20-HS	BS-20-C	BDR-20-HS	BDR-20-C	BDL-20-HS	BDL-20-C	BM-20-HS	BF-20-HS
20 (TPI)	1 2mm	900		Tracking Data	19T / .0168"	19T / .0168"	17T / .0188"	17T / .0188"	17T / .0188"	17T / .0188"	17T / .0188"	17T / .0188"
20 (11 1)	1,211111	50		Full Faced	-	24148	-	-	-	-	-	-
				Beveled	-	24171	-	-	-	-	-	-
				Description	BS-25-HS	BS-25-C	BDR-25-HS	BDR-25-C	BDL-25-HS	BDL-25-C	BM-25-HS	BF-25-HS
25 (TPI)	1 0mm	90°	Medium	Tracking Data	25T / .0128"	25T / .0128"	21T / .0152"	21T / .0152"	21T / .0152"	21T / .0152"	21T / .0152"	21T / .0152"
	1,01111			Full Faced	24104	24150	-	-	-	-	-	
				Beveled	24127	24173	-	-	-	-	-	-
				Description	BS-30-HS	BS-30-C	BDR-30-HS	BDR-30-C	BDL-30-HS	BDL-30-C	BM-30-HS	BF-30-HS
30 (TPI)	0.8mm	90°		Tracking Data	29T / .0110"	29T / .0110"	26T / .0122"	26T / .0122"	26T / .0122"	26T / .0122"	26T / .0122"	26T / .0122"
••• (,	•,••••			Full Faced	24106	24152	24198	24244	24290	24336	24382	24428
				Beveled	24129	24175	24221	24267	24313	24359	24405	24451
				Description	BS-35-HS	BS-35-C	BDR-35-HS	BDR-35-C	BDL-35-HS	BDL-35-C	BM-35-HS	BF-35-HS
35 (TPI)	0.7mm	90°		Tracking Data	34T / .0093"	34T / .0093"	29T / .0110"	29T / .0110"	29T / .0110"	29T / .0110"	29T / .0110"	29T / .0110"
	-,			Full Faced	24108	24154	24200	24246	24292	24338	-	-
			_	Beveled	24131	24177	24223	24269	24315	24361	-	-
				Description	BS-40-HS	BS-40-C	BDR-40-HS	BDR-40-C	BDL-40-HS	BDL-40-C	BM-40-HS	BF-40-HS
40 (TPI)	0.6mm	90°		Tracking Data	39T / .0081"	39T / .0081"	34T / .0093"	34T / .0093"	34T / .0093"	34T / .0093"	34T / .0093"	34T / .0093"
	-,			Full Faced	24110	24156	24202	24248	24294	24340	-	
			Fine	Beveled	24133	24179	24225	24271	24317	24363	-	-
				Description	BS-50-HS	BS-50-C	BDR-50-HS	BDR-50-C	BDL-50-HS	BDL-50-C	BM-50-HS	BF-50-HS
50 (TPI)	0.5mm	70°		Tracking Data	49T / .0064"	49T / .0064"	43T / .0073"	43T / .0073"	43T / .0073"	43T / .0073"	43T / .0073"	43T / .0073"
	-,			Full Faced	24112	24158	24204	24250	24296	24342	24388	24434
			-	Beveled	24135	24181	24227	24273	24319	24365	24411	24457
				Description	BS-80-HS	BS-80-C	BDR-80-HS	BDR-80-C	BDL-80-HS	BDL-80-C	BM-80-HS	BF-80-HS
80 (TPI)	0.3mm	70°		Tracking Data	79T / .0040"	79T / .0040"	68T / .0046"	68T / .0046"	68T / .0046"	68T / .0046"	68T / .0046"	68T / .0046"
	- , -			Full Faced	24114	24160	24206	24252	24298	24344	24390	24436
				Beveled	24137	24183	24229	24275	24321	24367	24413	24459
Diametr	al Pitch											
				Description	BS-96-HS	BS-96-C	BDR-96-HS	BDR-96-C	BDL-96-HS	BDL-96-C	BM-96-HS	BF-96-HS
96	0.8mm	800	Modium	Tracking Data	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"
50	0,011111	00	Medium	Full Faced	24116	24162	24208	24254	24300	24346	24392	24438
				Beveled	24139	24185	24231	24277	24323	24369	24415	24461
				Description	BS-128-HS	BS-128-C	BDR-128-HS	BDR-128-C	BDL-128-HS	BDL-128-C	BM-128-HS	BF-128-HS
128	0.6mm	80°		Tracking Data	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"
120	0,011111	00		Full Faced	24118	24164	24210	24256	24302	24348	24394	24440
			Fine	Beveled	24141	24187	24233	24279	24325	24371	24417	24463
				Description	BS-160-HS	BS-160-C	BDR-160-HS	BDR-160-C	BDL-160-HS	BDL-160-C	BM-160-HS	BF-160-HS
160	0.5mm	80°		Tracking Data	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"
	0,01111			Full Faced	24120	24166	24212	24258	24304	24350	24396	24442
				Beveled	24143	24189	24235	24281	24327	24373	24419	24465





#### **C** Series

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	light	Diagon	al Right	Diagor	nal Left	Dian	nond
		Included									Male	Female
Inch	Metric	Tooth	Knurl Pattern	C Series	High Speed	Cobalt TiN Costod	High Speed	Cobalt	High Speed	Cobalt TiN Costod	High Speed	High Speed
поп	Wethe	Angle	1 allenn	Description								
				Tracking Data	257 / 0204"	257 / 0204"	22T / 0222"	22T / 0222"	CDL-10-HS	CDL-10-C	22T / 0222"	CF-10-HS
16 (TPI)	1,6mm	90°	Course	Full Faced	2017.0204	2017.0204	2/610	2/166/	2217.0232	2217.0232	2217.0232	2217.0232
				Boyeled	24529	24593	24610	24004	24715	24772		
				Description	CS-20-HS	CS-20-C	CDR-20-HS	CDR-20-C	CDL-20-HS	CDL-20-C	- CM-20-HS	CE-20-HS
				Tracking Data	31T / 0164"	31T / 0164"	27T / 0188"	27T / 0188"	27T / 0188"	27T / 0188"	27T / 0188"	27T / 0188"
20 (TPI)	1,2mm	90°		Full Faced	24504	24558	24612	24666	24720	24774	24828	24882
				Beveled	24531	24585	24639	24693	24720	24801	24855	24909
				Description	CS-25-HS	CS-25-C	CDR-25-HS	CDR-25-C	CDL-25-HS	CDL-25-C	CM-25-HS	CF-25-HS
			Modium	Tracking Data	38T / .0133"	38T / .0133"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"
25 (TPI)	1,0mm	90°	wearan	Full Faced	24506	24560	24614	24668	24722	24776	24830	24884
				Beveled	24533	24587	24641	24695	24749	24803	24857	24911
				Description	CS-30-HS	CS-30-C	CDR-30-HS	CDR-30-C	CDL-30-HS	CDL-30-C	CM-30-HS	CF-30-HS
				Tracking Data	47T / .0107"	47T / .0107"	40T / .0126"	40T / .0126"	40T / .0126"	40T / .0126"	40T / .0126"	40T / .0126"
30 (TPI)	0,8mm	90°		Full Faced	24508	24562	24616	24670	24724	24778	24832	24886
				Beveled	24535	24589	24643	24697	24751	24805	24859	24913
				Description	CS-35-HS	CS-35-C	CDR-35-HS	CDR-35-C	CDL-35-HS	CDL-35-C	CM-35-HS	CF-35-HS
				Tracking Data	55T / .0092"	55T / .0092"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"
35 (TPI)	0,7mm	90°		Full Faced	24510	24564	24618	24672	24726	24780	-	-
				Beveled	24537	24591	24645	24699	24753	24807	-	-
				Description	CS-40-HS	CS-40-C	CDR-40-HS	CDR-40-C	CDL-40-HS	CDL-40-C	CM-40-HS	CF-40-HS
				Tracking Data	63T / .0080"	63T / .0080"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"
40 (TPI)	0,6mm	90°		Full Faced	24512	24566	24620	24674	24728	24782	24836	24890
				Beveled	24539	24593	24647	24701	24755	24809	24863	24917
			Fine	Description	CS-50-HS	CS-50-C	CDR-50-HS	CDR-50-C	CDL-50-HS	CDL-50-C	CM-50-HS	CF-50-HS
	0 5	700		Tracking Data	79T / .0064"	79T / .0064"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"
50 (191)	0,5000	70-		Full Faced	24514	24568	24622	24676	24730	24784	24838	24892
				Beveled	24541	24595	24649	24703	24757	24811	24865	24919
				Description	CS-80-HS	CS-80-C	CDR-80-HS	CDR-80-C	CDL-80-HS	CDL-80-C	CM-80-HS	CF-80-HS
80 (TDI)	0 3mm	700		Tracking Data	125T / .0040"	125T / .0040"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"
00(111)	0,511111	10		Full Faced	24516	24570	24624	24678	24732	24786	-	24894
				Beveled	24543	24597	24651	24705	24759	24813	-	24921
Diametr	al Pitch											
				Description	CS-64-HS	CS-64-C	CDR-64-HS	CDR-64-C	CDL-64-HS	CDL-64-C	CM-64-HS	CF-64-HS
64	4.0	0.00		Tracking Data	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"
04	1,211111	00		Full Faced	24518	24572	24626	24680	24734	24788	24842	24896
			Modium	Beveled	24545	24599	24653	24707	24761	24815	24869	24923
			mearann	Description	CS-96-HS	CS-96-C	CDR-96-HS	CDR-96-C	CDL-96-HS	CDL-96-C	CM-96-HS	CF-96-HS
96	0.8mm	800		Tracking Data	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"
	0,011111			Full Faced	24520	24574	24628	24682	24736	24790	24844	24898
				Beveled	24547	24601	24655	24709	24763	24817	24871	24925
				Description	CS-128-HS	CS-128-C	CDR-128-HS	CDR-128-C	CDL-128-HS	CDL-128-C	CM-128-HS	CF-128-HS
128	0,6mm	80°		Tracking Data	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"
	.,			Full Faced	24522	24576	24630	24684	24738	24792	24846	24900
			Fine	Beveled	24549	24603	24657	24711	24765	24819	24873	24927
				Description	CS-160-HS	CS-160-C	CDR-160-HS	CDR-160-C	CDL-160-HS	CDL-160-C	CM-160-HS	CF-160-HS
160	0,5mm	80°		Tracking Data	801 / .0063"	801 / .0063"	801 / .0063"	801 / .0063"	801 / .0063"	801 / .0063"	801 / .0063"	801 / .0063"
				Full Faced	24524	245/8	24032	24080	24/40	24/94	24648	24902
				peveled	24551	24005	24059	24/13	24/6/	24621	240/5	24929



#### **D** Series

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For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	night	Diagon	al Right	Diagor	nal Left	Dian	nond
Inch	Metric	Included Tooth Angle	Knurl Pattern	D Series Knurl Wheel	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	Female High Speed TiN Coated	Female Cobalt TiN Coated
16 (TPI)	1,6mm	90°	Course	Description Tracking Data Full Faced	DS-16-HS 25T / .0204" 25001	DS-16-C 25T / .0204" 25002	DDR-16-HS 22T / .0232" 25055	DDR-16-C 22T / .0232" 25056	DDL-16-HS 22T / .0232" 25109	DDL-16-C 22T / .0232" 25110	DF-16-HS 22T / .0232" -	DF-16-C 22T / .0232"
				Beveled	25028	25029	25082	25083	25136	25137	-	-
				Description	DS-20-HS	DS-20-C	DDR-20-HS	DDR-20-C	DDL-20-HS	DDL-20-C	DF-20-HS	DF-20-C
20 (TPI)	1,2mm	90°		Full Faced	25003	25004	2717.0188	2717.0188	2717.0188	2717.0188	2717.0188	2/1/.0188
				Beveled	25030	25031	25084	25085	25138	25139	25192	-
				Description	DS-25-HS	DS-25-C	DDR-25-HS	DDR-25-C	DDL-25-HS	DDL-25-C	DF-25-HS	DF-25-C
25 (TPI)	1.0mm	900	Medium	Tracking Data	38T / .0133"	38T / .0133"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"
23(111)	1,01111	50		Full Faced	25005	25006	25059	25060	25113	25114	25167	25168
				Beveled	25032	25033	25086	25087	25140	25141	25194	25195
				Description	DS-30-HS	DS-30-C	DDR-30-HS	DDR-30-C	DDL-30-HS	DDL-30-C	DF-30-HS	DF-30-C
30 (TPI)	0,8mm	90°		Tracking Data	471 / .0107"	471 / .0107"	401 / .0126"	401 / .0126"	401 / .0126"	401 / .0126"	401 / .0126"	401 / .0126"
				Full Faced	25007	25008	25061	25062	25115	25116	25169	25170
				Description	DS-35-HS	DS-35-C	DDR-35-HS	DDR-35-C	DDI -35-HS	DDL -35-C	DE-35-HS	DE-35-C
				Tracking Data	55T / .0092"	55T / .0092"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"
35 (TPI)	0,7mm	90°		Full Faced	25009	25010	25063	25064	25117	25118	-	-
				Beveled	25036	25037	25090	25091	25144	25145	-	-
				Description	DS-40-HS	DS-40-C	DDR-40-HS	DDR-40-C	DDL-40-HS	DDL-40-C	DF-40-HS	DF-40-C
40 (TDI)	0.6mm	0.00		Tracking Data	63T / .0080"	63T / .0080"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"
40 (1 PI)	0,011111	90		Full Faced	25011	25012	25065	25066	25119	25120	25173	25174
			Fine	Beveled	25038	25039	25092	25093	25146	25147	25200	25201
			T IIIC	Description	DS-50-HS	DS-50-C	DDR-50-HS	DDR-50-C	DDL-50-HS	DDL-50-C	DF-50-HS	DF-50-C
50 (TPI)	0.5mm	70°		Tracking Data	79T / .0064"	79T / .0064"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"
	- , -			Full Faced	25013	25014	25067	25068	25121	25122	25175	25176
				Beveled	25040	25041	25094	25095	25148	25149	25202	25203
				Description	125T / 0040"	DS-80-C	DDR-80-H5	107T / 0047"	DDL-80-HS	DDL-80-C	DF-80-HS	DF-80-C
80 (TPI)	0,3mm	70°		Full Faced	25015	25016	25069	25070	25123	25124	25177	25178
				Beveled	25042	25043	25096	25097	25125	25151	25204	25205
Diamet	ral Pitch			Borolou	20042	20040	20000	20007	20100	20101	20204	20200
				Description	DS-64-HS	DS-64-C	DDR-64-HS	DDR-64-C	DDL-64-HS	DDL-64-C	DF-64-HS	DF-64-C
				Tracking Data	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"
64	1,2mm	80°		Full Faced	25017	25018	25071	25072	25125	25126	25179	-
			Madium	Beveled	25044	25045	25098	25099	25152	25153	-	-
			wearum	Description	DS-96-HS	DS-96-C	DDR-96-HS	DDR-96-C	DDL-96-HS	DDL-96-C	DF-96-HS	DF-96-C
96	0.8mm	80°		Tracking Data	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"
	•,•			Full Faced	25019	25020	25073	25074	25127	25128	25181	25182
				Beveled	25046	25047	25100	25101	25154	25155	-	-
				Description	DS-128-HS	DS-128-C	DUK-128-HS	DUR-128-C	DUL-128-HS	DDL-128-C	DF-128-HS	DF-128-C
128	0,6mm	80°		Full Faced	25021	25022	25075	25076	25129	041 / .00/8" 25130	041/.00/8" 25183	041/.00/8"
				Reveled	25021	25022	25102	25103	25129	25150	20100	
			Fine	Description	DS-160-HS	DS-160-C	DDR-160-HS	DDR-160-C	DDL-160-HS	DDL-160-C	DF-160-HS	DF-160-C
				Tracking Data	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"
160	0,5mm	80°		Full Faced	25023	25024	25077	25078	25131	25132	25185	25186
				Beveled	25050	25051	25104	25105	25158	25159	-	25213





#### **M** Series

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	light	Diagon	al Right	Diago	nal Left	Dian	nond
Circular N		Included									Female	Female
		Tooth	Knurl	M Series	High Speed	Cobalt	High Speed	Cobalt	High Speed	Cobalt	High Speed	Cobalt TiN
Inch	Metric	Angle	Pattern	Knurl Wheel	TiN Coated	Coated						
				Description	MS-10-HS	MS-10-C	MDR-10-HS	MDR-10-C	MDL-10-HS	MDL-10-C	MF-10-HS	MF-10-C
	2 5	0.00		Tracking Data	31T / .0326"	31T / .0326"	26T / .0389"					
10(19)	2,5000	90-		Full Faced	25303	25304	25369	-	25435	-	-	-
				Beveled	25336	25337	25402	-	25468	-	-	-
				Description	MS-12-HS	MS-12-C	MDR-12-HS	MDR-12-C	MDL-12-HS	MDL-12-C	MF-12-HS	MF-12-C
				Tracking Data	37T / .0273"	37T / .0273"	33T / .0306"					
12 (TPI)	2,0mm	90°		Full Faced	25305	25306	25371	25372	25437	25438	-	-
				Beveled	25338	25339	25404	25405	25470	25471	-	-
			Course	Description	MS-14-HS	MS-14-C	MDR-14-HS	MDR-14-C	MDL-14-HS	MDL-14-C	MF-14-HS	MF-14-C
	4.0	0.00		Tracking Data	44T / .0230"	44T / .0230"	46T / .0220"					
14 (TPI)	1,8mm	90°		Full Faced	25307	25308	25373	25374	25439	25440	-	-
				Beveled	25340	25341	25406	25407	25472	25473	-	-
				Description	MS-16-HS	MS-16-C	MDR-16-HS	MDR-16-C	MDL-16-HS	MDL-16-C	MF-16-HS	MF-16-C
	4.0	0.00		Tracking Data	50T / .0202"	50T / .0202"	45T / .0224"					
16 (TPI)	1,6mm	90°		Full Faced	25309	25310	25375	25376	25441	25442	-	-
				Beveled	25342	25343	25408	25409	25474	25475	-	-
				Description	MS-20-HS	MS-20-C	MDR-20-HS	MDR-20-C	MDL-20-HS	MDL-20-C	MF-20-HS	MF-20-C
	4.0	0.00		Tracking Data	61T / .0165"	61T / .0165"	54T / .0187"					
20 (191)	1,2mm	90°		Full Faced	25311	25312	25377	25378	25443	25444	25509	25510
				Beveled	25344	25345	25410	25411	25476	25477	25542	25543
				Description	MS-25-HS	MS-25-C	MDR-25-HS	MDR-25-C	MDL-25-HS	MDL-25-C	MF-25-HS	MF-25-C
25 (TDI)	1.0	0.00	Medium	Tracking Data	78T / .0129"	78T / .0129"	68T / .0148"					
25 (TPI)	1,0mm	90°		Full Faced	25313	25314	25379	25380	25445	25446	25511	-
				Beveled	25346	25347	25412	25413	25478	25479	25544	-
				Description	MS-30-HS	MS-30-C	MDR-30-HS	MDR-30-C	MDL-30-HS	MDL-30-C	MF-30-HS	MF-30-C
	0.0	0.00		Tracking Data	95T / .0106"	95T / .0106"	81T / .0124"					
30 (191)	0,8mm	90°		Full Faced	25315	25316	25381	25382	25447	25448	25513	25514
				Beveled	25348	25349	25414	25415	25480	25481	25546	25547
				Description	MS-35-HS	MS-35-C	MDR-35-HS	MDR-35-C	MDL-35-HS	MDL-35-C	MF-35-HS	MF-35-C
25 (TDI)	0.7	0.00		Tracking Data	110T / .0091"	110T / .0091"	95T / .0106"					
35 (111)	0,711111	30		Full Faced	25317	25318	-	-	-	-	-	-
				Beveled	25350	25351	-	-	-	-	-	-
				Description	MS-40-HS	MS-40-C	MDR-40-HS	MDR-40-C	MDL-40-HS	MDL-40-C	MF-40-HS	MF-40-C
	0.6mm	000	Eino	Tracking Data	124T / .0081"	124T / .0081"	108T / .0093"					
40 (111)	0,011111	30	Fille	Full Faced	25319	-	-	-	-	-	-	-
				Beveled	25352	-	-	-	-	-	-	-
				Description	MS-50-HS	MS-50-C	MDR-50-HS	MDR-50-C	MDL-50-HS	MDL-50-C	MF-50-HS	MF-50-C
50 (TDI)	0.5mm	700		Tracking Data	158T / .0063"	158T / .0063"	135T / .0074"					
30 (111)	0,511111	10		Full Faced	25321	25322	-	-	-	-	-	-
				Beveled	25354	25355	-	-	-	-	-	-
Diametr	al Pitch											
				Description	MS-64-HS	MS-64-C	MDR-64-HS	MDR-64-C	MDL-64-HS	MDL-64-C	MF-64-HS	MF-64-C
				Tracking Data	64T / .0156"							
64	1,2mm	80°		Full Faced	25323	25324	-	-	-	-	-	-
				Beveled	25356	25357	-	-	-	-	-	-
			Medium	Description	MS-96-HS	MS-96-C	MDR-96-HS	MDR-96-C	MDL-96-HS	MDL-96-C	MF-96-HS	MF-96-C
				Tracking Data	96T / .0104"	96T / .0104"	96T / 0104"	96T / .0104"	96T / 0104"	96T / .0104"	96T / .0104"	96T / .0104"
96	0,8mm	80°		Full Faced	25325	25326	25391	25392	25457	25458	25523	
				Beveled	25358	25359	25424	25425	25490	25491	25556	_
				Description	MS-128-HS	MS-128-C	MDR-128-HS	MDR-128-C	MDL-128-HS	MDL-128-C	MF-128-HS	MF-128-C
				Tracking Data	128T / 0078"							
128	0,6mm	80°	Fine	Full Faced	25327	25328	-	-	-	-	-	
				Beveled	25360	25361	_	-	_	-	_	_
							1		1		1	



#### **O** Series

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For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	night	Diagon	al Right	Diagor	nal Left	Dian	nond
		Included									Male	Female
		Tooth	Knurl	O Series	High Speed	Cobalt	High Speed	Cobalt	High Speed	Cobalt	High Speed	High Speed
Inch	Metric	Angle	Pattern	Knuri wheel	LIN Coated	TIN Coated						
				Description	OS-10-HS	OS-10-C	ODR-10-HS	ODR-10-C	ODL-10-HS	ODL-10-C	OM-10-HS	OF-10-HS
10 (TPI)	2.5mm	90°		Tracking Data	31T / .0326"	31T / .0326"	26T / .0389"					
	,-			Full Faced	25604	25670	25736	-	25868	-	-	-
				Beveled	25637	25703	25769	-	25901	-	-	-
				Description	OS-12-HS	OS-12-C	ODR-12-HS	ODR-12-C	ODL-12-HS	ODL-12-C	OM-12-HS	OF-12-HS
12 (TPI)	2,0mm	90°		Tracking Data	37T / .0273"	37T / .0273"	33T / .0306"					
. ,				Full Faced	25606	25672	25738	25804	25870	25936	-	
			Course	Beveled	25639	25705	25771	25837	25903	25969	-	-
				Description	OS-14-HS	OS-14-C	ODR-14-HS	ODR-14-C	ODL-14-HS	ODL-14-C	OM-14-HS	OF-14-HS
14 (TPI)	1,8mm	90°		Tracking Data	44T / .0230"	44T / .0230"	46T / .0220"					
. ,				Full Faced	25608	25674	25740	25806	25872	25938	-	-
				Beveled	25641	25707	25773	25839	25905	25971	-	-
				Description	OS-16-HS	OS-16-C	ODR-16-HS	ODR-16-C	ODL-16-HS	ODL-16-C	OM-16-HS	OF-16-HS
16 (TPI)	1.6mm	90°		Tracking Data	50T / .0202"	50T / .0202"	45T / .0224"					
	,-			Full Faced	25610	25676	25742	25808	25874	25940	-	-
				Beveled	25643	25709	25775	25841	25907	25973	-	-
				Description	OS-20-HS	OS-20-C	ODR-20-HS	ODR-20-C	ODL-20-HS	ODL-20-C	OM-20-HS	OF-20-HS
20 (TPI)	1,2mm	90°		Tracking Data	611 / .0165"	611 / .0165"	541 / .0187"	541 / .0187"	541 / .0187"	541 / .0187"	541 / .0187"	541 / .0187"
. ,				Full Faced	25612	25678	25744	25810	25876	25942	26008	26074
				Beveled	25645	25711	25777	25843	25909	25975	26041	26107
				Description	0S-25-HS	0S-25-C	ODR-25-HS	ODR-25-C	ODL-25-HS	ODL-25-C	OM-25-HS	OF-25-HS
25 (TPI)	1,0mm	90°	Medium	Tracking Data	7817.0129	/81/.0129*	681 / .0148"	681 / .0148	681 / .0148	681 / .0148	681 / .0148	681 / .0148
				Full Faced	25614	25680	25746	25812	25878	25944	26010	26076
				Beveled	25647	25/13	25779	25845	25911	25977	26043	26109
				Description	05-30-H5	05-30-0	ODR-30-HS	ODR-30-C	ODL-30-HS	ODL-30-C	UN-30-H5	UF-30-H5
30 (TPI)	0,8mm	90°			9517.0106	951 / .0106	8117.0124	8117.0124	811 / .0124	8117.0124	811 / .0124	8117.0124
				Full Faced	25616	20082	25748	25814	25880	25946	26012	26078
				Description	23049	25715	23701	23047	20913	25979	20045	20111
				Tracking Data	110T / 0001"	110T / 0001"	0DR-35-H3	ODK-35-C	0DL-35-H3	ODL-35-C	0M-35-H3	0F-35-H3
35 (TPI)	0,7mm	90°		Full Faced	25618	25684	-	-	-	-	-	-
				Beveled	25651	25717				_		
				Description	OS-40-HS	05-40-0	ODR-40-HS	ODR-40-C		ODI -40-C	OM-40-HS	OF-40-HS
				Tracking Data	124T / .0081"	124T / .0081"	108T / .0093"					
40 (TPI)	0,6mm	90°	Fine	Full Faced	25620	-	-	-	-	-	-	-
				Beveled	25653	-	-	-	-	-	-	-
				Description	OS-50-HS	OS-50-C	ODR-50-HS	ODR-50-C	ODL-50-HS	ODL-50-C	OM-50-HS	OF-50-HS
				Tracking Data	158T / .0063"	158T / .0063"	135T / .0074"					
50 (TPI)	0,5mm	70°		Full Faced	25622	25688	-	-	-	-	-	
				Beveled	25655	25721	-	-	-	-	-	-
Diametr	al Pitch											
				Description	0S-64-HS	05-64-0	ODR-64-HS	ODR-64-C	ODI -64-HS	ODI -64-C	OM-64-HS	OF-64-HS
				Tracking Data	64T / .0156"							
64	1,2mm	80°		Full Faced	25624	25690	-	-	-	-	-	-
				Beveled	25657	25723	-	-	-	-	-	-
			Medium	Description	OS-96-HS	OS-96-C	ODR-96-HS	ODR-96-C	ODL-96-HS	ODL-96-C	OM-96-HS	OF-96-HS
				Tracking Data	96T / .0104"							
96	0,8mm	80°		Full Faced	25626	25692	25758	25824	25890	25956	26022	26088
				Beveled	25659	25725	25791	25857	25923	25989	26055	26121
				Description	OS-128-HS	OS-128-C	ODR-128-HS	ODR-128-C	ODL-128-HS	ODL-128-C	OM-128-HS	OF-128-HS
400	0.0	000		Tracking Data	128T / .0078"							
128	0,6mm	80°	Fine	Full Faced	25628	25694	-	-	-	-	-	-
				Beveled	25661	25727	-	-	-	-	-	-



#### **P** Series

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	light	Diagon	al Right	Diago	nal Left	Dian	nond
Inch	Metric	Included Tooth Angle	Knurl Pattern	P Series Knurl Wheel	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	Male High Speed TiN Coated	Female High Speed TiN Coated
	0.5	000		Description Tracking Data	PS-10-HS 39T / .0323"	PS-10-C 39T / .0323"	PDR-10-HS 34T / .0371"	PDR-10-C 34T / .0371"	PDL-10-HS 34T / .0371"	PDL-10-C 34T / .0371"	PM-10-HS 34T / .0371"	PF-10-HS 34T / .0371"
10 (191)	2,5000	90°		Full Faced Beveled	26198 26215	-	-	-	-	-	-	-
12 (TDI)	2 0mm	000		Description Tracking Data	PS-12-HS 47T / .0268"	PS-12-C 47T / .0268"	PDR-12-HS 41T / .0307"	PDR-12-C 41T / .0307"	PDL-12-HS 41T / .0307"	PDL-12-C 41T / .0307"	PM-12-HS 41T / .0307"	PF-12-HS 41T / .0307"
12 (171)	2,01111	30	Course	Full Faced Beveled	26200 26217	26234 26251	26268 26285	26302 26319	26336 26353	<b>26370</b> 26387	26404 26421	-
14 (TPI)	1.8mm	90°	Course	Description Tracking Data	PS-14-HS 55T / 0229"	PS-14-C 55T / 0229"	PDR-14-HS 55T / 0229"	PDR-14-C 55T / 0229"	PDL-14-HS 55T / 0229"	PDL-14-C 55T / 0229"	PM-14-HS 55T / 0229"	PF-14-HS 55T / 0229"
				Full Faced Beveled	26202 26219	26236 26253	26270 26287	26304 26321	26338 26355	26372 26389	-	-
16 (TPI)	1,6mm	90°		Description Tracking Data Full Faced	PS-16-HS 63T / .0200" 26204	PS-16-C 63T / .0200" 26238	PDR-16-HS 53T / .0238" 26272	PDR-16-C 53T / .0238" 26306	PDL-16-HS 53T / .0238" 26340	PDL-16-C 53T / .0238" 26374	PM-16-HS 53T / .0238" 26408	PF-16-HS 53T / .0238" 26442
				Beveled	26221	26255	26289	26323	26357	26391	26425	26459
				Description	PS-20-HS	PS-20-C	PDR-20-HS	PDR-20-C	PDL-20-HS	PDL-20-C	PM-20-HS	PF-20-HS
20 (TPI)	1,2mm	90°		Full Faced	26206	26240	26274	26308	26342	26376	26410	26444
				Beveled	26223	26257	26291	26325	26359	26393	26427	26461
				Description	PS-25-HS	PS-25-C	PDR-25-HS	PDR-25-C	PDL-25-HS	PDL-25-C	PM-25-HS	PF-25-HS
25 (TPI)	1,0mm	90°	Medium	Tracking Data	97T / .0130"	97T / .0130"	85T / .0148"	85T / .0148"	85T / .0148"	85T / .0148"	85T / .0148"	85T / .0148"
				Beveled	26206	26242	26276	26310	26361	26376	26412	26440
				Description	PS-30-HS	PS-30-C	PDR-30-HS	PDR-30-C	PDL-30-HS	PDL-30-C	PM-30-HS	PF-30-HS
	0.0	000		Tracking Data	117T / .0107"	117T / .0107"	103T / .0122"	103T / .0122"	103T / .0122"	103T / .0122"	103T / .0122"	103T / .0122"
30 (191)	0,8mm	90°		Full Faced	26210	26244	26278	26312	26346	26380	26414	26448
				Beveled	26227	26261	26295	26329	26363	26397	26431	26265
Diametr	al Pitch											
				Description	PS-64-HS	PS-64-C	PDR-64-HS	PDR-64-C	PDL-64-HS	PDL-64-C	PM-64-HS	PF-64-HS
64	1,2mm	80°		Tracking Data	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"
	ŕ			Full Faced	26212	26246	26280	-	26348	-	-	-
			Medium	Beveled	26229 PS-96-HS	26263 PS-96-C	26297		26365		- DM-96-HS	- DE-06-US
				Tracking Data	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"
96	0,8mm	80°		Full Faced	26214	26248	26282	26316	26350	26384	26418	26452
				Beveled	26231	26265	26299	26333	26367	26401	26435	26469



#### **R Series**

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For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	light	Diagon	al Right	Diagor	nal Left	Dian	nond
Inch	Metric	Included Tooth Angle	Knurl Pattern	R Series Knurl Wheel	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	Female High Speed TiN Coated	Female Cobalt TiN Coated
10 (TPI)	2,5mm	90°		Description Tracking Data Full Faced	RS-10-HS 23T / .0330" 26501	RS-10-C 23T / .0330" 26502	RDR-10-HS 20T / .0380" 26563	RDR-10-C 20T / .0380" 26564	RDL-10-HS 20T / .0380" 26625	RDL-10-C 20T / .0380" 26626	RF-10-HS 20T / .0380" -	RF-10-C 20T / .0380" -
12 (TPI)	2,0mm	90°		Description Tracking Data Full Faced	26532 RS-12-HS 28T / .0271" 26503	26533 RS-12-C 28T / .0271" 26504	26594 RDR-12-HS 25T / .0304" 26565	26595 RDR-12-C 25T / .0304" 26566	26656 RDL-12-HS 25T / .0304" 26627	26657 RDL-12-C 25T / .0304" 26628	- RF-12-HS 25T / .0304" -	- RF-12-C 25T / .0304" -
14 (TPI)	1,8mm	90°	Course	Beveled Description Tracking Data Full Faced Beveled	26534 RS-14-HS 34T / .0224" 26505 26536	26535 RS-14-C 34T / .0224" 26506 26537	26596 RDR-14-HS 34T / .0224" 26567 26598	26597 RDR-14-C 34T / .0224" 26568 26599	26658 RDL-14-HS 34T / .0224" 26629 26660	26659 RDL-14-C 34T / .0224" 26630 26661	- RF-14-HS 34T / .0224" -	- RF-14-C 34T / .0224" -
16 (TPI)	1,6mm	90°	-	Description Tracking Data Full Faced Beveled	RS-16-HS 38T / .0200" 26507 26538	RS-16-C 38T / .0200" 26508 26539	RDR-16-HS 33T / .0230" 26569 26600	RDR-16-C 33T / .0230" 26570 26601	RDL-16-HS 33T / .0230" 26631 26662	RDL-16-C 33T / .0230" 26632 26663	RF-16-HS 33T / .0230" 26693 26724	RF-16-C 33T / .0230" -
20 (TPI)	1,2mm	90°		Description Tracking Data Full Faced Beveled	RS-20-HS 47T / .0161" 26509 26540	RS-20-C 47T / .0161" 26510 26541	RDR-20-HS 41T / .0185" 26571 26602	RDR-20-C 41T / .0185" 26572 26603	RDL-20-HS 41T / .0185" 26633 26664	RDL-20-C 41T / .0185" 26634 26665	RF-20-HS 41T / .0185" 26695 26726	RF-20-C 41T / .0185" 26696 26727
25 (TPI)	1,0mm	90°	Medium	Description Tracking Data Full Faced	RS-25-HS 59T / .0128" 26511 26542	RS-25-C 59T / .0128" 26512 26543	RDR-25-HS 51T / .0148" 26573 26604	RDR-25-C 51T / .0148" 26574 26605	RDL-25-HS 51T / .0148" 26635 26666	RDL-25-C 51T / .0148" 26636 26667	RF-25-HS 51T / .0148" 26697 26728	RF-25-C 51T / .0148" 26698 26729
30 (TPI)	0,8mm	90°	-	Description Tracking Data Full Faced Beveled	RS-30-HS 71T / .0106" 26513 26544	RS-30-C 71T / .0106" 26514 26545	RDR-30-HS 61T / .0124" 26575 26606	RDR-30-C 61T / .0124" 26576 26607	RDL-30-HS 61T / .0124" 26637 26668	RDL-30-C 61T / .0124" 26638 26669	RF-30-HS 61T / .0124" 26699 26730	RF-30-C 61T / .0124" 26700 26731
35 (TPI)	0,7mm	90°		Description Tracking Data Full Faced Beveled	RS-35-HS 82T / .0092" 26515 26546	RS-35-C 82T / .0092" 26516 26547	RDR-35-HS 71T / .0106" 26577 26608	RDR-35-C 71T / .0106" 26578 26609	RDL-35-HS 71T / .0106" 26639 26670	RDL-35-C 71T / .0106" 26640 26671	RF-35-HS 71T / .0106" -	RF-35-C 71T / .0106" - -
40 (TPI)	0,6mm	90°	Fine	Description Tracking Data Full Faced Beveled	RS-40-HS 94T / .0080" 26517 26548	RS-40-C 94T / .0080" 26518 26549	RDR-40-HS 81T / .0093" 26579 26610	RDR-40-C 81T / .0093" 26580 26611	RDL-40-HS 81T / .0093" 26641 26672	RDL-40-C 81T / .0093" 26642 26673	RF-40-HS 81T / .0093" 26703 26734	RF-40-C 81T / .0093" 26704 26735
50 (TPI)	0,5mm	70°		Description Tracking Data Full Faced Beveled	RS-50-HS 117T / .0064" 26519 26550	RS-50-C 117T / .0064" 26520 26551	RDR-50-HS 102T / .0074" 26581 26612	RDR-50-C 102T / .0074" 26582 26613	RDL-50-HS 102T / .0074" 26643 26674	RDL-50-C 102T / .0074" 26644 26675	RF-50-HS 102T / .0074" 26705 26736	RF-50-C 102T / .0074" 26706 26737
Diametr	al Pitch						1		1		1	
64	1,2mm	80°		Description Tracking Data Full Faced Beveled	RS-64-HS 48T / .0156 26521 26552	RS-64-C 48T / .0156 26522 26553	RDR-64-HS 48T / .0156 26583 26614	RDR-64-C 48T / .0156 26584 26615	RDL-64-HS 48T / .0156 26645 26676	RDL-64-C 48T / .0156 26646 26677	RF-64-HS 48T / .0156 26707 26738	RF-64-C 48T / .0156 -
96	0,8mm	80°	Medium	Description Tracking Data Full Faced Beveled	RS-96-HS 72T / .0104" 26523 26554	RS-96-C 72T / .0104" 26524 26555	RDR-96-HS 72T / .0104" 26585 26616	RDR-96-C 72T / .0104" 26586 26617	RDL-96-HS 72T / .0104" 26647 26678	RDL-96-C 72T / .0104" 26648 26679	RF-96-HS 72T / .0104" 26709 26740	RF-96-C 72T / .0104" - -
128	0,6mm	80°	Fire	Description Tracking Data Full Faced Beveled	RS-128-HS 96T / .0078" 26525 26556	RS-128-C 96T / .0078" 26526 26557	RDR-128-HS 96T / .0078" 26587 26618	RDR-128-C 96T / .0078" 26588 26619	RDL-128-HS 96T / .0078" 26649 26680	RDL-128-C 96T / .0078" 26650 26681	RF-128-HS 96T / .0078" 26711 26742	RF-128-C 96T / .0078" 26712 26743
160	0,5mm	80°	Fine	Description Tracking Data Full Faced Beveled	RS-160-HS 120T / .0063" 26527 26558	RS-160-C 120T / .0063" 26528 26559	RDR-160-HS 120T / .0063" 26589 26620	RDR-160-C 120T / .0063" 26590 26621	RDL-160-HS 120T / .0063" 26651 26682	RDL-160-C 120T / .0063" 26652 26683	RF-160-HS 120T / .0063" 26713 26744	RF-160-C 120T / .0063" - -





#### **S** Series

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. Knurl wheels Can be reversed for right or left hand operation.





Circular K	nurl Pitch				Stra	light	Diagon	al Right	Diagor	nal Left	Dian	nond
		Included									Male	Female
		Tooth	Knurl	S Series	High Speed	Cobalt	High Speed	Cobalt	High Speed	Cobalt	High Speed	High Speed
Inch	Metric	Angle	Pattern	Knurl Wheel	TiN Coated	TiN Coated	TiN Coated	TiN Coated	TiN Coated	TiN Coated	TiN Coated	TiN Coated
				Description	SS-10-HS	SS-10-C	SDR-10-HS	SDR-10-C	SDL-10-HS	SDL-10-C	SM-10-HS	SF-10-HS
10 (TDI)	2 5mm	000		Tracking Data	23T / .0330"	23T / .0330"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"
10(11)	2,511111	90		Full Faced	26802	26862	26924	26986	27048	27110	-	-
				Beveled	26833	26893	26955	27017	27079	27141	-	-
				Description	SS-12-HS	SS-12-C	SDR-12-HS	SDR-12-C	SDL-12-HS	SDL-12-C	SM-12-HS	SF-12-HS
				Tracking Data	28T / .0271"	28T / .0271"	25T / .0304"	25T / .0304"	25T / .0304"	25T / .0304"	25T / .0304"	25T / .0304"
12 (TPI)	2,0mm	90°		Full Faced	26804	26864	26926	26988	27050	27112	-	-
				Beveled	26835	26895	26957	27019	27081	27143	-	-
			Course	Description	SS-14-HS	SS-14-C	SDR-14-HS	SDR-14-C	SDL-14-HS	SDL-14-C	SM-14-HS	SF-14-HS
				Tracking Data	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"	34T / .0224"
14 (TPI)	1,8mm	90°		Full Faced	26806	26866	26928	26990	27052	27114	-	-
				Beveled	26837	26897	26959	27021	27083	27145	-	-
				Description	SS-16-HS	SS-16-C	SDR-16-HS	SDR-16-C	SDL-16-HS	SDL-16-C	SM-16-HS	SF-16-HS
				Tracking Data	38T / .0200"	38T / .0200"	33T / .0230"	33T / .0230"	33T / .0230"	33T / .0230"	33T / .0230"	33T / .0230"
16 (TPI)	1,6mm	90°		Full Faced	26808	26868	26930	26992	27054	27116	27178	27240
				Beveled	26839	26899	26961	27023	27085	27147	27209	27271
				Description	SS-20-HS	SS-20-C	SDR-20-HS	SDR-20-C	SDI -20-HS	SDI -20-C	SM-20-HS	SE-20-HS
				Tracking Data	47T / .0161"	47T / 0161"	41T / 0185"	41T / 0185"	41T / 0185"	41T / .0185"	41T / 0185"	41T / .0185"
20 (TPI)	1,2mm	90°		Full Faced	26810	26870	26932	26994	27056	27118	27180	27242
				Boyeled	268/1	26901	26963	27025	27030	271/0	27211	27273
				Description	20041 88.25 HS	20301 SS 25 C	SDB 25 HS	SDP 25 C	27007 SDI 25 HS	SDI 25 C	SM 25 US	SE 25 US
				Tracking Data	50T / 0129"	50T / 0129"	50R-25-H5	50K-25-C	50L-25-H3	SDL-25-C	51T / 01/0"	57-25-H5
25 (TPI)	1,0mm	90°	Medium		3917.0120	3917.0120	3117.0146	3117.0146	37059	3717.0140	3117.0140	3117.0140
				Full Faced	20012	20072	20934	20990	27050	27120	27102	27244
				Beveled	26843	26903	20905	2/02/	27089	2/151	2/213	2/2/5
				Description	55-30-H5	55-30-0	SDR-30-HS	SDR-30-C	SDL-30-HS	SDL-30-C	SM-30-HS	SF-30-HS
30 (TPI)	0,8mm	90°		Iracking Data	/11/.0106	/11/.0106	611 / .0124	611 / .0124	6117.0124	6117.0124	6117.0124	6117.0124
				Full Faced	26814	26874	26936	26998	27060	2/122	2/184	27246
				Beveled	26845	26905	26967	27029	27091	27153	27215	27277
				Description	SS-35-HS	SS-35-C	SDR-35-HS	SDR-35-C	SDL-35-HS	SDL-35-C	SM-35-HS	SF-35-HS
35 (TPI)	0,7mm	90°		Tracking Data	82T / .0092"	82T / .0092"	71T / .0106"	71T / .0106"	71T / .0106"	71T / .0106"	71T / .0106"	71T / .0106"
. ,				Full Faced	26816	26876	26938	27000	27062	27124	-	-
				Beveled	26847	26907	26969	27031	27093	27155	-	-
				Description	SS-40-HS	SS-40-C	SDR-40-HS	SDR-40-C	SDL-40-HS	SDL-40-C	SM-40-HS	SF-40-HS
40 (TPI)	0.6mm	90°	Fine	Tracking Data	94T / .0080"	94T / .0080"	81T / .0093"	81T / .0093"	81T / .0093"	81T / .0093"	81T / .0093"	81T / .0093"
				Full Faced	26818	26878	26940	27002	27064	27126	27188	27250
				Beveled	26849	26909	26971	27033	27095	27157	27219	27281
				Description	SS-50-HS	SS-50-C	SDR-50-HS	SDR-50-C	SDL-50-HS	SDL-50-C	SM-50-HS	SF-50-HS
50 (TPI)	0.5mm	70°		Tracking Data	117T / .0064"	117T / .0064"	102T / .0074"	102T / .0074"	102T / .0074"	102T / .0074"	102T / .0074"	102T / .0074"
	•,•			Full Faced	26820	26880	26942	27004	27066	27128	27190	27252
				Beveled	26851	26911	26973	27035	27097	27159	27221	27283
Diametr	al Pitch											
				Description	SS-64-HS	SS-64-C	SDR-64-HS	SDR-64-C	SDL-64-HS	SDL-64-C	SM-64-HS	SF-64-HS
	1.0	000		Tracking Data	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156
64	1,2mm	80°		Full Faced	26822	26882	26944	27006	27068	27130	-	27254
				Beveled	26853	26913	26975	27037	27099	27161	-	27285
			Medium	Description	SS-96-HS	SS-96-C	SDR-96-HS	SDR-96-C	SDL-96-HS	SDL-96-C	SM-96-HS	SF-96-HS
0.0	0.0	000		Tracking Data	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"
96	0,8mm	80°		Full Faced	26824	26884	26946	27008	27070	27132	27194	27256
				Beveled	26855	26915	26977	27039	27101	27163	27225	27287
				Description	SS-128-HS	SS-128-C	SDR-128-HS	SDR-128-C	SDL-128-HS	SDL-128-C	SM-128-HS	SF-128-HS
				Tracking Data	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"	96T / .0078"
128	0,6mm	80°		Full Faced	26826	26886	26948	27010	27072	27134	-	27258
				Beveled	26857	26917	26979	27041	27103	27165	-	27289
			Fine	Description	SS-160-HS	SS-160-C	SDR-160-HS	SDR-160-C	SDL-160-HS	SDL-160-C	SM-160-HS	SF-160-HS
				Tracking Data	120T / .0063"	120T / .0063"	120T / .0063"	120T / .0063"	120T / .0063"	120T / .0063"	120T / .0063"	120T / .0063"
160	0,5mm	80°		Full Faced	26828	26888	26950	27012	27074	27136	-	27260
				Beveled	26859	26919	26981	27043	27105	27167	-	27291



#### **SW2 Series**

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For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. "SW" knurling wheels are technically designed to knurl against a square shoulder.

With super precise workmanship, the wheels are made of heat treated High Speed and Cobalt steel to with stand severe knurling operation.



Circular K	nurl Pitch				Stra	ight	Diagona	al Right	Diagon	al Left	Diam	iond
Inch	Metric	Included Tooth Angle	Knurl Pattern	SW2 Series Knurl Wheel	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	Female High Speed TiN Coated	Female Cobalt TiN Coated
16 (TPI)	1,6mm	90°	Course	Description Tracking Data Full Faced Beveled	SW2S-16-HS 25T / .0204" 27401 27426	SW2S-16-C 25T / .0204" 27402 27427	SW2R-16-HS 22T / .0232" 27451 27476	SW2R-16-C 22T / .0232" - -	SW2L-16-HS 22T / .0232" 27501 27526	SW2L-16-C 22T / .0232" - -	SW2F-16-HS 22T / .0232" 27551	SW2F-16-C 22T / .0232" -
20 (TPI)	1,2mm	90°		Description Tracking Data Full Faced Beveled	SW2S-20-HS 31T / .0164" 27403 27428	SW2S-20-C 31T / .0164" 27404 27429	SW2R-20-HS 27T / .0188" 27453 27478	SW2R-20-C 27T / .0188" 27454 27479	SW2L-20-HS 27T / .0188" 27503 27528	SW2L-20-C 27T / .0188" 27504 27529	SW2F-20-HS 27T / .0188" - -	SW2F-20-C 27T / .0188" 27554
25 (TPI)	1,0mm	90°	Medium	Description Tracking Data Full Faced Beveled	SW2S-25-HS 38T / .0133" 27405 27430	SW2S-25-C 38T / .0133" 27406 27431	SW2R-25-HS 34T / .0149" 27455 27480	SW2R-25-C 34T / .0149" 27456 27481	SW2L-25-HS 34T / .0149" 27505 27530	SW2L-25-C 34T / .0149" 27506 27531	SW2F-25-HS 34T / .0149" 27555	SW2F-25-C 34T / .0149" - -
30 (TPI)	0,8mm	90°		Description Tracking Data Full Faced Beveled	SW2S-30-HS 47T / .0107" 27407 27432	SW2S-30-C 47T / .0107" 27408 27433	SW2R-30-HS 40T / .0126" 27457 27482	SW2R-30-C 40T / .0126" 27458 27483	SW2L-30-HS 40T / .0126" 27507 27532	SW2L-30-C 40T / .0126" 27508 27533	SW2F-30-HS 40T / .0126" 27557	SW2F-30-C 40T / .0126" - -
35 (TPI)	0,7mm	90°		Description Tracking Data Full Faced Beveled	SW2S-35-HS 55T / .0092" - -	SW2S-35-C 55T / .0092" 27410 27435	SW2R-35-HS 47T / .0107" 27459 27484	SW2R-35-C 47T / .0107" - -	SW2L-35-HS 47T / .0107" 27509 27534	SW2L-35-C 47T / .0107" - -	SW2F-35-HS 47T / .0107" 27559 -	SW2F-35-C 47T / .0107" - -
40 (TPI)	0,6mm	90°	Fine	Description Tracking Data Full Faced Beveled	SW2S-40-HS 63T / .0080" 27411 27436	SW2S-40-C 63T / .0080" 27412 27437	SW2R-40-HS 55T / .0092" 27461 27486	SW2R-40-C 55T / .0092" - -	SW2L-40-HS 55T / .0092" 27511 27536	SW2L-40-C 55T / .0092" - -	SW2F-40-HS 55T / .0092" 27561	SW2F-40-C 55T / .0092" -
50 (TPI)	0,5mm	70°		Description Tracking Data Full Faced Beveled	SW2S-50-HS 79T / .0064" - -	SW2S-50-C 79T / .0064" 27414 27439	SW2R-50-HS 68T / .0074" 27463 27488	SW2R-50-C 68T / .0074" - -	SW2L-50-HS 68T / .0074" 27513 27538	SW2L-50-C 68T / .0074" - -	SW2F-50-HS 68T / .0074" 27563 -	SW2F-50-C 68T / .0074" - -
Diametr	al Pitch											
64	1,2mm	80°		Description Tracking Data Full Faced Beveled	SW2S-64-HS 32T / .0156" 27415 27440	SW2S-64-C 32T / .0156" - -	SW2R-64-HS 32T / .0156" 27465 27490	SW2R-64-C 32T / .0156" - -	SW2L-64-HS 32T / .0156" 27515 27540	SW2L-64-C 32T / .0156" - -	SW2F-64-HS 32T / .0156" 27565	SW2F-64-C 32T / .0156" - -
96	0,8mm	80°	Medium	Description Tracking Data Full Faced Beveled	SW2S-96-HS 48T / .0104" 27417 27442	SW2S-96-C 48T / .0104" - -	SW2R-96-HS 48T / .0104" 27467 27492	SW2R-96-C 48T / .0104" 27468 27493	SW2L-96-HS 48T / .0104" 27517 27542	SW2L-96-C 48T / .0104" 27518 27543	SW2F-96-HS 48T / .0104" 27567 -	SW2F-96-C 48T / .0104" - -
128	0,6mm	80°	Fine	Description Tracking Data Full Faced Beveled	SW2S-128-HS 64T / .0078" 27419 27444	SW2S-128-C 64T / .0078" - -	SW2R-128-HS 64T / .0078" 27469 27494	SW2R-128-C 64T / .0078" - -	SW2L-128-HS 64T / .0078" 27519 27544	SW2L-128-C 64T / .0078" - -	SW2F-128-HS 64T / .0078" 27569 -	SW2F-128-C 64T / .0078" - -
160	0,5mm	80°	rine	Description Tracking Data Full Faced Beveled	SW2S-160-HS 80T / .0063" 27421 27446	SW2S-160-C 80T / .0063" - -	SW2R-160-HS 80T / .0063" 27471 27496	SW2R-160-C 80T / .0063" - -	SW2L-160-HS 80T / .0063" 27521 27546	SW2L-160-C 80T / .0063" -	SW2F-160-HS 80T / .0063" 27571	SW2F-160-C 80T / .0063" - -





#### **SW4 Series**

For knurl cutting, use full faced knurl wheels only. For End Feed form knurling, use beveled knurl wheels only. For In Feed form knurling, beveled or full faced may be used. "SW" knurling wheels are technically designed to knurl against a square shoulder.





Knurl wheels are TiN coated to reduce the co-efficient of friction when knurling, increasing the quality and the force of knurling as well as the life of the knurl wheels.

With super precise workmanship, the wheels are made of heat treated High Speed and Cobalt Steel to with stand severe knurling operation.

Circular K	nurl Pitch				Stra	ignt	Diagona	al Right	Diagon	al Lett	Dian	nond
Inch	Metric	Included Tooth Angle	Knurl Pattern	SW4 Series Knurl Wheel	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	High Speed TiN Coated	Cobalt TiN Coated	Female High Speed TiN Coated	Female Cobalt TiN Coated
14 (TPI)	1,8mm	90°		Description Tracking Data Full Faced Beveled	SW4S-14-HS 44T / .0230" 28001 28028	SW4S-14-C 44T / .0230" 28002 28029	SW4R-14-HS 38T / .0266" 28055 28082	SW4R-14-C 38T / .0266" 28056 28083	SW4L-14-HS 38T / .0266" 28109 28136	SW4L-14-C 38T / .0266" 28110 28137	SW4F-14-HS 38T / .0266" 28163 -	SW4F-14-C 38T / .0266" - -
16 (TPI)	1,6mm	90°	Course	Description Tracking Data Standard Bevel	SW4S-16-HS 50T / .0202" 28003 28030	SW4S-16-C 50T / .0202" 28004 28031	SW4R-16-HS 45T / .0224" 28057 28084	SW4R-16-C 45T / .0224" 28058 28085	SW4L-16-HS 45T / .0224" 28111 28138	SW4L-16-C 45T / .0224" 28112 28139	SW4F-16-HS 45T / .0224" 28165 -	SW4F-16-C 45T / .0224" 28166 28193
20 (TPI)	1,2mm	90°		Description Tracking Data Full Faced Beveled	SW4S-20-HS 61T / .0165" 28005 28032	SW4S-20-C 61T / .0165" 28006 28033	SW4R-20-HS 54T / .0187" 28059 28086	SW4R-20-C 54T / .0187" 28060 28087	SW4L-20-HS 54T / .0187" 28113 28140	SW4L-20-C 54T / .0187" 28114 28141	SW4F-20-HS 54T / .0187" 28167 -	SW4F-20-C 54T / .0187" 28168 28195
25 (TPI)	1,0mm	90°	Medium	Description Tracking Data Full Faced Beveled	SW4S-25-HS 78T / .0129" 28007 28034	SW4S-25-C 78T / .0129" 28008 28035	SW4R-25-HS 68T / .0148" 28061 28088	SW4R-25-C 68T / .0148" 28062 28089	SW4L-25-HS 68T / .0148" 28115 28142	SW4L-25-C 68T / .0148" 28116 28143	SW4F-25-HS 68T / .0148" - -	SW4F-25-C 68T / .0148" - -
30 (TPI)	0,8mm	90°		Description Tracking Data Full Faced Beveled	SW4S-30-HS 95T / .0106" 28009 28036	SW4S-30-C 95T / .0106" 28010 28037	SW4R-30-HS 81T / .0124" 28063 28090	SW4R-30-C 81T / .0124" 28064 28091	SW4L-30-HS 81T / .0124" 28117 28144	SW4L-30-C 81T / .0124" 28118 28145	SW4F-30-HS 81T / .0124" -	SW4F-30-C 81T / .0124" - -
35 (TPI)	0,7mm	90°		Description Tracking Data Full Faced Beveled	SW4S-35-HS 110T / .0091" 28011 28038	SW4S-35-C 110T / .0091" 28012 28039	SW4R-35-HS 95T / .0106" - -	SW4R-35-C 95T / .0106" 28066 28093	SW4L-35-HS 95T / .0106" - -	SW4L-35-C 95T / .0106" 28120 28147	SW4F-35-HS 95T / .0106" - -	SW4F-35-C 95T / .0106" - -
40 (TPI)	0,6mm	90°	Fine	Description Tracking Data Full Faced Beveled	SW4S-40-HS 124T / .0081" 28013 28040	SW4S-40-C 124T / .0081" 28014 28041	SW4R-40-HS 108T / .0093" - -	SW4R-40-C 108T / .0093" 28068 28095	SW4L-40-HS 108T / .0093" - -	SW4L-40-C 108T / .0093" 28122 28149	SW4F-40-HS 108T / .0093" - -	SW4F-40-C 108T / .0093" - -
50 (TPI)	0,5mm	70°		Description Tracking Data Standard Bevel	SW4S-50-HS 158T / .0063" - -	SW4S-50-C 158T / .0063"	SW4R-50-HS 135T / .0074" - -	SW4R-50-C 135T / .0074" 28070 28097	SW4L-50-HS 135T / .0074" - -	SW4L-50-C 135T / .0074" 28124 28151	SW4F-50-HS 135T / .0074" - -	SW4F-50-C 135T / .0074" - -
Diametr	al Pitch											
64	1,2mm	80°		Description Tracking Data Full Faced Beveled	SW4S-64-HS 64T / .0156" 28017 28044	SW4S-64-C 64T / .0156" 28018 28045	SW4R-64-HS 64T / .0156" - -	SW4R-64-C 64T / .0156" - -	SW4L-64-HS 64T / .0156" - -	SW4L-64-C 64T / .0156" - -	SW4F-64-HS 64T / .0156" - -	SW4F-64-C 64T / .0156" - -
96	0,8mm	80° Medium	Description Tracking Data Full Faced Beveled	SW4S-96-HS 96T / .0104" 28019 28046	SW4S-96-C 96T / .0104" 28020 28047	SW4R-96-HS 96T / .0104" - -	SW4R-96-C 96T / .0104" 28074 28101	SW4L-96-HS 96T / .0104" - -	SW4L-96-C 96T / .0104" 28128 28155	SW4F-96-HS 96T / .0104" 28181 -	SW4F-96-C 96T / .0104" - -	







#### CNC Modular Knurling Tool Adjustment Screw

Description	Part No. 733101-	Reference Knurling Tool
CNC-1175	28505	CNC Modular Knurling Tool
SCNC-875	28510	SCNC Modular Knurling Tool



#### CNC Modular Knurling Tool Lock Screw

Description	Part No. 733101-	Reference Knurling Tool	
CNC-1024	28515	CNC Modular Knurling Tool	
SCNC-832	28520	SCNC Modular Knurling Tool	



#### Spring & Ball Plunger For Self-Centering Knurl Tools

Description	Part No. 733101-	Reference Knurling Tool	
STBL-18	2852 5	3SHKT-50, 162 SCKN-50 SSCK-38, 50	
STBL-25	28530	3SHKT-75, 100, 125 SCKN -75, 100, 125, 150 SSCK-75, 100, 125, 150 HDSCK-75, 100, 100, 125, 150	



#### PSW Series Knurling Pin Set

High S			
Description	Part No.	D	L
PSW-2.0S	29005	1/4	5/8
PSW-4.0S	29015	1/2	1-1/8



#### SKPS Series Knurling Pin Set

High S	peed			Screw
Description	Part No. 733101-	D	L	Length
SKPS-50-2	29020	1/4	5/8	1/4
SKPS-50-3	2902 5	1/4	5/8	3/8
SKPS-50-4	29030	1/4	5/8	1/2
SKPS-75-4	2903 5	3/8	1.0	1/2
SKPS-75-6	29040	3/8	1.0	3/4
SKPS-100-6	2904 5	1/2	1-1/8	3/4



#### SW Series Knurling Pin Set

High S	peed		
Description	Part No. 733101-	D	L
SW2.0P-1S	29050		
SW2.0P-2S	2905 5	1/4	1/2
SW2.0P-3S	29060		
SW4.0P-1S	29080		
SW4.0P-2S	29085	1/2	1-1/8
SW4.0P-3S	29090		



#### PSW Series Knurling Pin Set Cobalt

Cobalt			
Description	Part No. 733101-	D	L
PSW-2.0S-CO	30000	1/4	5/8
PSW-4.0S-CO	30002	1/2	1-1/8

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#### SW Series Knurling Pin Set Cobalt

Cobalt			
Description	Part No. 733101-	D	L
SW2.0P-CO-1S	30003		
SW2.0P-CO-2S	30004	1/4	1/2
SW2.0P-CO-3S	30005		
SW4.0P-CO-1S	30009		
SW4.0P-CO-2S	30010	1/2	1-1/8
SW4.0P-CO-3S	30011		
	Cobalt           Description           SW2.0P-CO-1S           SW2.0P-CO-3S           SW4.0P-CO-1S           SW4.0P-CO-2S           SW4.0P-CO-3S	Cobalt           Description         Part No. 733101-           SW2.0P-CO-1S         30003           SW2.0P-CO-3S         30005           SW4.0P-CO-1S         30009           SW4.0P-CO-3S         30011	Cobalt         Part No. 733101-         D           Description         Part No. 733101-         D           SW2.0P-CO-1S         30003         1/4           SW2.0P-CO-2S         30005         SW4.0P-CO-1S           SW4.0P-CO-1S         30009         1/2           SW4.0P-CO-2S         30010         1/2



#### KPS Series Knurling Pin Set

High Sp	High Speed Carbide		Carbide		
Description	Part No. 733101-	Description	Part No. 733101-	D	L
KPS-12-38	28800	KPS-12-38-C	28900	1/8	3/8
KPS-18-50	28805	KPS-18-50-C	28905	3/16	1/2
KPS-18-62	28810	KPS-18-62-C	28910	3/16	5/8
KPS-25-62	28815	KPS-25-62-C	28915	1/4	5/8
KPS-25-75	28820	KPS-25-75-C	28920	1/4	3/4
KPS-25-87	28825	KPS-25-87-C	28925	1/4	7/8
KPS-25-100	28830	KPS-25-100-C	28930	1/4	1.0
KPS-25-125	28835	KPS-25-125-C	28935	1/4	1-1/4
KPS-31-75	28840	KPS-31-75-C	28940	5/16	3/4
KPS-31-100	28845	KPS-31-100-C	28945	5/16	1.0
KPS-31-125	28850	KPS-31-125-C	28950	5/16	1-1/4
KPS-50-125	28855	KPS-50-125-C	28955	1/2	1-1/4
KPS-50-150	28860	KPS-50-150-C	28960	1/2	1-1/2





#### Linear Measurement

- 1 foot = 12 inches 1 yard = 3 feet 1 yard = 36 inches 1 mile = 1,760 yards 1 mile = 5,280 feet 1 mile = 63,360 inches 1 light year = 5.879 trillion miles 1 inch = 2.540 centimeters
- 1 foot = .3048 meters 1 yard = .9144 meters 1 mile = 1.609 kilometers 1 centimeter = .3937 inches
- 1 meter = 3.281 feet
- 1 meter = 1.094 yards
- 1 kilometer = .6214 miles
- 1 kilometer = 1000 meters 1 hectometer = 100 meters 1 dekameter = 10 meters 1 meter = 10 decimeters 1 meter = 100 centimeters 1 meter = 1000 millimeters 1 light year = 9.46 trillion kilometers

#### **Square Measurement**

- 1 sq. foot = 144 sq. inches 1 sq. yard = 9 sq. feet 1 sq. yard = 1,296 sq. inches 1 sq. mile = 3,097,600 sq. yards 1 sq. mile = 27,878,400 sq. feet 1 sq. mile = 4,014,489,600 sq. inches 1 acre = 4,840 sq. yards 1 acre = 6,272,640 sq. inches
- 1 sq. inch = 6.452 sq. centimeters 1 sq. foot = .09290 sq. meters 1 sq. yard = .8361 sq. meters 1 sq. mile = 2.590 sq. kilometers 1 sq. centimeter = .155 sq. inches 1 sq. kilometer = .247.1 acres 1 sq. kilometer = .3861 sq. miles 1 sq. meter = 10.76 sq. feet 1 sq. meter = 1.196 sq. yards
- 1 sq. kilometer = 1,000,000 sq. meters 1 sq hectometer = 10,000 sq. meters 1 sq dekameter = 100 sq. meters 1 sq meter = 100 sq. decimeters 1 sq meter = 10,000 sq. centimeters 1 sq meter = 1,000,000 sq. millimeters

#### **Cubic Measurement**

- 1 cu. foot = 1,728 cu. inches
   1 cu. yard = 27 cu. feet
   1 cu. yard = 46,656 cu. inches
   1 cu. inch = 16.39 cu. centimeters
   1 cu. foot = 28,320 cu. centimeters
   1 cu. foot = .02832 cu. meters
   1 cu. yard = 764,600 cu. centimeters
   1 cu. yard = .7646 cu. meters
   1 cu. centimeter = .06102 cu. inches
   1 cu. meter = 61,023 cu. inches
   1 cu. meter = 1.308 cu. yards
- 1 cu. kilometer = 1,000,000,000 cu. meters 1 cu. hectometer = 1,000,000 cu. meters 1 cu. dekameter = 1,000 cu. meters 1 cu. meter = 1,000 cu. decimeters 1 cu. meter = 1,000,000 cu. centimeters 1 cu. meter = 1,000,000 cu. millimeters

#### Weight Measurements

1 pound = 16 ounces 1 ton = 2000 pounds 1 ton = 32,000 ounces 1 ounce = 28.349527 grams 1 pound = .4536 kilograms 1 english ton = .90718 metric tons 1 gram = .03527 ounces 1 kilogram = 2.205 pounds 1 metric ton = .98421 english tons 1 kilogram = 1000 grams

1 hectogram = 100 grams 1 dekagram = 10 grams 1 gram = 10 decigrams 1 gram = 100 centigrams 1 gram = 1000 milligrams

#### **Fluid Volume Measurements**

1 gallon = 4 quarts
1 gallon = 8 pints
1 gallon = 16 cups
1 gallon = 256 liquid ounces
1 quart = 2 pints
1 quart = 4 cups
1 quart = 64 liquid ounces
1 pint = 2 cups
1 pint = 16 liquid ounces
1 cup = 8 liquid ounces

1 gallon = 3.785 liters

1 quart = .9463 liters 1 pint = .4732 liters 1 liter = .2642 gallons 1 liter = 1.057 quarts 1 liter = 2.113 pints 1 kiloliter = 1000 liters 1 hectoliter = 100 liters 1 dekaliter = 10 liters 1 liter = 10 deciliters 1 liter = 100 centiliters 1 liter = 1000 milliliters 1 liter = 10000 milliliters

#### **Temperature Conversions**

To convert Fahrenheit degrees into Celsius, subtract 32, multiply by .5556.

To convert Celsius into Fahrenheit, multiply by 1.8 and add 32.

#### Speeds

1 mile/hour = 88 feet/minute 1 mile/hour = 1.467 feet/second 1 mile/hour = 1.609 kilometers/hour 1 miles/hour = 44.70 centimeters/second 1 foot/minute = .0113636 miles/hour 1 foot/second = 30.48 centimeters/second 1 foot/second = .6818 miles/hour 1 centimeter/second = .3281 feet/second speed of sound = 742 miles/hour in air speed of sound = 1,193.9 kilometers/hour speed of light = 186,295 miles/second speed of light = 299,748 kilometers/second

#### Time

- 1 minute = 60 seconds 1 hour = 60 minutes 1 hour = 3,600 seconds 1 day = 24 hours 1 day = 1,440 minutes 1 day = 86,400 seconds 1 week = 7 days 1 week = 168 hours 1 week = 10,080 minutes 1 week = 604,800 seconds 1 year = 12 months 1 year = 52 weeks 1 year = 365 days 6 hours 1 year = 525,960 minutes
- 1 year = 31,557,600 seconds

	From Metric to Inch F
	Metric
	From Metric to Inch V
	Millime
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1	

Metric	Conversion
Metho	Conversion

From Inch to Metric Formula								
	Inch Value				Metric Value			
	1.000	х	25.4	=	25.400			
	1.000	÷	0.03937	=	25.400			
From Inch to N	Aetric Values							
	Inch				Millimeter			
	0.00001	Х	25.4	=	0.000254			
	0.0001	Х	25.4	=	0.00254			
	0.001	Х	25.4	=	0.0254			
	0.01	Х	25.4	=	0.254			
	0.1	X	25.4	=	2.54			
	1.00	х	25.4	=	25.40			
	1.125	х	25.4	=	28.58			
	1.250	х	25.4	=	31.75			
	1.375	х	25.4	=	34.93			
	1.500	х	25.4	=	38.10			
	1.625	х	25.4	=	41.28			
	1.750	х	25.4	=	44.45			
	1.875	х	25.4	=	47.63			
	2.00	х	25.4	=	50.80			
	3.00	х	25.4	=	76.20			
	4.00	х	25.4	=	101.60			
	5.00	х	25.4	=	127.00			
	6.00	х	25.4	=	152.40			
	7.00	х	25.4	=	177.80			
	8.00	х	25.4	=	203.20			
	9.00	х	25.4	=	228.60			
	10.00	х	25.4	=	254.00			
	11.00	х	25.4	=	279.40			
	12.00	Х	25.4	=	304.80			
	13.00	х	25.4	=	330.20			
	14.00	х	25.4	=	355.60			
	15.00	х	25.4	=	381.00			
	16.00	х	25.4	=	406.40			
	17.00	х	25.4	=	431.80			
	18.00	х	25.4	=	457.20			
	19.00	х	25.4	=	482.60			
	20.00	х	25.4	=	508.00			
	21.00	х	25.4	=	533.40			
	22.00	х	25.4	=	558.80			
	23.00	х	25.4	=	584.20			
	24.00	х	25.4	=	609.60			
	25.00	х	25.4	=	635.00			
1-Foot	12.00	Y	25 /	_	304.80			
14000	12.00	X	20.4	=	304.00			
1-Yard	36.00	Y	25.4	-	914 40			
	00.00	~	20.4		511.40			

From wetric to	o inch Formula	a			
	Metric Value				Inch Value
	1.000	÷	25.4	=	0.03937
	1.000	х	0.03937	=	0.03937
From Metric to	Inch Values				
	Millimeter				Inch
	0.00001	÷	25.4	=	0.0000039
	0.0001	÷	25.4	=	0.0000039
	0.001	÷	25.4	=	0.000039
	0.01	÷	25.4	=	0.00039
	0.1	÷	25.4	=	0.00394
	1		25.4		0.0304
	1 1	-	25.4	=	0.0394
	1.1	-	20.4	=	0.0433
	1.2	÷	20.4	=	0.0472
	1.3	÷	25.4	=	0.0512
	1.4	÷	25.4	=	0.0551
	1.5	÷	25.4	=	0.0591
	1.6	÷	25.4	=	0.0630
	1.7	÷	25.4	=	0.0669
	1.8	÷	25.4	=	0.0709
	1.9	÷	25.4	=	0.0748
	2	÷	25.4	=	0.0787
	3	÷	25.4	=	0.1181
	4	÷	25.4	=	0.1575
	5	÷	25.4	=	0.1969
	6	÷	25.4	=	0.2362
	7	÷	25.4	=	0.2756
	8	÷	25.4	=	0.3150
	9	÷	25.4	=	0.3543
	10	÷	25.4	=	0.3937
	11	÷	25.4	=	0.4331
	12	÷	25.4	=	0.4724
	13	÷	25.4	=	0.5118
	14	÷	25.4	=	0.5512
	15	÷	25.4	=	0.5906
	16	÷	25.4	=	0.6299
	17	÷	25.4	=	0.6693
	18	÷	25.4	=	0.7087
	19	÷	25.4	=	0.7480
	20	÷	25.4	=	0.7874
	21	÷	25.4	=	0.8268
	22	÷	25.4	=	0.8661
	23	÷	25.4	=	0.9055
	24	÷	25.4	=	0.9449
	25	÷	25.4	=	0.9843
1-Meter	1000	÷	25.4	=	39.3701
1-Decimeter	100	÷	25.4	=	3.9370
1-Centimeter	10	÷	25.4	=	0.3937
1-Millimeter	1	÷	25.4	=	0.0394

# Index by Product Group

#### **CNC Modular Knurling Tools**

Straight Cutting	Knurling	Tools
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Motric				1
Wethe	UPC	inch	UPC	
Description	733101-	Description	733101-	Page
CNC-20-1-2	20405	CNC-75-1-2	20410	19
CNC-25-1-2	20415	CNC-100-1-2	20420	19
CNC 20 4 2	20475	CNC 425 4 2	20420	10
GNG-32-1-2	20425	CNC-125-1-2	20430	19
CNC-20-2-R	20505	CNC-75-2-R	20510	19
CNC 25 2 D	20000		20520	10
GNG-20-2-R	20515	CNC-100-2-R	20520	19
CNC-32-2-R	20525	CNC-125-2-R	20530	19
	00005	010 75 0 14	00040	40
GNC-20-3-M	20605	CNC-75-3-W	20610	19
CNC-25-3-M	20615	CNC-100-3-M	20620	19
CNC-32-3-M	20625	CNC-125-3-M	20630	19
CNC-20-4-M	20640	CNC-75-4-M	20646	19
CNC-25-4-M	20642	CNC-100-4-M	20648	19
CNC-32-4-M	20644	CNC-125-4-M	20650	19
CNC-20-5-O	20705	CNC-75-5-0	20710	19
CNC-25-5-O	20715	CNC-100-5-O	20720	19
CNC-32-5-O	20725	CNC-125-5-0	20730	19
CNC-20-6-4	20775	CNC-75-6-4	20780	19
CNC-25-6-4	20785	CNC-100-6-4	20790	19
CNC 32 6 4	20705	CNC 125 6 4	20800	10
5110-32-0-4	20/95	GNG-120-0-4	20000	19
CNC-20-7-P	20005	CNC-75-7-P	20910	10
CNC 25 7 D	20015	CNC 100 7 P	20020	10
5NG-23-/-R	20915	GNG-100-7-R	20920	19
CNC-32-7-R	20925	CNC-125-7-R	20930	19
CNC Mashular		Teel Charle		I
	nuriing	IOOI SHANK	04040	
UNC-20	21005	CNC-75	21010	20
CNC-25	21015	CNC-100	21020	20
CNC-32	21025	CNC-125	21030	20
CNC Modular	Knurlina	Heads		
CNC Modular	Knurling	Heads	21035	20
CNC Modular	Knurling	Heads CNCKH-1-2	21035	20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R	21035 21040	20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M	21035 21040 21045	20 20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M	21035 21040 21045 28947	20 20 20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-O	21035 21040 21045 28947 21050	20 20 20 20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-0 CNCKH-6-4	21035 21040 21045 28947 21050 21056	20 20 20 20 20 20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060	20 20 20 20 20 20 20 20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-O CNCKH-64 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060	20 20 20 20 20 20 20 20
CNC Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-O CNCKH-6-4 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060	20 20 20 20 20 20 20 20
CNC Modular Small Modular	Knurling	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060	20 20 20 20 20 20 20 20
CNC Modular Small Modular SCNC-10-1-2	Knurling Knurling 20005	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-0 CNCKH-5-0 CNCKH-6-4 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060 20010	20 20 20 20 20 20 20 20 20 20
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2	Knurling Knurling 20005 20015	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-O CNCKH-6-4 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060 20010 20020	20 20 20 20 20 20 20 20 20 20
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2	Knurling Knurling 20005 20015 20025	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-7-R SCNC-37-1-2 SCNC-50-1-2 SCNC-162-1-2	21035 21040 21045 28947 21050 21056 21060 20010 20020 20025	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2	Knurling Knurling 20005 20015 20025	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-7-R	21035 21040 21045 28947 21050 21056 21060 20010 20020 20025	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-106-2	Knurling Knurling 20005 20015 20025 20105	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-0 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-50-1-2 SCNC-162-1-2 SCNC-37-6-2	21035 21040 21045 28947 21050 21056 21060 20010 20020 20025 20110	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-10-6-2 SCNC-10-6-2 SCNC-12-6-2	Knurling 20005 20015 20025 20105 20105 20115	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-7-R SCNC-37-1-2 SCNC-37-1-2 SCNC-162-1-2 SCNC-37-6-2 SCNC-50-6-2	21035 21040 21045 28947 21050 21056 21060 20010 20020 20025 20110 20120	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-106-2 SCNC-12-6-2 SCNC-12-6-2 SCNC-12-6-2	Knurling 20005 20015 20025 20105 20105 20115 20125	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-37-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2	21035 21040 21045 28947 21050 21056 21060 20010 20020 20025 20110 20120 20125	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-10-6-2 SCNC-10-6-2 SCNC-162-6-2	Knurling 20005 20015 20025 20105 20105 20115 20125	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-0 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-162-1-2 SCNC-37-6-2 SCNC-50-6-2 SCNC-162-6-2	21035 21040 21045 28947 21050 21056 21060 20010 20020 20025 20110 20120 20125	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-107-D	Knurling 20005 20015 20025 20105 20105 20115 20125 20205	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-5-0 CNCKH-5-0 CNCKH-6-4 CNCKH-7-R SCNC-37-1-2 SCNC-37-1-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-10-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-10-7-D SCNC-10-7-D SCNC-10-7-D	Knurling 20005 20015 20025 20105 20105 20125 20125 20205 20215	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-37-1-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-162-6-2 SCNC-37-7-D SCNC-50-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20020 20025 20110 20120 20125 20210	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-7-D SCNC-102-7 D	Knurling 20005 20015 20025 20105 20105 20115 20125 20205 20205 20205 20205 20205	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-37-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-37-7-D SCNC-62-7 D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20125 20210 20220 20225	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-10-2-1-2 SCNC-10-2-3 SCNC-10-2-3 SCNC-10-2-3 SCNC-10-2-3 SCNC-10-2-3 SCNC-10-7-D SCNC-10-7-D SCNC-10-7-D	Knurling 20005 20015 20025 20105 20105 20115 20125 20205 20205 20215 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-0 CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-37-1-2 SCNC-162-1-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-162-6-2 SCNC-37-7-D SCNC-37-7-D SCNC-50-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20220 20225	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-107-D SCNC-107-D SCNC-162-7-D	Knurling 20005 20015 20025 20105 20105 20125 20205 20205 20215 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-4-M CNCKH-6-4 CNCKH-6-4 CNCKH-7-R TOOIS SCNC-37-1-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-7-D SCNC-37-7-D SCNC-37-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20220 20225	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-2-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-7-D SCNC-102-7-D SCNC-102-7-D	Knurling 20005 20015 20025 20105 20105 20105 20125 20225 20225 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-7-D SCNC-7-D SCNC-162-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20225	20 20 20 20 20 20 20 20 20 20 20 20 20 2
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-10-1-2 SCNC-10-2-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-7-D SCNC-102-7-D SCNC-102-7-D SCNC-102-7-D	Knurling 20005 20015 20025 20105 20105 20115 20125 20205 20215 20225 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-7-R CNCKH-7-R CNCKH-7-R CNC-162-1-2 SCNC-37-6-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-37-7-D SCNC-50-7-D SCNC-162-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20125 20210 20220 20225 k	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-106-2 SCNC-107-D SCNC-107-D SCNC-10 SCNC-10 SCNC-10	Knurling 20005 20015 20025 20105 20105 20125 20205 20205 20215 20225 20205 20215 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-7-D SCNC-37-7-D SCNC-37-7-D SCNC-37 SCNC-37 SCNC-37 SCNC-37	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20225 20210 20225 k k 20310	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-102-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-102-7-D SCNC-102-7-D SCNC-162-7-D SCNC-102-7-D SCNC-10 SCNC-10 SCNC-10 SCNC-10 SCNC-10 SCNC-10 SCNC-10 SCNC-10	Knurling 20005 20015 20025 20105 20105 20105 20125 20205 20215 20225 20225	Heads CNCKH-1-2 CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R CNCKH-7-R CNCKH-7-R CNC-162-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-7-D SCNC-37 SCNC-37 SCNC-37 SCNC-50	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20225 20210 20225 k k 20310 20320	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-7-D SCNC-102-7-D SCNC-102-7-D SCNC-10 SCNC-10 SCNC-12 SCNC-12 SCNC-12 SCNC-12 SCNC-12 SCNC-12 SCNC-12	Knurling 20005 20015 20025 20105 20105 20115 20125 20205 20215 20225 20215 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-7-R CNCKH-7-R CNCKH-7-R CNC-162-1-2 SCNC-37-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-7-D SCNC-162-7-D SCNC-50 SCNC-50 SCNC-50 SCNC-162	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20125 20210 20220 20225 <b>k</b> 20310 20320 20325	20 20 20 20 20 20 20 20 20 20 20 20 20 2
CNC Modular Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-106-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-7-D SCNC-102-7-D SCNC-102-7-D SCNC-102 SCNC-102 SCNC-102 SCNC-162	Knurling 20005 20015 20025 20105 20105 20115 20125 20205 20215 20225 20215 20225 20215 20225	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-37-6-2 SCNC-162-1-2 SCNC-37-6-2 SCNC-37-6-2 SCNC-37-7-D SCNC-50-7-D SCNC-162-7-D SCNC-37 SCNC-37 SCNC-37 SCNC-37	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20220 20225 <b>k</b> 20310 20320 20325	20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         21         23         24         25         26         27         28         29         21         22         22         22         22         23
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-10-6-2 SCNC-12-6-2 SCNC-12-6-2 SCNC-10-7-D SCNC-10-7-D SCNC-10-7-D SCNC-162-7-D SCNC-162-7-D SCNC-162 SCNC-10	Knurling 20005 20015 20015 20105 20105 20125 20225 20205 20215 20225 20205 20215 20225 20215 20225 20215 20225	Heads CNCKH-1-2 CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R SCNC-37-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-7-D SCNC-50-7-D SCNC-50-7-D SCNC-162-7-D SCNC-162-7-D SCNC-162-7-D SCNC-162	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20220 20225 k 20310 20320 20325	20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         21         22         22         22         22         22         22         22         22         22         22
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-10-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-10-7-D	Knurling 20005 20015 20025 20105 20105 20105 20105 20205 20215 20225 20225 20225 20225 20215 20305 20315 20325	Heads CNCKH-1-2 CNCKH-3-M CNCKH-3-M CNCKH-5-0 CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-7-D SCNC-37 SCNC-37 SCNC-37 SCNC-37 SCNC-50 SCNC-162 Urrling Tool Shan SCNC-37 SCNC-50 SCNC-162 Urrling Heads SCNCKH-1-2	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20125 20210 20225 20210 20225 k 20310 20320 20325	20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         21         22         22         22         22         22         22         23
Small Modular SCNC-10-1-2 SCNC-10-1-2 SCNC-12-1-2 SCNC-102-1-2 SCNC-102-1-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-102-6-2 SCNC-10-7-D SCNC-10-7-D SCNC-10 SCNC-10 SCNC-10 SCNC-10 SCNC-162 SCNC-162 SCNC-162	Knurling 20005 20015 20025 20105 20105 20115 20125 20205 20215 20225 20205 20215 20225 20215 20225 20215 20215 20225 20215 20225 20215 20225 20215 20225 20235 20235 20315 20325 20315 20325 2035 2	Heads CNCKH-1-2 CNCKH-2-R CNCKH-3-M CNCKH-5-0 CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-37-6-2 SCNC-162-6-2 SCNC-37-7-D SCNC-162-7-7	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20220 20225 <b>k</b> 20310 20320 20325 <b>k</b>	20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         21         23         23         23         22         22         22         22         23         23         23
CNC Modular Small Modular SCNC-10-1-2 SCNC-12-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-7-D SCNC-162-7-D SCNC-162-7-D SCNC-162 SCNC-10 SCNC-10 SCNC-10 SCNC-12 SCNC-162 Small CNC Mo	Knurling 20005 20015 20025 20105 20105 20105 20105 20205 20205 20215 20225 20225 20215 20225 20215 20225 20215 20225 20215 20225	Heads CNCKH-1-2 CNCKH-3-M CNCKH-3-M CNCKH-5-O CNCKH-6-4 CNCKH-6-4 CNCKH-7-R Tools SCNC-37-1-2 SCNC-162-1-2 SCNC-162-1-2 SCNC-162-6-2 SCNC-162-6-2 SCNC-162-7-D SCNC-162-7-D SCNC-50 SCNC-162 Urling Tool Shan SCNC-37 SCNC-50 SCNC-162 Urling Heads SCNCKH-1-2 SCNCKH-7-D	21035 21040 21045 28947 21050 21056 21060 20020 20025 20110 20120 20125 20210 20225 k 20310 20320 20325 20335 20335 20340 20345	20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         20         21         22         23

Metric			Inch			
Description	UPC 733	3101-	Description	UPC 73	3101-	Page
107ST-12-R-RH/LH	21105	21205	107ST-50-R-RH/LH	21110	21210	24
107ST-162-R-RH/I H	21115	21215	107ST-162-R-RH/I H	21115	21215	24
107ST 20 M DU/LU	21110	24225	107ST 75 M DU/I U	21110	21210	24
10731-20-WI-RH/LH	21125	21220	10731-75-WI-KH/LH	21130	21230	24
107ST-25-M-RH/LH	21135	21235	10/SI-100-M-RH/LH	21140	21240	24
107ST-32-M-RH/LH	21145	21245	107ST-125-M-RH/LH	21150	21250	24
107ST-12-2-RH/LH	21106	21206	107ST-50-2-RH/LH	21111	21211	24
107ST-162-2-RH/LH	21116	21216	107ST-162-2-RH/LH	21116	21216	24
107ST-20-4-RH/LH	21126	21226	107ST-75-4-RH/LH	21131	21231	24
107ST-25-4-RH/I H	21136	21236	107ST-100-4-RH/I H	21141	21241	24
107ST 32 / PU// U	211/6	212/6	107ST 125 / PU/LU	21151	21251	24
10701-52-4-1(1)/EIT	21140	21240	10701-123-4-1(1/Eff	21131	21201	27
Development Kernelle			I		1	
Revolving Knurili	ng roois		1			
3SHKT-12-D	21505		3SHKT-50-D	21510		25
3SHKT-162-D	21515		3SHKT-162-D	21515		25
3SHKT-20-M	21525		3SHKT-75-M	21530		25
3SHKT-25-M	21535		3SHKT-100-M	21540		25
3SHKT-32-M	21545		3SHKT-125-M	21550		25
	21040			21000		20
			I		1	
Face Knurling To	ois		1			
FACEKT-20-2	21615		FACEKT-75-2	21620		25
FACEKT-25-2	21625		FACEKT-100-2	21630		25
FACEKT-20-4	21635		FACEKT-75-4	21640		25
FACEKT-25-4	21645		FACEKT-100-4	21650		25
	است الاست				I	
Single wheel Fixe	ea nnurli	ing 100	15			
SWFKT-831-B	21705		SWFKT-831-B	21705		26
SWFKT-10-D	21715		SWFKT-38-D	21720		26
SWFKT-12-D	21725		SWFKT-50-D	21730		26
SWFKT-162-D	21765		SWFKT-162-D	21765		26
SWEKT-20-M	21735		SWEKT-75-M	21740		26
SWEKT 25 O	21745		SWEKT 100 O	21750		26
SWI KT-25-0	21745		SWI KI-100-0	21750		20
SWFK1-32-0	21/55		SWFK1-125-0	21760		26
HDSWFK1-20-0	21805		HDSWFK1-75-0	21810		26
HDSWFKT-25-P	21815		HDSWFKT-100-P	21820		26
HDSWFKT-32-P	21825		HDSWFKT-125-P	21830		26
Single Shoulder \	Nheel Kr	urling	Tools			
SSWEKT_10_2	21775	lanna	SSWEKT-38-2	21777		26
SOWEKT 42.2	21770		COWFICT 50 2	24704		20
55WFK1-12-2	21779		55WFK1-50-2	21/01		20
SSWFK1-162-2	21783		SSWFK1-162-2	21/83		26
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# **Safety Precautions & Product Hazards**

This catalog contains information and specifications concerning knurling tools sold by Dorian Tool International. Although some of the knurling wheels are made from cobalt are very tough and resist breakage, most are brittle and special safety precautions are required when using them. Small fragment and chips may be thrown from a knurling tool when a fracture occurs. Since these fragments or chips are thrown at very high speeds and are very hot, contact with the skin or eyes could cause severe injury. Also, the grinding of these cutting tools will produce fine cobalt dust which may be harmful to the lungs. Listed below are some suggestions on how to minimize the potential for injury while using knurling tools. Dorian Tool has no control over use of these knurling tools. The user must determine the suitability of these tools in its particular application.

WARNING: Very hot chip fragments may be thrown from knurling tools at very high speeds. These chips can cause severe burns, cuts or punctures to the skin, or damage to the eyes. Along with safety glasses with side shields, the following are some of the safety precautions that must be followed by operators and observers while using knurling tools:

- 1. Make sure that the wheel size and style are adequate for use to which it is being put.
- 2. Chip control is necessary to prevent a continuous chip catching in the workpiece.
- 3. Chips are very hot and have sharp edges and should not be moved by hand.
- 4. Turn off the machine whenever chips are removed or when the knurling tools are changed.
- 5. Do not use air hoses to blow chips away from the machine.
- 6. To prevent tool breakage use the correct size toolholder.
- 7. Make sure that the overhang on the knurl tool is as short as possible. Too much overhang can result in chatter and tool breakage.
- 8. To prevent the workpiece from coming loose during use, be sure the workpiece is tight and secure in its holder.
- 9. Overloading of cobalt knurling wheels may cause fractures of these wheels.

WARNING: Grinding or finishing cobalt produces fine cobalt dust. This dust may cause injury to the lungs. Operators and observers must take the following safety precautions to minimize the possibility of such injury:

- 1. Use with adequate ventilation.
- 2. Maintain the dust or mist level below OSHA and ACGIH levels.
- 3. Avoid breathing dust or mist. If not possible, wear OSHA approved respirators, particularly when grinding cobalt.
- 4. Minimize prolonged skin contact.
- 5. Wash hands thoroughly after handling.

# WARNING: Use of cutting fluids and work materials create hazards. Be careful at all times.

- 1. Keep the cutting fluid clean so no particles can be carried back across the workpiece and possibly scratch it.
- 2. Cutting fluids may catch on fire when exposed to high temperatures generated during knurling.
- 3. Work materials such as aluminum, magnesium, uranium, and titanium are flammable and could catch on fire.
- 4. Cutting fluids should be treated or replaced to reduce bacterial levels which may cause illness.





Enrico R. Giannetti President

## A Word from the President:



ince the introduction of the Quadra Index Tool Post in 1982, the Dorian Evolution has never stopped. By developing new ideas and promoting new technology, Dorian Tool has continuously improved our service, technical support, and delivery to our customers.

At Dorian Tool, the quest for innovative tools will never end. Our highly trained and skilled engineers have developed technology that set new standards in the industry and changed the machining process forever. Today, Dorian Tool offers a wide selection of products for manual and CNC machines. From carbide inserts to toolholders; knurling tools to marking tools; machine tool accessories to automated turrets & rotary tables; tool setters to tool presetters; our tool selection has become the First Choice Technology for thousands of small and large shops around the world.

Thank you for making Dorian Tool successful. Our success comes from the original commitment we made to our customers:

# Technology, Quality, & Service



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Mailing Address:												
Catalog	Quantity Catalog	Quantity										
Tool Guide for Everyday MachiningOur most current Volume will be sent to you. Products offered per volume may vary depend- ing on demand and featured items.Inside this Tool Guide You will find High Perfor- mance cutting tools, inserts and machine tool ac- 	2011 Jet-Stream Thru Coolant System Dorian Tool's Jet-Stream™ Thru Coolant Cutting Tools use a patented thru-coolant locking clamp which is pre- cisely aimed to direct high pressure, high velocity cool- ant exactly onto the cutting edge of the carbide insert, from a short distance of ¼"(6mm). This catalog offers a vass range Jet-Stream™ Thru Coolant Cutting Tools for Turning, Boring and Threading applications.											
2011 Turning & Boring Cutting Tools & InsertsDorian Tool offers a complete selection of index able cutting tools. Our wide variety of Turning, Bor- ing tools and inserts provide solutions for all your Turning, Facing, Boring, Chamfering, I.D. & O.D. Profiling, Chuck Work and Between Center Work Machining Operations.2012 Version Coming Soon featuring a new line of carbide Inserts!	2011 Threading, Grooving & API Cutting Tools & Inserts         Dorian Tool offers a complete selection of indexable cutting tools. Our wide variety of Turning, Boring, threading tools and inserts provide solutions for all your Turning, Facing, Boring, Chamfering, I.D. & O.D. Profil- ing, Chuck Work and Between Center Work Machining Operations.	rmance Freedom										
2008 CNC Adjustable Angle Heads Choose from two styles (Universal and 90°) and six models for any milling, drilling, tapping and face milling operations. The Universal CNC Adjustable Angle Heads have two positioning axes and are of- fered in ER25 and ER32 collet toolholding systems. The use of the Universal CNC Adjustable Angle Heads increases productivity and quality by elimi- nating secondary operations and the need for more expensive 4th & 5th axis rotary tables. The 90° CNC Adjustable Angle Heads have one positioning axis and are offered in ER16, ER25 and ER32 collet toolholding systems as well as CAT/ISO/BT 40 ta- per toolholding system.	NEW 2012 knurling Tools & Wheels         Dorian Tool offers a wide range of knurling tools to cover most knurling applications. Since the introduction of Dorian's modular knurling tool system, knurling has never been easier. The knurl tools range from cutting to forming a knurling pattern. The cutting style knurl tools have revolutionized knurling. It is faster and requires less pressure to create a knurl over forming. A wide range of knurl wheel pitches are also available.         Includes NEW Knurling Tools for Swiss Screw Machines	In the second se										
2006 Perfetta Live Centers & Bull Nose These live centers, which have already been rec- ognized throughout the rest of the industrial world as the most precise live centers ever built, are now available to the American machine tool industry. Designed for turning on a CNC lathe or for use on a CNC grinding machine, the Perfetta™ Live Center has over 50 years of proven workmanship. Where speed, precision and dependability are the requirements, these tools guarantee quality and performance.	2011 Lathe Accessories Catalog With a full line of Victory Automatic Thru Coolant, Super Quick Change and Quadra™ Indexing Quick Change tool posts and holders as well as manual, elec- tro-pneumatic, and electro-mechanical turrets, Dorian Tool has all that is needed to improve efficiency on both manual and CNC lathes. In addition, the Dorian Tru- Jaws system makes for easy remachining of soft jaws. This catalog replaces all three Dorian Tool post catalogs as well as the 2005 MTA (Machine Tool Accessories) catalog.	ries										
NEW 2012 Swiss Screw Machine Tools and Advanced Technology Catalog           Featuring Jet-Stream™ Thru Coolant System for Turning, Threading and Cut-off Toolholders. Designed for Swiss Screw Machines.	NEW 2012 Tunable DVI Boring & Threading Bars for Difficult Deep Boring and Threading Applications! Featuring internal working parts that can be adjusted during the application!	COMING SOON										

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# **Sales Policy**

Conditions of Sale: All sales are made in accordance with our standard conditions of sale, current at the time orders are accepted. Specifications and prices are subject to change without notice.

Terms of Payment: Standard payment terms for all products is (1% 10 Net 30 days) upon credit approval. Dorian reserves the right to hold shipments or to ship on a C.O.D. basis, any orders received from any purchaser whose account is delinquent. Invoices not paid timely are subject to 1.5% interest per month, not to exceed 18%. However, purchasers who default on terms agreed upon, Dorian reserves the right to add collection and/or attorney fees to the total amount of the invoice or total amount of all invoices. No order will be processed if any invoices are over 45 days old. All taxes, duties, or other expenses arising out of, or in connection with the sale of product shall be the sole liability of purchaser.

No Minimum Order: There will be a \$5.00 handling fee for orders drop shipped with a value under \$50.00 net.

Delivery Terms: F.O.B. East Bernard, Texas. All shipments are made by regular UPS, Parcel Post, or truck. Full transportation costs will be charged to the buyer. Specify shipment to be made by other than regular means of transportation.

Defective Product Claim: If within 30 days from shipping date, customer claims that product is defective and requires an immediate replacement, a distributor can issue a purchase order for a new product and return the defective product to Dorian for inspection. Upon inspection, if the product is found to be defective a credit will be issued for the replacement. If the product is not found to be defective, an invoice will be issued for the replacement. Freight to and from Dorian will be at the customer's expense.

Claims: Any claim discrepancies in shipments are to be made within 7 days of receipt of merchandise. Any in transit claim for damaged and lost goods must be made against the transportation company only. The foregoing shall constitute the sole and exclusive remedies of the customer and are in lieu of all other warranties, expressed, implied, or statutory, including but not limited to any implied warranty of merchantablity or fitness.

Satisfaction Guaranteed: If you are not fully satisfied with a Dorian product, simply return it within 30 days of shipping date and you will receive full CREDIT if the merchandise is received in resalable condition and in the original packaging.

Product Limited Warranty: Dorian extends to the purchaser for resale, use in their own business, or original equipment manufacturing, a limited warranty, that products made by DORIAN will be free from any defects in material and workmanship for one year after the date of purchase when used under normal intended applications. No other guarantee is made by this policy, nor does it apply to any product which has been altered, misused, or used in applications other than its normal intended use. Request for a Return Goods Authorization (RGA) number from Dorian and return freight pre-paid to Dorian any part or product which is determined by Dorian to be defective in material or workmanship will be repaired or replaced at Dorian's option.

Special Product Quotations: All special product quotations are valid for thirty days from the date of quotation unless otherwise specified. Orders for special products must be confirmed in writing before manufacturing can begin, along with payment for 50% of the quoted price, with the remaining 50% to be paid upon delivery of the special products. Special products and non-stock standard products cannot be canceled or returned for exchange or credit.

Cancellations: Customer may not cancel or modify any purchase order once a purchase order has been expressly accepted by Dorian, unless (a) customer has given Dorian reasonable notice to stop work, (b) customer pays for all work -in-progress and any raw materials or supplies used or consumed by Dorian in connection with the order, at the time work is stopped (or for which commitments have been made by Dorian at such time) in connection with the order (c) customer pays all costs and expenses otherwise incurred by Dorian in connection with the order, and (d) customer pays a cancellation charge of fifteen percent (15%) of the initial quoted price.

Returns: Return undamaged product within 30 days of the ship date, if the merchandise is received in resalable condition and in the original packaging you will receive full CREDIT on your account, - Product(s) returned after 30 days but prior to 90 days after the ship date is subject to a 20% restocking fee.- Unless otherwise specified, no material will be accepted for returned after 90 days of the ship date.- If the Distributor or End User, within 30 days of the ship date, claims a product is defective and needs immediate replacement, the customer must place a new order, and a RMA number will be issued for the defective product. The Distributor will be advised upon completion of inspection if credit will be issued.- Any product returned for repair, under warranty or warranty expired, will not be accepted without a RMA number.- Customer will be advised of any charges before repairs are made.- All returns must be authorized by Dorian Tool with a official RMA number.- Dorian Tool does not constitute acceptance of the product when a RMA number is issued.- The RMA number must be visible on the outside of the box and a copy of the RMA form must be placed inside the original box along with the returned product - Any package received without an official RMA number visible on the outside of the box will be refused and returned to the sender at their expense.- The customer is responsible for the freight to and from Dorian Tool.- NO PRODUCT WILL BE ACCEPTED FOR RETURN WHEN RECEIVED IN NON-RESALABLE CONDITION. This includes, but is not limited to: damaged packages, non Dorian labels and marking, missing parts, cosmetic damages, used and/or obsolete product(s).- Quality Control must inspect and accept product before credit will be issued.- RMAs are processed daily by RMA Service Center at X 260.- RMA numbers are valid for 30 days from the date is issued. All product(s) requested for return must be received by Dorian Tool within 30 days of the RMA date.- In the event the RMA is denied, the customer has 30 days from the date of notification to respond with shipping instructions for their product. If shipping instructions are not provided by the customer within 30 days from the RMA denial notification, the product will be disposed at the customers expense.- By writing the RMA number on the outside of the box and shipping product to Dorian against this number constitutes acceptance of Dorian's terms and conditions.

Condition ,terms and specifications are subject to change without notice. Any typographical error in any printing matter is subject to correction.





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