

THE
KNURLING
TOOL *Specialists*
for CNC and Manual Lathes



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*The Possibilities
Are Endless*

With

Dorian Tool

Knurling Tools





Knurling Tool Graphic Index

CNC Modular Shank for Standard Series Modular Knurling Heads



PAGE 20

CNC Modular Shank for SMALL Series Modular Knurling Heads



PAGE 22

SWFKT Single Wheel Fixed Knurling Tool



HDSWFKT Heavy Duty Single Wheel Fixed Knurling Tool

PAGE 26

MMKT Milling Machine Knurling Tool



PAGE 30

1-Light Duty Diamond Cutting Knurling Head



PAGE 20

1-SMALL Light Duty Diamond Cutting Knurling Head



PAGE 23

SSWFKT Single Shoulder Wheel Fixed Knurling Tool



PAGE 26

KTW109_M Heavy Duty Style Straddle Square Shank Knurling Tool



1.5 & 2.5 Diameter Range

PAGE 33 (See pg 31 for Interchangeable Arms)

2-Heavy Duty Diamond Cutting Knurling Head



PAGE 20

6- SMALL Shoulder Forming Knurling Head



PAGE 23

FKT Fixed Knurling Tool

HDFKT Heavy Duty Fixed Knurling Tool



PAGE 27

KTW109_4 Shoulder Style Straddle Square Shank Knurling Tool



1.5 & 2.5 Diameter Range

PAGE 33 (See pg 31 for Interchangeable Arms)

3-Extra Heavy Duty Diamond Cutting Knurling Head



PAGE 20

7- SMALL Straddle Forming Knurling Head



PAGE 23

SFKT Shoulder Fixed Knurling Tool



PAGE 27

KTW109_40-0 Heavy Duty Style Straddle Square Shank Knurling Tool



4.0 Diameter Range

PAGE 34 (See pg 31 for Interchangeable Arms)

4- Double Wheel Forming Knurling Head



PAGE 21

107ST- R/M Straight Cutting Knurling Tool



PAGE 24

SCKN Self Centering Knurling Tool

HDSCKN Heavy Duty Self Centering Knurling Tool



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KTW109_40-4 Shoulder Style Straddle Square Shank Knurling Tool



4.0 Diameter Range

PAGE 34 (See pg 31 for Interchangeable Arms)

5- Single Wheel Forming Knurling Head



PAGE 21

107ST- SW2/SW4 Straight Cutting Shoulder Knurling Tool



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SSCK Shoulder Self Centering Knurling Tool



PAGE 28

CNC109_M Side Mount Flange Square Shank Knurling Tool



1.5 & 2.5 Diameter Range

PAGE 35 (See pg 31 for Interchangeable Arms)

6- Shoulder Forming Knurling Head



PAGE 21

3SHKT- Three Swivel Head Forming Knurling Tool



PAGE 25

TIKT True Internal Knurling Tool



PAGE 29

CNC109_4 Side Mount Shoulder Square Shank Knurling Tool



1.5 & 2.5 Diameter Range

PAGE 35 (See pg 31 for Interchangeable Arms)

7- Straddle Forming Knurling Head



PAGE 21

FACEKT Single Wheel Face Forming Knurling Tool



PAGE 25

SIKT Shoulder Internal Knurling Tool



PAGE 29

3WKT_ Three Wheel Knurling Tool



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For help fill in the information shown below and fax to: (979) 282-2951

Quote Number	
Purchase Order Number	

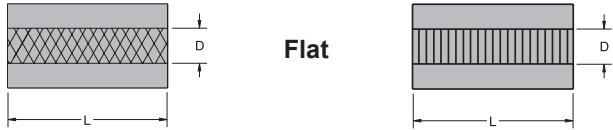
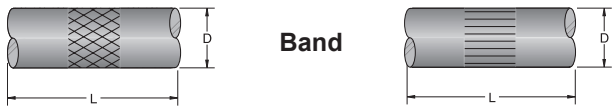
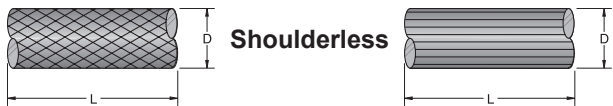
Company _____
 Address _____
 City _____
 State _____ Zip _____

Name _____
 Phone () _____
 Fax () _____
 Email _____

Knurl Type Examples

60° Diamond Pattern*

Straight Pattern



Customer to complete section below

D - Diameter Range

From _____ To _____

D1 - Diameter Range

From _____ To _____

L - Length of Knurl

From _____ To _____

A° - Angle _____

Type of Knurl

- Shoulderless
- To the shoulder
- Face
- Taper
- Flat
- Internal
- Band

Knurl Pattern

- Straight
- Diamond Male
- Diamond Female
- Diagonal

Pitch Style

- Circular pitch (TPI)
- Diametral (DP)
- Metric (mm)

Pitch Size

TPI
 DP
 Metric

Type of Machine

Type of Mat'l

Solid
 Tubing

Material Hardness

HRC
 BHN

Qty of Parts Being Knurled

Tool Shank Size

Right hand or Left hand

- Right hand - chuck rotation is counterclockwise.
- Left hand - chuck rotation is clockwise

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


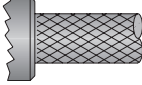
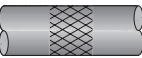

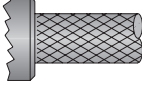
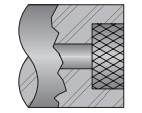
Knurl Tool Recommendation (to be filled out by Dorian)

Knurl Part	First Choice				Second Choice			
	Part Description	Description	Price	Delivery	Part Description	Description	Price	Delivery
Knurling Tool								
Knurling Head								
Knurl Wheel								
Knurl Pin								

Comments: _____



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

Knurl Application	Knurling Tool Recommendation			
	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	-	-	-






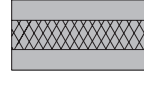
knurl Application	Knurling Tool Recommendation			
	Best	Good	Fair	Not Recommended
Straight Shoulderless 	107ST SWFKT	CNC109 KTW109	SCK	SSCK
Straight to a Shoulder 	SSWFKT	CNC-109-4 KTW109-4	CNC-6 SSCK	SFKT
Band 	CNC-5 SWFKT HDSWFKT	SCKN HDSCK	FKT HDFKT	107ST
Small Diameter Straight Shoulderless 	CNC-7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

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

Tool Description	Page No.	What the Knurling Tool Can do							
		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	•			•	•	•	•	•



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 | 6. Qty. of parts being knurled |
| 2. Pitch style | 7. Tool center height |
| 3. Type of knurl | 8. Tool shank size |
| 4. Diameter range | 9. Right hand or Left hand |
| 5. Type of material | |

Knurling Tools Available:

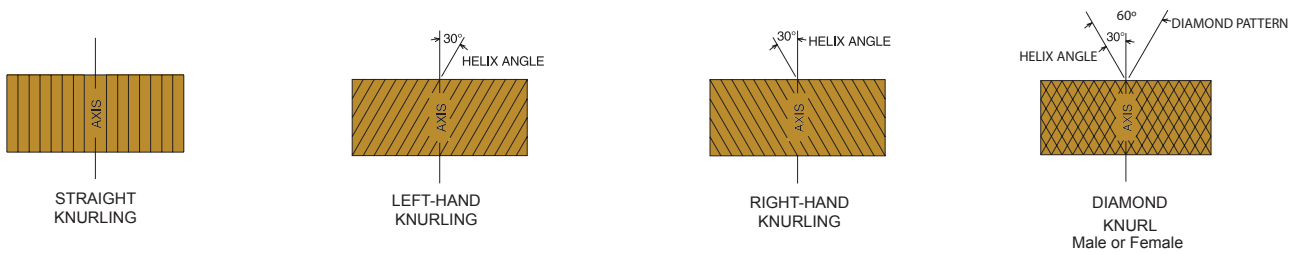
1. Metric System
2. Inches System

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

For Metric Conversion see page 59.

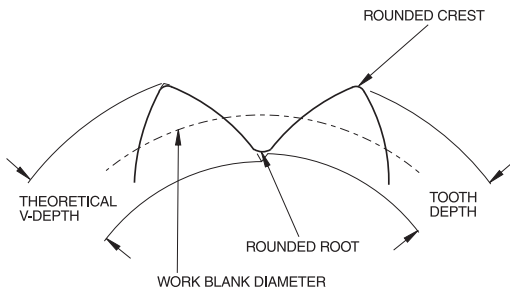


Knurling Pattern



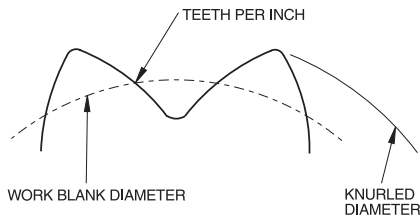
Tooth Form

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.



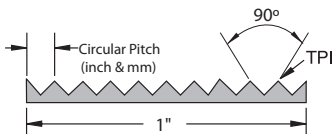
The Circular Pitch System

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.



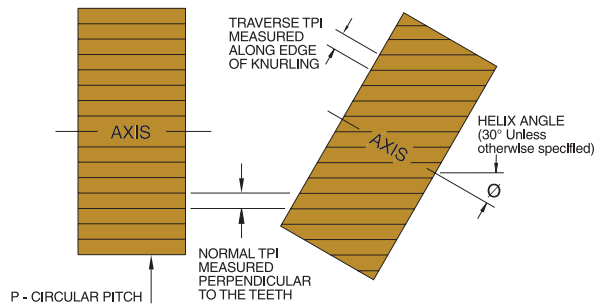
Number of Teeth per Inch - TPI

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.

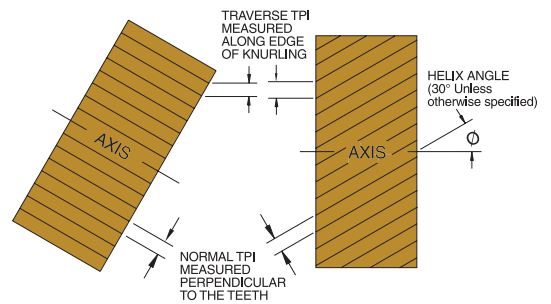


- **TPI system** is the number of teeth per inch (measured on a linear inch).
- **Circular pitch Inch system** is the distance from tooth to tooth, or is derived from 1" divided by the number of teeth per inch.
- **Circular pitch metric system** is the distance from tooth to tooth.
- **Diametral pitch 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 Knurling		*Diagonal and Diamond Knurling			
TPI (No. of Teeth Per Inch)	Circular Pitch	TPI		Circular Pitch	
		Normal (TPI _n)	Transverse (TPI _t)	Normal (P)	Transverse (P _t)
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_t), if the Normal Teeth Per Inch (TPI_n) is known, is shown below.

$$TPI_t = TPI_n \times \cos 30^\circ (.86603)$$

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

$$P_t = \frac{P}{\cos 30^\circ (.86603)}$$

TPI and Circular Pitch Examples

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

$$TPI_t = TPI_n \times \cos 30^\circ = 20 \times .86603 = 17.32 TPI_t$$

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

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

$$P_t = P_n \div \cos 30^\circ = .0500 \div .86603 = .0577 \text{ Circular Transverse Pitch}$$

Straight Knurl - Tooth and Pitch Calculations

$$P = \frac{1.000}{TPI}$$

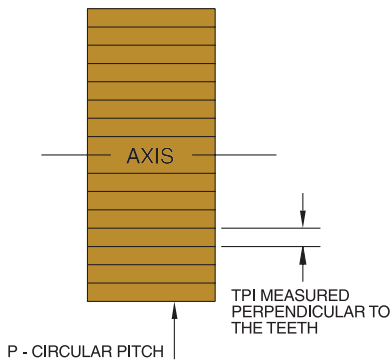
$$N_w = \frac{3.1416 \times D_w}{P}$$

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

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

Where:

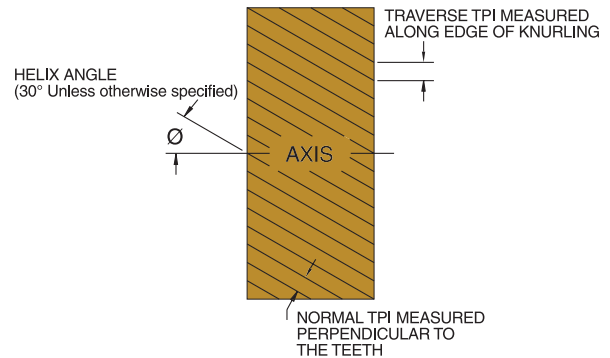
- D_w = Theoretical work blank diameter.
- N_w = Number of teeth on work.
- P = Circular pitch.
- TPI = Number of teeth per inch measured on circumference of blank diameter.



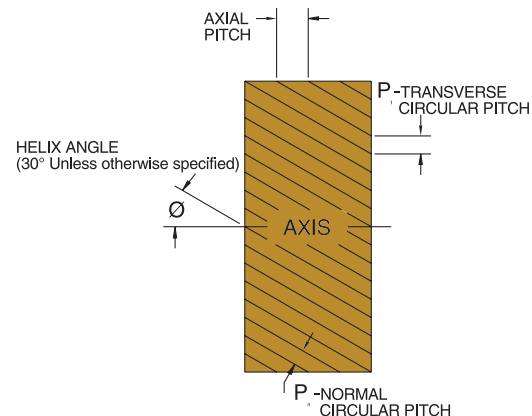
Diagonal & Diamond Knurl Tooth & Pitch Calculations

$$TPI_t = \frac{N_w}{3.1416 \times D_w} \text{ or } TPI_n \times \cos \emptyset \quad TPI_n = \frac{N_w}{3.1416 \times D_w \times \cos \emptyset} \text{ or } \frac{TPI_t}{\cos \emptyset}$$

$$N_w = 3.1416 \times D_w \times TPI_n \text{ or } 3.1416 \times D_w \times TPI_n \times \cos \emptyset$$



$$N_w = \frac{3.1416 \times D_w}{P_t} \text{ or } \frac{3.1416 \times D_w \times \cos \emptyset}{P_n} \quad D_w = \frac{P_t \times N}{3.1416} \text{ or } \frac{P_n \times N_w}{3.1416 \times \cos \emptyset}$$



- Where: D_w = Theoretical work blank diameter.
- N_w = Number of teeth on work.
- P = Circular pitch.
- P_n = Normal circular pitch.
- P_t = Transverse circular pitch.
- TPI = Number of teeth per inch measured on circumference of blank diameter.
- TPI_n = Normal teeth per inch.
- TPI_t = Transverse teeth per inch.
- ∅ = Helix angle (cos 30° = .86603).

$$P = \frac{1.000}{TPI}$$

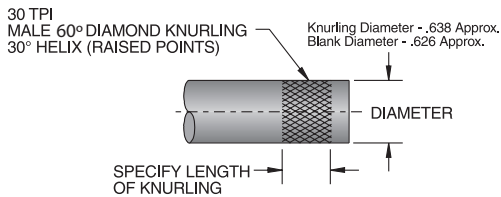
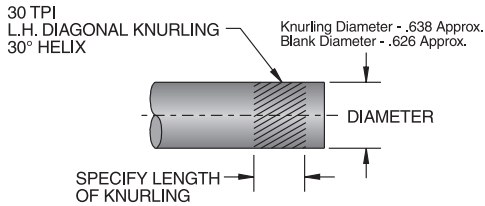
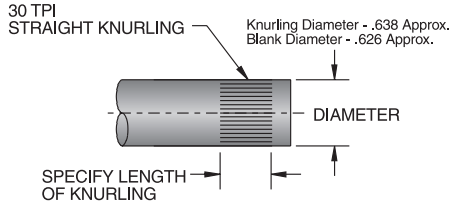
$$P_t = \frac{P_n}{.86603}$$



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.

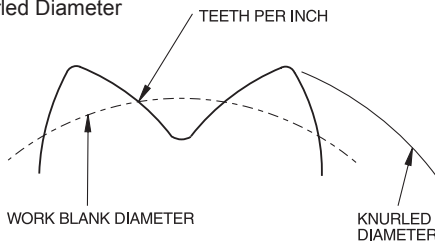
Always specify the **tooth pattern** of the knurling, stating whether it is **straight**, **diagonal**, or **diamond pattern**. Mention whether the diagonal knurling is **right** or **left** hand, and indicate the **angle** of the helix.



General Purpose Knurling

For general purpose knurling, only limited dimensions are necessary.

- TPI (Teeth Per Inch)
- Work Blank Diameter
- Knurled 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.

One (1) Wheel In - Feed	Knurls Used			
IN - FEED With Side Knurl Holder				
IN - FEED With Top Knurl Holder				
IN - FEED With Top Knurl Holder				

Two (2) Wheel In - Feed	Knurls Used			
IN - FEED With Side Knurl Holder				
IN - FEED With Adjustable Straddle Type Knurl Holder				

Two (2) Wheel End - Feed	Knurls Used			
END-FEED With Adjustable Knurl Holder Actuated from Cross Slide				
END-FEED With Adjustable Knurl Holder				
END-FEED With Adjustable Swivel Type Knurl Holder				
END-FEED With Adjustable Swivel Type Knurl Holder				



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.

Where:

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

P=Diametral Pitch
 N_w=Number of teeth on work, or P x D_w
 D_w=Theoretical work blank diameter or $\frac{N_w}{P}$

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.

Approximate Increase of Blank Diameter

Straight and Diagonal American Standard

Diametral Pitch	**Teeth Per Inch Approx.	**Circular Pitch	Approx. Depth of Tooth or Increase in Knurled Diameter		Min. No. of Teeth in Knurled Circumference	Work Blank Diameters	
			Straight	Diagonal		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

** 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.

Diametral Pitch	Teeth Per Inch (TPI)	
	Straight	30° 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:

Where:

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

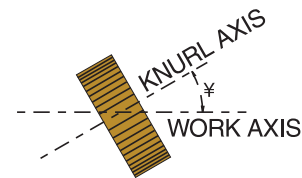
P=Diametral Pitch
 N_w=Number of teeth on work, or P x D_w
 D_w=Theoretical work blank diameter or $\frac{N_w}{P}$

For end-feed knurling with straight tooth knurls:

Where:

$$D_w = \frac{N_w}{P \times \cos \phi}$$

P=Diametral Pitch
 N_w=Number of teeth on work, or P x D_w
 D_w=Theoretical work blank diameter or $\frac{N_w}{P}$
 φ=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.

Where:

$$N_w = D_w \times P \times \cos \phi$$

P=Diametral Pitch
 N_w=Number of teeth on work, or P x D_w
 D_w=Theoretical work blank diameter or $\frac{N_w}{P}$
 φ=Angle between knurl axis and work axis. (cos 30°=.86603)

For Example:

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

$$N_w = 1.000 \times 96 \times .86603 = 83.14 \text{ teeth}$$

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° diagonal knurling according to the following formula:

$$D_w = \frac{N_w}{P \times \cos \phi} = \frac{83}{96 \times .86603} = .998 \text{ inch}$$

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 Knurled Diameters			
For In-feed Rolling with Circular Pitch Knurls on General Applications			
* † TPI	Standard Width of Knurl Face		
	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 conditions satisfactory for knurling and work being right and properly supported. † Refers to normal TPI on diagonal knurling.

Table 4

Approximate Diameter Increase of Blank with Standard Circular Pitch Knurls				
*TPI	Straight	Diagonal**	**Diamond (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
Diametral 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 with Standard Circular Pitch Knurl		
Type of Knurl	Percentage of Depth of Knurl	Where circular pitch= $\frac{1.000}{TPI}$
Straight Tooth	35% of Circular Pitch (P)	
Diagonal	35% of Normal Circular Pitch (Pn)	
Diamond	40% of Normal Circular Pitch (Pn)	
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.

$P = \frac{1.000}{20 \text{ TPI}} = .0500 \text{ Circular Pitch}$ Tool Depth = $.0500 \times 35\% = .0175$

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)

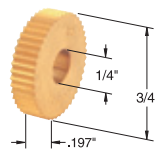
Step 7: Round to closest whole number _____
(in the above example either 34 or 35 can be used)

Step 8: Calculate new diameter to turn material before knurl: _____
(quick calculator value x rounded number of teeth from step 7, example: .033 x 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)

Step 10: Verify against print tolerances : _____

Example for Step 4:



Circular Knurl Pitch		Included Tooth Angle	Knurl Pattern	R Series Knurl Wheel	Straight
Inch	Metric				Cobalt TiN Coated
10 (TPI)	2,5mm	90°	Course	Description Tracking Data Standard *Bevel	RS-10-C 23T .0330 26502 26533

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.

Teeth (on blank) = $\frac{\text{Teeth (on knurl tool)} \times \text{Diameter (Blank)}}{\text{Diameter (wheel)} + \text{Correction Factor}}$

* 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.

$$RPM = \frac{12 \times SFM}{\pi \times DIA}$$

SFM Formula

Speeds and Feeds			
Description	Material Specs	TPI	Metric Pitch
Low carbon steel	1018 1117 1215 etc.	>14	>1,8
		16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>
Alloy Steel Tool steels	4130 4140 D2 etc.	>14	>1,8
		16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>
Stainless Steel	304 17-4 etc.	>14	>1,8
		16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>
Aluminum Brass Plastic	6061 C360 Delrin etc.	>14	>1,8
		16-20	1,6-1,2
		25-35	1,0-0,7
		40>	0,6>

Table 8

Knurl Forming		
End Feed	In Feed	Speed
		Smaller <-Wheel dia.> Larger
0.006" [.15mm]	.001-.003" [.025-.075mm]	50-70 SFM [15-21 m/min]
0.008" [.20mm]	.002-.004" [.050-.100mm]	
0.010" [.25mm]	.002-.004" [.050-.100mm]	
0.012" [.30mm]	.002-.004" [.050-.100mm]	
0.004" [.10mm]	.001-.002" [.025-.050mm]	
0.005" [.13mm]	.001-.003" [.025-.075mm]	
0.007" [.18mm]	.001-.003" [.025-.075mm]	
0.009" [.23mm]	.001-.003" [.025-.075mm]	
0.004" [.10mm]	.001-.002" [.025-.050mm]	35-50 SFM [10-15 m/min]
0.005" [.13mm]	.001-.003" [.025-.075mm]	
0.007" [.18mm]	.001-.003" [.025-.075mm]	
0.009" [.23mm]	.001-.003" [.025-.075mm]	
0.008" [.20mm]	.002-.004" [.050-.100mm]	
0.010" [.25mm]	.003-.005" [.075-.125mm]	
0.013" [.33mm]	.003-.005" [.075-.125mm]	
0.017" [.43mm]	.003-.005" [.075-.125mm]	

Knurl Cutting		
End Feed	In Feed	Speed
		Smaller <-Wheel dia.> Larger
0.009" [.23mm]	.001-.003" [.025-.075mm]	100-140 SFM [30-42 m/min]
0.011" [.28mm]	.002-.004" [.050-.100mm]	
0.013" [.33mm]	.002-.004" [.050-.100mm]	
0.015" [.38mm]	.002-.004" [.050-.100mm]	
0.007" [.18mm]	.001-.002" [.025-.050mm]	
0.008" [.20mm]	.001-.003" [.025-.075mm]	
0.010" [.25mm]	.001-.003" [.025-.075mm]	
0.012" [.30mm]	.001-.003" [.025-.075mm]	
0.007" [.18mm]	.001-.002" [.025-.050mm]	70-100 SFM [21-30 m/min]
0.008" [.20mm]	.001-.003" [.025-.075mm]	
0.010" [.25mm]	.001-.003" [.025-.075mm]	
0.012" [.30mm]	.001-.003" [.025-.075mm]	
0.011" [.28mm]	.002-.004" [.050-.100mm]	
0.013" [.33mm]	.003-.005" [.075-.125mm]	
0.016" [.40mm]	.003-.005" [.075-.125mm]	
0.020" [.50mm]	.003-.005" [.075-.125mm]	

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. Doriantool is not responsible for any injuries that may occur.



Common Knurling Problems

Problem	Cause	Solution
Knurling double tracking	<ol style="list-style-type: none"> 1. Circumference around blank is not an approximate multiple of the pitch of the knurl 2. Shallow depth 	<ol style="list-style-type: none"> 1. Force knurl in harder the first revolution 2. Change blank diameter +/- .005 3. Try slightly different pitch knurl 4. Grind or stone approximately .003 off the diameter of the knurl wheel 5. Order special knurl
Knurling flaking or slivered	<ol style="list-style-type: none"> 1. Knurling on stock material with scale 2. Over-rolling stock material 3. Knurl wheels too deep in the part 	<ol style="list-style-type: none"> 1. Turn off scale 2. Reduce number of revolutions the wheel is in contact with part 3. Reduce the depth of the knurl wheels
Knurl destruction	<ol style="list-style-type: none"> 1. Knurl wheels too deep in the part 2. Over-rolling stock material 3. RPM too fast causing wheels to seize 	<ol style="list-style-type: none"> 1. Reduce the depth of the knurl wheels 2. Reduce number of revolutions the wheel is in contact with part 3. Reduce speed and improve flow of coolant
Knurl wheel's poor tool life	<ol style="list-style-type: none"> 1. Knurling on stock material with scale 2. Over-rolling stock material 3. Knurling Stainless steel (302, 303, 304, 316, & 174ph) 4. Rolling semi-hardened steels 5. Stock run out excessive 6. Knurl wheels improperly hardened or of poor quality 7. Poor lubrication 8. Knurl wheels too deep in the part 	<ol style="list-style-type: none"> 1. Turn off scale 2. Reduce number of revolutions the wheel is in contact with part 3. Slow speeds and feeds 4. Use cobalt titanium nitriding knurl wheels 5. Machine parts concentric 6. Change knurl wheels 7. Increase lubrication 8. Reduce the depth of the knurl wheels
Uneven depth of knurl	<ol style="list-style-type: none"> 1. Center height not set 	<ol style="list-style-type: none"> 1. Adjust center height with shim or adjustment screws if the tool is adjustable
Twisted knurl pattern	<ol style="list-style-type: none"> 1. Center height not set 2. Knurl wheels not held square to part. 	<ol style="list-style-type: none"> 1. Adjust center height with shim or adjustment screws if the tool is adjustable 2. Indicate wheels during setup to make sure they are square to the part

Wheel and Pin Care For Shoulder Type Form Tools	Wheel and Pin Care For Shoulderless Type Form Tools
	
<p>To replace or check knurl wheel and pin check the following:</p> <ol style="list-style-type: none"> 1. Removal of Knurl Pin After all the holding screws are removed, sometimes the pin is still tight in the holder. These can be removed by slightly tapping them out with a proper punch. 2. Inspection Inspect the wheel and pin for burrs or other characteristics which may inhibit proper function of the wheel and pin. 3. Lubrication Use plenty of high temperature grease between knurl and pin. 4. Wheel and Pin Engagement The pin should be tightened until the knurl wheel is free of play yet can spin freely by hand. 	<p>To replace or check knurl wheel and pin check the following:</p> <ol style="list-style-type: none"> 1. Removal of Knurl Pin After all the holding screws are removed, sometimes the pin is still tight in the holder. These can be removed by slightly tapping them out with a proper punch. 2. Inspection Inspect the wheel and pin for burrs or other characteristics which may inhibit proper function of the wheel and pin. 3. Lubrication Use plenty of high temperature grease between knurl and pin. 4. Wheel and Pin Engagement Tighten the holding screws to hold the pin secure with the wheel placed inside the holder.



For single wheel 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 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 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 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.**

For Straddle Style Knurl Tools

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

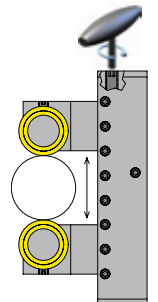


2. Center Height: Dorian straddle style tools have some floatation to allow centering during setup.

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:

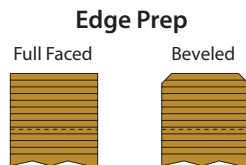
- Loosen locking screws on the side of the holder
- Insert a wrench into the head and turn screw to open the arms larger than the part.
- Calculate the diameter required for the depth of the knurls using the formulas provided earlier in the text.
- Place a piece of raw material into the chuck and turn it to the diameter determined above.
- Jog the tool to place the wheels above and below the part on centerline.
- Turn the adjustment screw until both wheels touch the material.
- Lock the locking screws over the arms only. Tightening the other screws will bend the protective shim.
- 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.**

Beveled versus Full Faced.

When knurling longitudinally (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.



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.

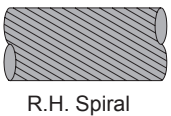
To adjust center-height:

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.

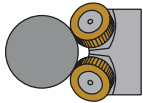
Knurling Adjustment Set Up

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)

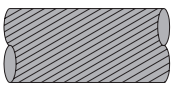
Knurling Head Adjustments



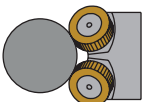
R.H. Spiral



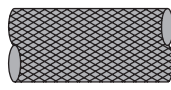
- Knurl tool is too low.
- Top wheel is cutting a deeper R.H. Diagonal Knurl
- Turn the Fine Center Adjustment Screw until both wheels are on center and touching simultaneously.



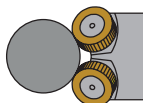
L.H. Spiral



- 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.



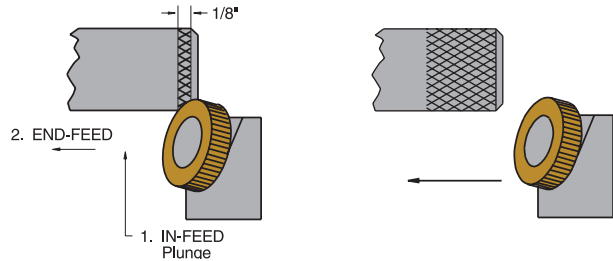
Diamond Knurl



- 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.

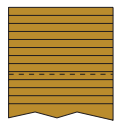


Full Faced Cutting Knurl Wheel

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.

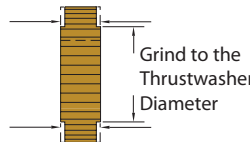
Edge Prep

Full Faced

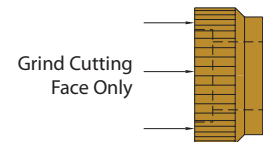


Wheel Grinding (For cutting style tools only)

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



R & M STYLE KNURL WHEEL



SW STYLE KNURL WHEEL



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.

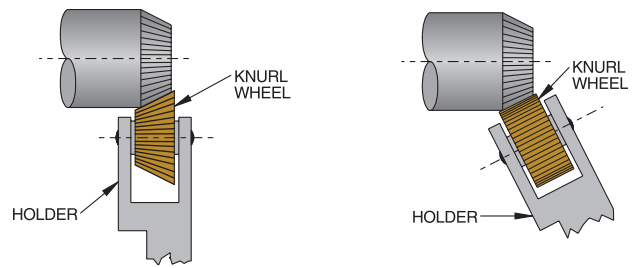


Figure 1 - Poor

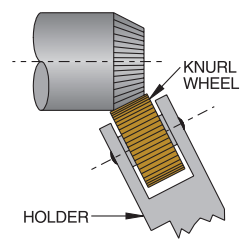


Figure 2 - Better

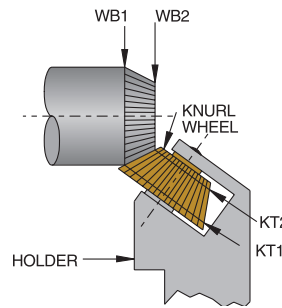


Figure 3 - Best

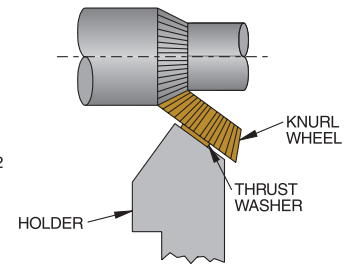


Figure 4 - Shank-Type Knurl

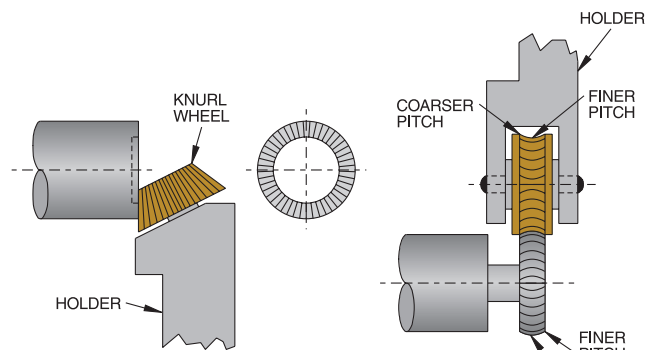


Figure 5 - End Knurling

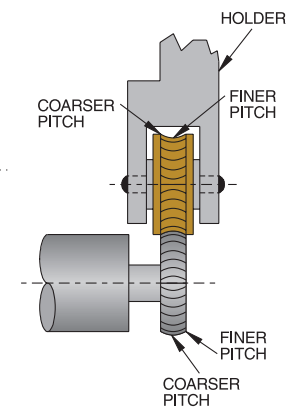
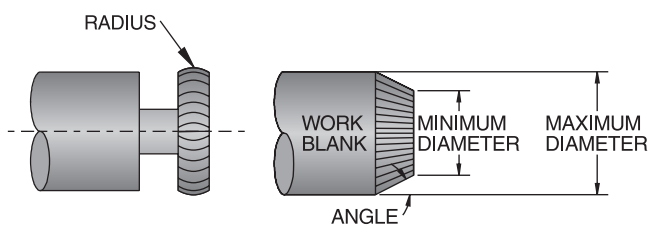


Figure 6

SEE FIGURE 3

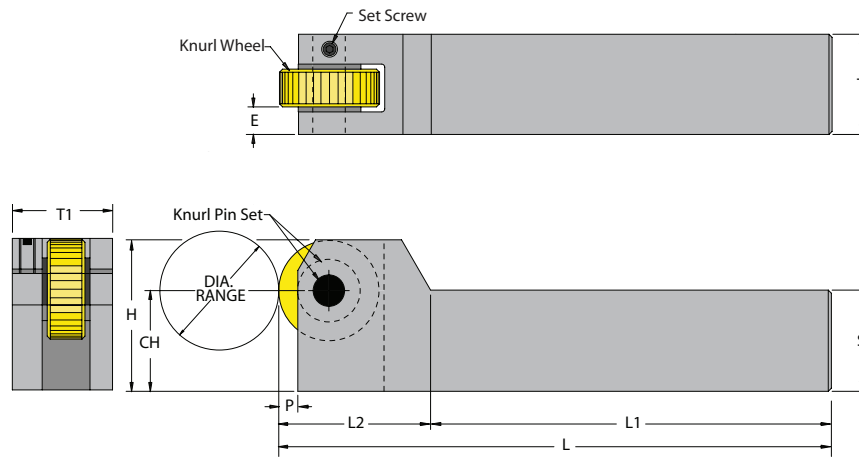
$$\frac{WB1}{*KT1} = \frac{WB2}{*KT2}$$

* Correction Factor Less Tracking

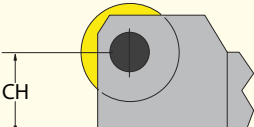
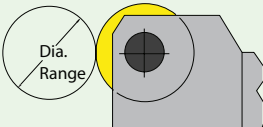
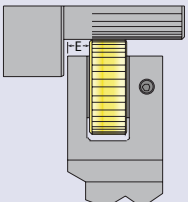
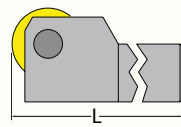
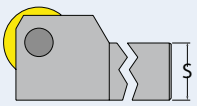




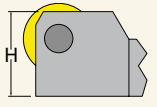
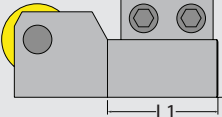
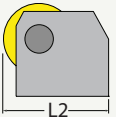
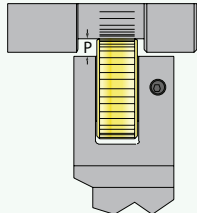
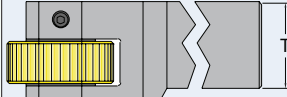
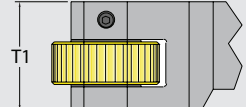
Knurl Tool Dimension Identification Chart



C.H.	Dia. Range	E	L	S
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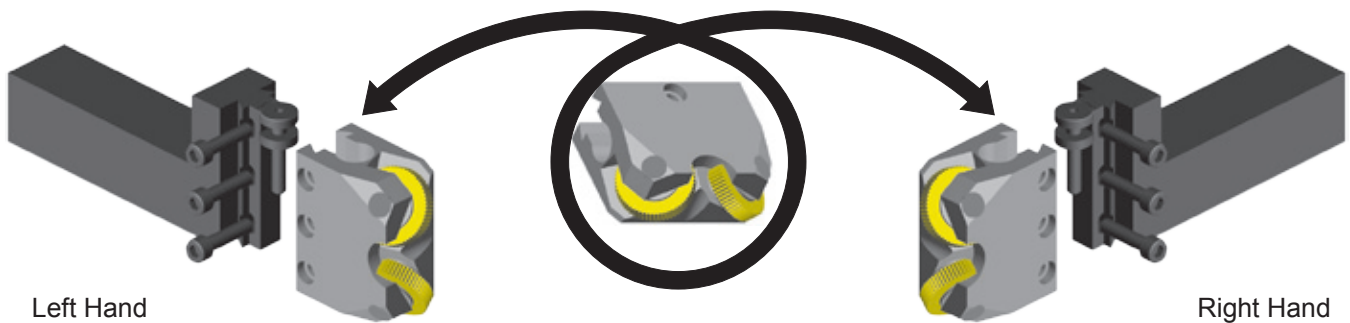
 <p>CH = Center Height - Dimension required to position centerline of tool with the chuck of the lathe.</p>	 <p>Dia. Range - The minimum and maximum diameters suggested to effectively use the knurl tool to produce a good knurl.</p>	 <p>E = Shoulder Clearance - The minimal distance to a shoulder that the knurl tool can approach.</p>	 <p>L = Length - Overall length of tool.</p>	 <p>S = Shank Height - The height of the shank. This is determined by the requirement of the lathe</p>
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H	L1	L2	P	T	T1
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 <p>H = Head Height - The height of the head. This is used to determine if there may be a tool clearance issue on a CNC lathe turret.</p>	 <p>L1 = Length of Shank - The amount of shank that can be held in the holding mechanism of the turret or holding post</p>	 <p>L2 = Length of Head - The amount of the tool that protrudes from the holding mechanism. This is relevant for indexing</p>	 <p>P = Wheel Projection - The distance that the wheel protrudes from the holder. This is generally useful when needing to knurl inside a slot or over a shoulder.</p>	 <p>T = Shank Width - The width of the shank. This can be square or rectangular.</p>	 <p>T1 = Head width - The width of the head can help to determine placement of the tool on the part.</p>
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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 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.

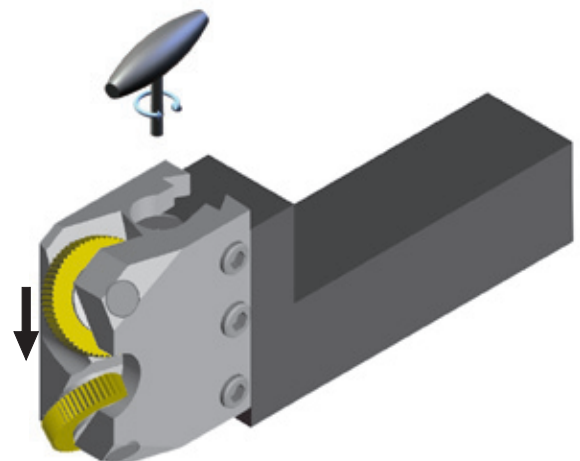
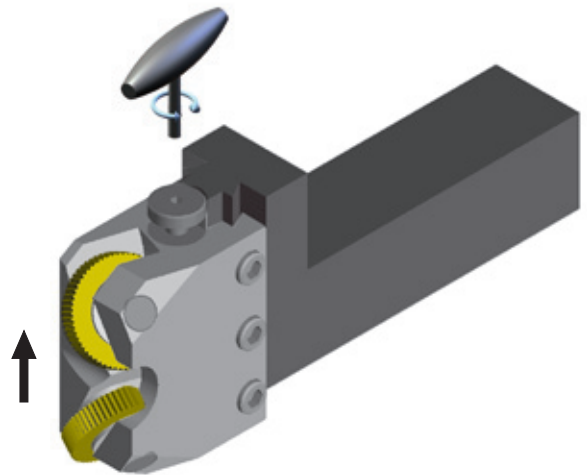
Two Ways to Achieve Knurling With This Tool

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.



Knurling Flexibility!

Three
CNC Modular Knurling Tool
Shank Sizes

Seven
CNC Modular Knurling Tool
Heads

These tools offer better performance and flexibility. Every combination of knurl heads and knurl shanks, are listed on this page. Notice how many applications that can be accomplished with one CNC Modular Knurling Tool. Not only is this tool modular for a wide variety of applications it is also supplied with heavy duty parts.



For CNC Modular Knurling Tool Shank See Page 20

- Center height adjustment.
- Carbide knurl pin.
- 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).

1 LD 60° Diamond Cutting Knurling Head - **Small** Cutting Range 5/16" to 1-1/2" (8mm to 38mm)

End feed range:
.004 to .012



Cutting

- **Knurl cutting action.**
Minimum stress on the machine, and faster than knurl forming action.
- **Compact design** - Allows more clearance for the tool head.
- **Twin straight SW series knurl wheels for male diamond pattern.**
Allows tool to knurl close to a square shoulder.
- **Knurl wheels are mounted on a thrust washer.**
Ensures smooth and even rotation of the knurl.
- **Supplied with SW2S-30-HS knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.

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

End feed range:
.004 to .016



Cutting

- **Knurl cutting action.**
Minimum stress on the machine, and faster than knurl forming action.
- **Twin straight R series knurl wheels for male diamond pattern.**
Supplies more rigidity for larger diameters
- **Knurl wheels are mounted between thrust washers.**
Ensures smooth and even rotation of the knurls.
- **Supplied with RS-25-HS knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.

3 Extra H.D. 60° Diamond Cutting Knurling Head - **Large** Cutting Range 2.0" & up (50mm & up)

End feed range:
.004 to .025



Cutting

- **Knurl cutting action.**
Minimum stress on the machine, and faster than knurl forming action.
- **Twin straight M series knurl wheels for male diamond pattern.**
Supplies more rigidity for larger diameters.
- **Knurl wheels are mounted between thrust washers.**
Ensures smooth and even rotation of the knurls.
- **Supplied with MS-25-HS knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.

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

In/End Feed Range:
.004 to .012



Forming

- **Knurl Forming action.**
Better Quality of knurl pattern.
- **Twin M series knurl wheels for straight or diamond pattern.**
Supplies more rigidity for larger diameters.
- **Knurl wheels are mounted between thrust washers.**
Ensures smooth and even rotation of the knurls.
- **Supplied with MDR/L-25-HSB knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.

5 Single Wheel Forming Knurling Head - **Straight Bump Unlimited Diameter**

In/End Feed Range:
.004 to .012



Forming

- **Knurl forming action.**
Great quality of knurl pattern.
- **Single O series knurl wheel for straight or diamond pattern.**
Narrow knurl applications, up to .375" wide
- **Knurl wheel is mounted between thrust washers.**
Ensures smooth and even rotation of the knurl.
- **Supplied with OS-25-HSB knurl wheel - TiN coated.**
Adds longer life and better performance to the knurl wheel.

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

In/End Feed Range:
.004 to .012



Forming

- **Knurl forming action.**
Better quality of knurl pattern.
- **Twin SW series knurl wheels for straight or diamond pattern.**
Allows tool to knurl against a square shoulder.
- **Knurl wheels are mounted on a thrust washer.**
Ensures smooth and even rotation of the knurl.
- **Supplied with SW4R/L-25-HSB knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.

7 Straddle Forming Knurling Head - **Diameter Range: up to 1" (25mm)**

In/End Feed Range:
.004 to .012



Forming

- **Knurl forming action.**
Better quality of knurl pattern.
- **Compact design.**
Allows more clearance for the tool head.
- **Twin R series knurl wheels for straight or diamond pattern.**
Supplies more rigidity for compact design.
- **Supplied with RDR/L-30-HSB knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.
- **Self-centering knurling head.**
Precise alignment to the working part.



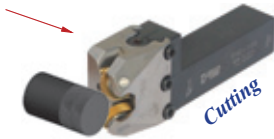
1 LD 60° Diamond Cutting Knurling TOOL - Small Cutting Range 5/16" to 1-1/2" (8mm to 38mm)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
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.

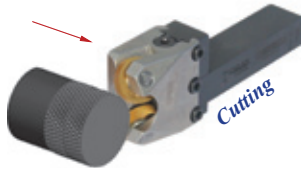
2 H.D. 60° Diamond Cutting Knurling TOOL - Medium Cutting Range 1.0" to 5" (25mm to 125mm)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
CNC-20-2-R	20505	20	CNC-75-2-R	20510	3/4"	5 7/8"	R			
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.

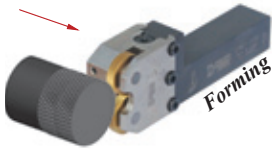
3 Extra H.D. 60° Diamond Cutting Knurling TOOL - Large Cutting Range 2.0" & up (50mm & up)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
CNC-20-3-M	20605	20	CNC-75-3-M	20610	3/4"	6"	M			
CNC-25-3-M	20615	25	CNC-100-3-M	20620	1"	6"	M	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"	M			

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

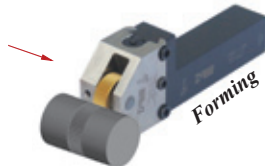
4 Double Wheel Forming Knurling TOOL - Diameter Range: 5/16" & up (8mm & up)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
CNC-20-4-M	20640	20	CNC-75-4-M	20646	3/4"	6"	M			
CNC-25-4-M	20642	25	CNC-100-4-M	20648	1"	6"	M	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"	M			

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



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

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

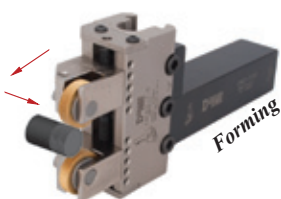
6 Shoulder Forming Knurling TOOL - Diameter Range: 5/16" & up (8mm & up)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
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.

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

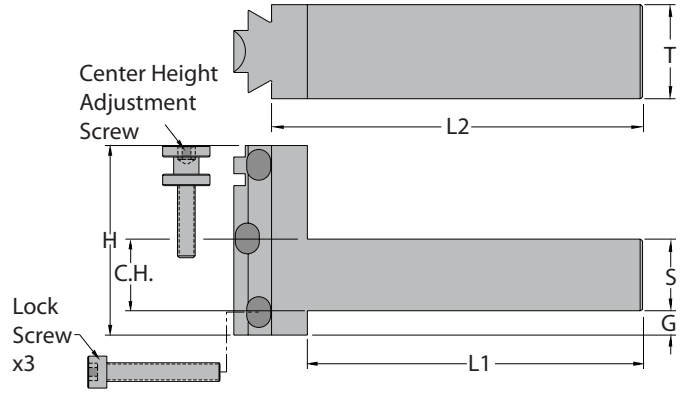


Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
CNC-20-7-R	20905	20	CNC-75-7-R	20910	3/4"	6 3/8"	R			
CNC-25-7-R	20915	25	CNC-100-7-R	20920	1"	6 3/8"	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



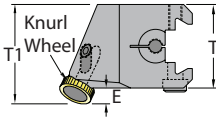
CNC Modular Knurling Tool Shank

Metric Description	UPC No. 733101-	C.H. & S mm	Inch Description	UPC No. 733101-	C.H. & S inch	G	H	L1	L2	T	Adjustment Screw		Lock Screw Set of 3	
											Description	UPC No. 733101-	Description	UPC No. 733101-
CNC-20	21005	20	CNC-75	21010	3/4"	0.250	2.000	3.500	3.875	1.000	CNC-1175	28505	CNC-1024	28515
CNC-25	21015	25	CNC-100	21020	1.0"	0.000	2.000	3.500	3.875	1.000				
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

Cutting



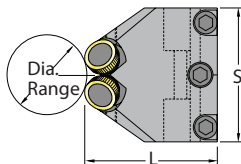
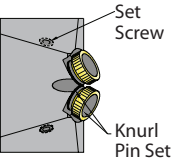
1 Light Duty 60° Diamond Cutting Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E	L	S	T	T1	Knurl Wheel Style	Description	UPC No. 733101-	Set Screw
CNCKH-1-2	21035	5/16" to -1 1/2" 8 to 38mm	0.250	1.960	2.000	1.250	1.500	SW2*	PSW-2.0S	29005	M4x.7

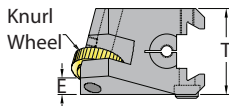
*Supplied with a set of straight high speed TiN coated knurl wheels, 30 TPI for a male diamond pattern.

Knurl Pin Set		Set Screw
Description	UPC No. 733101-	
PSW-2.0S	29005	M4x.7

Resulting Knurl Pattern
Male 60° diamond pattern with straight wheels.



Cutting



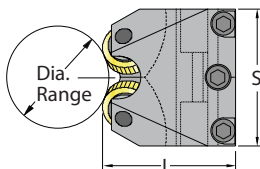
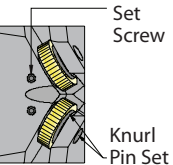
2 Heavy Duty 60° Diamond Cutting Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E	L	S	T	Knurl Wheel Style	Description	UPC No. 733101-	Set Screw
CNCKH-2-R	21040	1.0" to 5.0" 25 to 125mm	0.312	1.960	2.000	1.250	R*	KPS-25- 87-C	28925	M4x.7

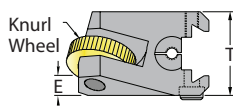
* Supplied with a set of straight high speed TiN coated knurl wheels, 25 TPI for a male diamond pattern.

Knurl Pin Set		Set Screw
Description	UPC No. 733101-	
KPS-25- 87-C	28925	M4x.7

Resulting Knurl Pattern
Male 60° diamond pattern with straight wheels.



Cutting



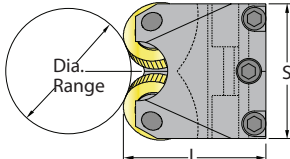
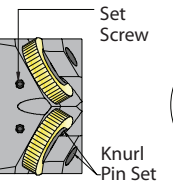
3 Extra H.D. 60° Diamond Cutting Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E	L	S	T	Knurl Wheel Style	Description	UPC No. 733101-	Set Screw
CNCKH-3-M	21045	2.0" & up 50mm & up	0.312	2.125	2.000	1.250	M*	KPS-31-100-C	28945	M4x.7

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

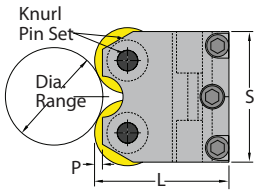
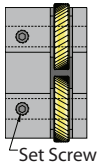
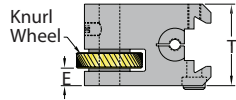
Knurl Pin Set		Set Screw
Description	UPC No. 733101-	
KPS-31-100-C	28945	M4x.7

Resulting Knurl Pattern
Male 60° diamond pattern with straight wheels.





Forming



4 Double Wheel Forming Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L P S T				
			CNCKH-4-M	28947	.312" & up 8mm & up	0.265	2.125

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

Warning, may cause deflection on small diameters, and too much pressure on large diameters.

Knurl Wheel Style	Knurl Pin Set		Set Screw
	Description	UPC No. 733101-	
M*	KPS-31-125-C	28950	M5x.8

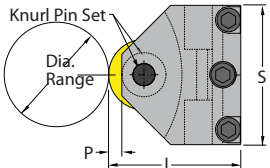
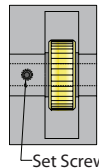
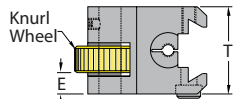
Resulting Knurl Pattern

Straight pattern with straight wheel.

Male 60° diamond pattern with diagonal wheel.



Forming



5 Single Wheel Forming Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L P S T				
			CNCKH-5-O	21050	Unlimited	0.312	1.875

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

Warning, may cause deflection on small diameters, and too much pressure on large diameters.

Knurl Wheel Style	Knurl Pin Set		Set Screw
	Description	UPC No. 733101-	
O*	KPS-31-125-C	28950	M4x.7

Resulting Knurl Pattern

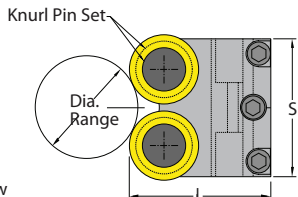
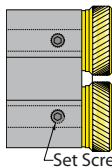
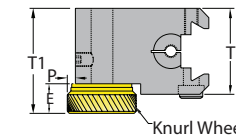
Straight pattern with straight wheel.

Female 60° Diamond pattern with male wheel.

Male pattern with female wheel.



Forming



6 Shoulder Forming Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L P S T T1					
			CNCKH-6-4	21056	5/16" & up 8mm & up	0.250	1.875	0.050

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

Warning, may cause deflection on small diameters, and too much pressure on large diameters.

Knurl Wheel Style	Knurl Pin Set		Set Screw
	Description	UPC No. 733101-	
SW4*	SW4.0P-2S	29085	M5x.8

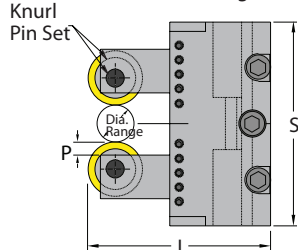
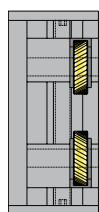
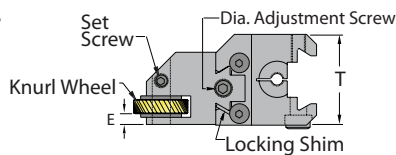
Resulting Knurl Pattern

Straight pattern with straight wheel.

Male 60° diamond pattern with diagonal wheel.



Forming



7 Straddle Forming Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L P S T				
			CNCKH-7-R	21060	up to 1.0" up to 25mm	0.120	2.500

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

The tool has the capability to adjust the wheels to touching (Ø Dia.). **Warning**, physically applying a knurl on the smallest diameters may not be possible.

Knurl Wheel Style	Knurl Pin Set		Set Screw
	Description	UPC No. 733101-	
R*	KPS-25-62-C	28915	M4x.7

Resulting Knurl Pattern

Straight pattern with straight wheel.

Male 60° diamond pattern with diagonal wheel.





Knurling Flexibility!

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

**Three
SMALL CNC Modular Knurling Tool
Heads**



1 SMALL L..D. 60° Diamond Cutting Knurling Head - Small Cutting Range 5/16" to 1-1/2" (8mm to 38mm)

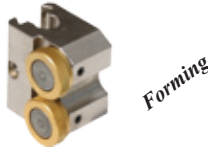
End feed range:
.004 to .012



- **Knurl cutting action.**
Minimum stress on the machine, and faster than knurl forming action.
- **Compact design** - Allows more clearance for the tool head.
- **Twin straight SW series knurl wheels for diamond pattern.**
Allows tool to knurl close to a square shoulder.
- **Knurl wheels are mounted on a thrust washer.**
Ensures smooth and even rotation of the knurl.
- **Supplied with SW2S-30-HS knurl wheels - TiN coated.**
Adds longer life and better performance to the knurl wheels.

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

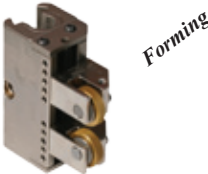
In/End Feed Range:
.004 to .012



- **Knurl forming action** - Provides better quality of knurl pattern.
- **Compact design** - Allows more clearance for the tool head.
- **Twin SW series knurl wheels for straight or diamond pattern.**
Allows tool to knurl against a square shoulder.
- **Knurl wheel is mounted on a thrust washer.**
Ensures smooth and even rotation of the knurl.
- **Supplied with SW2R/L-30-HSB knurl wheel (TiN coated)-**
Adds longer life and better performance to the knurl wheel.

7 SMALL Straddle Forming Knurling Head - Diameter Range: up to 1" (25mm)

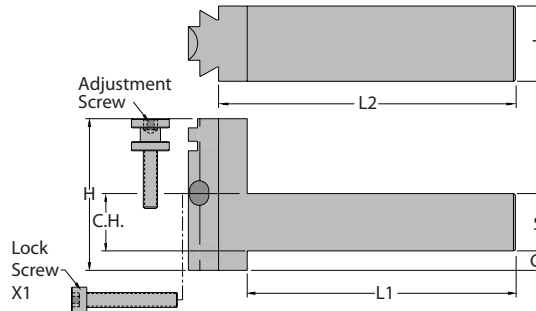
In/End Feed Range:
.004 to .012



- **Knurl forming action** - Provides better quality of knurl pattern.
- **Compact design** - Allows more clearance for the tool head.
- **Twin D series knurl wheels for straight or diamond pattern.**
Supplies more rigidity for compact design.
- **Supplied with DDR/L-30-HSB knurl wheels (TiN coated)-**
Adds longer life and better performance to the knurl wheel.
- **Knurl wheels are mounted between thrust washers.**
Ensures smooth and even rotation of the knurl.
- **Self-centering knurling head** -
For precise alignment to the working part.

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.



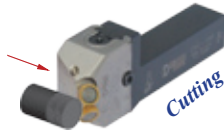
SMALL CNC Modular Knurling Tool Shank

Metric Description	UPC No. 733101-	C.H. & S mm	Inch Description	UPC No. 733101-	C.H. & S inch	G	H	L1	L2	T	Adjustment Screw		Lock Screw Set	
											Description	UPC No. 733101-	Description	UPC No. 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 Locking Screws and Adjustment Screws.



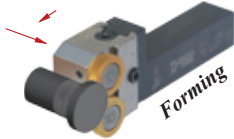
1 SMALL Light Duty 60° Diamond Cutting Knurling TOOL - Small Cutting Range 5/16" to 1-1/2" (8mm to 38mm)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
SCNC-10-1-2	20005	10	SCNC-37-1-2	20010	3/8"	4.000"	SW2*	PSW-2.0S	29005	SCNCKH-1-2
SCNC-12-1-2	20015	12	SCNC-50-1-2	20020	1/2"	4-1/4"	SW2*			
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.

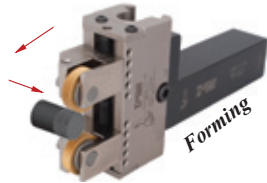
6 SMALL Shoulder Forming Knurling TOOL - Diameter Range: 1/4" & up (6,4mm & up)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
SCNC-10-6-2	20105	10	SCNC-37-6-2	20110	3/8"	4.000"	SW2	SW2.0P-2S	29055	SCNCKH-6-2
SCNC-12-6-2	20115	12	SCNC-50-6-2	20120	1/2"	4-1/4"	SW2			
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.

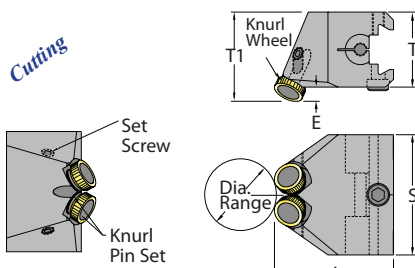
7 SMALL Straddle Forming Knurling TOOL - Diameter Range: up to 1/2" (up to 12,7mm)



Metric Description	UPC No. 733101-	Shank Size mm	Inch Description	UPC No. 733101-	Shank Size	Tool Length	Knurl Wheel Style	Knurl Pin Set		Modular Head Description
								Description	UPC No. 733101-	
SCNC-10-7-D	20205	10	SCNC-37-7-D	20210	3/8"	4-1/2"	D	KPS-18-50-C	28905	SCNCKH-7-D
SCNC-12-7-D	20215	12	SCNC-50-7-D	20220	1/2"	4-3/4"	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

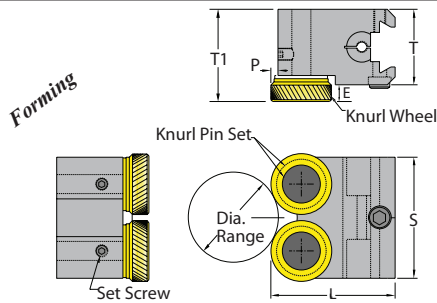


1 SMALL Light Duty 60° Diamond Cutting Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L S T T1					Knurl Wheel Style	Knurl Pin Set		Set Screw
			Description	UPC No. 733101-	Description	UPC No. 733101-					
SCNCKH-1-2	20335	5/16" to 1-1/2" 8 to 38mm	0.200	1.350	1.000	0.750	0.950	SW2*	PSW-2.0S	29005	M4x.7

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

Resulting Knurl Pattern
Male 60° diamond pattern with straight wheels.



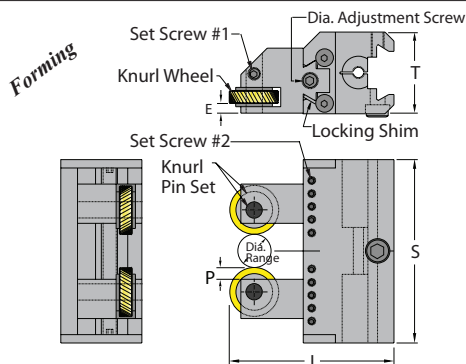
6 SMALL Shoulder Forming Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L P S T T1						Knurl Wheel Style	Knurl Pin Set		Set Screw
			Description	UPC No. 733101-	Description	UPC No. 733101-						
SCNCKH-6-2	20340	1/4" & up 6,4mm & up	0.040	1.270	0.050	1.000	0.750	0.790	SW2*	SW2.0P-2S	29055	M3x.5

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

Warning. may cause deflection on small diameters, and too much pressure on large diameters.

Resulting Knurl Pattern
Straight pattern with straight wheel. Male 60° diamond pattern with diagonal wheels.



7 SMALL Straddle Forming Knurling Head

Head Description	UPC No. 733101-	Dia. Range	E L P S T				Knurl Wheel Style	Knurl Pin Set		Set Screw	
			Description	UPC No. 733101-	#1	#2					
SCNCKH-7-D	20345	up to 1/2" up to 12,7mm	0.125	1.815	0.098	2.062	0.750	D*	KPS-18-50-C	28905	M4x.7 M3x.5

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

Warning. 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.

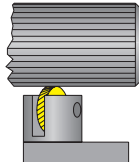
Resulting Knurl Pattern
Straight pattern with straight wheel. Male 60° diamond pattern with diagonal wheels.



Straight Cutting Knurling Tool

107ST - Straight Cutting Knurling Tool With A Square Shank For CNC

- Knurl cutting action. Minimum stress on the machine, and faster than knurl forming action.
- Single diagonal M or R series knurl wheel for straight pattern. Supplies more rigidity for larger diameters
- Knurl wheel is mounted between thrust washers. Ensures smooth and even rotation of the knurl.
- Preset center height for CNC.

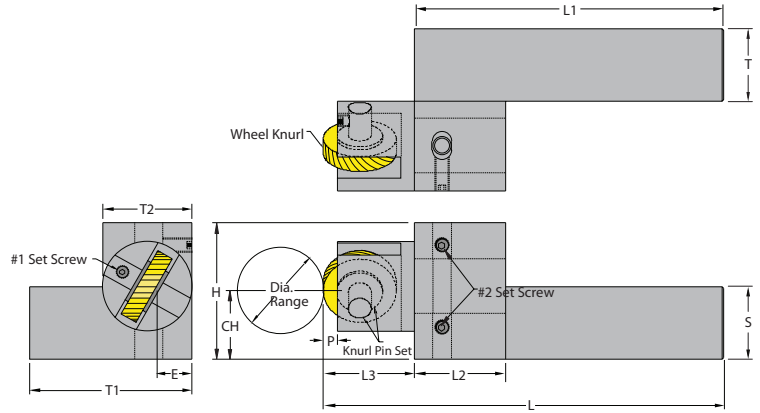


Resulting Knurl Pattern

Straight pattern with diagonal wheel.



For best results, use sharp "full faced" knurl wheel. In feed the knurl 1/8" on end of the part until the correct pattern is generated, then End Feed.

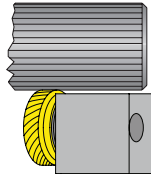


Metric Description	UPC No. 733101-CH & S		Inch Description	UPC No. 733101-CH & S		Dia. Range	Dimensions												Knurl Wheel Style	Knurl Pin Set		Set Screw	
	R.H.	L.H.		R.H.	L.H.		E	H	L	L1	L2	L3	P	T	T1	T2	Desc.	UPC No. 733101-		No. 1	No. 2		
107ST-12-R-RH/LH	21105	21205	12	107ST-50-R-RH/LH	21110	21210	0.500	Unlimited	.375	1.375	3.875	3.000	1.250	0.875	.125	0.500	1.500	1.000	RDL*	KPS-25-100-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-25-100-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-31-125-C	28950	M4-.7	M5-.8
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-31-125-C	28950	M4-.7	M5-.8
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-31-125-C	28950	M4-.7	M5-.8

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.

107ST - Straight Cutting Shoulder Knurling Tool With A Square Shank For CNC

- Knurl cutting action. Minimum stress on the machine, and faster than knurl forming action.
- Single diagonal SW2 or SW4 series knurl wheel for straight pattern. For knurling closer to a shoulder.
- Knurl wheel is mounted on a thrust washer. Ensures smooth and even rotation of the knurl.
- Preset center height for CNC.

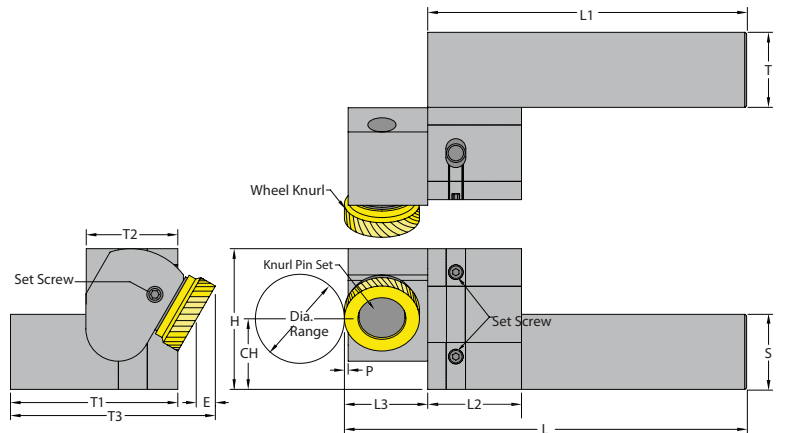


Resulting Knurl Pattern

Straight pattern with diagonal wheel.



For best results, use sharp "full faced" knurl wheel. In feed the knurl 1/8" on end of the part until the correct pattern is generated, then End Feed.



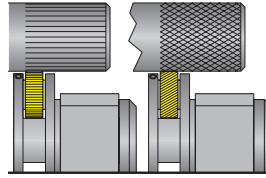
Metric Description	UPC No. 733101-CH & S		Inch Description	UPC No. 733101-CH & S		Dia. Range	Dimensions												Knurl Wheel Style	Knurl Pin Set		Set Screw	
	R.H.	L.H.		R.H.	L.H.		E	H	L	L1	L2	L3	P	T	T1	T2	T3	Desc.		UPC No. 733101-	No. 1	No. 2	
107ST-12-2-RH/LH	21106	21206	12	107ST-50-2-RH/LH	21111	21211	0.500	Unlimited	0.125	1.375	3.875	3.000	1.250	0.875	0.050	0.500	1.500	1.000	1.750	SW2L*	SW2.0P-1S	29050	M5-.8
107ST-162-2-RH/LH	21116	21216	16	107ST-162-2-RH/LH	21116	21216	0.625	Unlimited	0.125	1.500	3.875	3.000	1.250	0.875	0.050	0.625	1.625	1.000	1.875	SW2L*	SW2.0P-1S	29050	M5-.8
107ST-20-4-RH/LH	21126	21226	20	107ST-75-4-RH/LH	21131	21231	0.750	Unlimited	0.250	1.625	4.500	3.250	1.250	1.250	0.050	0.750	2.000	1.250	2.500	SW4L**	SW4.0P-1S	29080	M5-.8
107ST-25-4-RH/LH	21136	21236	25	107ST-100-4-RH/LH	21141	21241	1.000	Unlimited	0.250	1.875	5.500	4.250	1.250	1.250	0.050	1.000	2.250	1.250	2.750	SW4L**	SW4.0P-1S	29080	M5-.8
107ST-32-4-RH/LH	21146	21246	32	107ST-125-4-RH/LH	21151	21251	1.250	Unlimited	0.250	2.125	6.000	4.750	1.250	1.250	0.050	1.250	2.500	1.250	3.000	SW4L**	SW4.0P-1S	29080	M5-.8

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.



3SHKT - Three Swivel Head Knurling Tool **Resulting Knurl Pattern** **Recommended Use:**

- Precision square shank with preset center height.
- Three sets of twin knurl wheels for Straight and Diamond pattern.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.
- With three pairs of knurl wheels and a swivelling head, changing knurl wheels requires less time.
- Can be reversed for right or left hand operation.



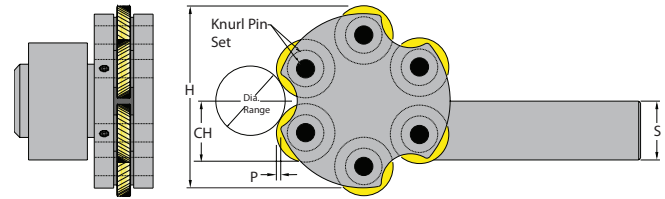
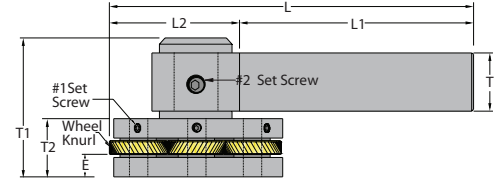
Straight pattern with straight wheel.



Male 60° diamond pattern with diagonal wheel.



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

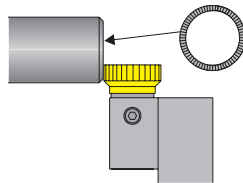


Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	T1	T2	Knurl Wheel	Knurl Pin Set		Set Screw		Spring & Ball Set	UPC No.
																	Description	UPC No.	#1	#2		
3SHKT-12-D	21505	12	3SHKT-50-D	21510	0.500	1/4" & up	0.195	1.660	4.125	2.750	1.375	0.035	0.750	1.690	0.690	D *	KPS-18-62	28810	M3x.5	M6x1.0	STBL-18	28525
3SHKT-162-D	21515	16	3SHKT-162-D	21515	0.625	6.4mm & up	0.195	1.660	4.125	2.750	1.375	0.035	0.750	1.690	0.690	D *	KPS-18-62	28810	M3x.5	M6x1.0	STBL-18	28525
3SHKT-20-M	21525	20	3SHKT-75-M	21530	0.750	5/16" & up 8mm & up	0.380	3.000	5.500	3.250	2.250	0.075	1.000	2.375	1.125	M **	KPS-31-100	28845	M4x.7	M8x1.25	STBL-25	28530
3SHKT-25-M	21535	25	3SHKT-100-M	21540	1.000		0.380	3.000	6.250	4.000	2.250	0.075	1.000	2.375	1.125	M **	KPS-31-100	28845	M4x.7	M8x1.25	STBL-25	28530
3SHKT-32-M	21545	32	3SHKT-125-M	21550	1.250		0.380	3.000	7.375	5.000	2.375	0.075	1.000	2.375	1.125	M **	KPS-31-100	28845	M4x.7	M8x1.25	STBL-25	28530

* 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 - Face Knurling Tool **Resulting Knurl Pattern** **Recommended Use:**

- Precision square shank with preset center height.
- Single knurl wheel for Straight and Diamond pattern.
- Knurl wheel is mounted on the thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.
- Specifically designed to knurl small width face knurl patterns, even up to a shoulder.
- Can be reversed for right or left hand operation.



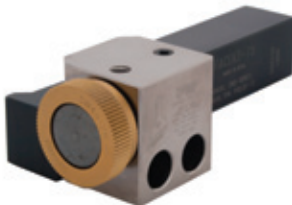
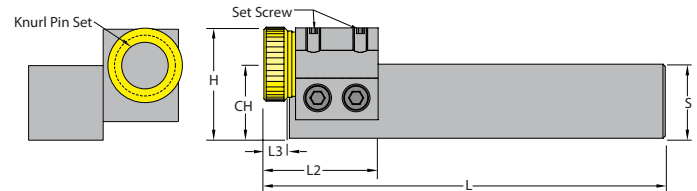
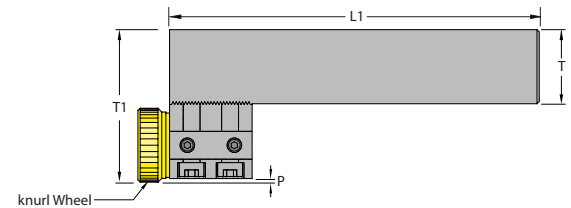
Straight pattern with straight wheel.



Male 60° diamond pattern with female wheel.



For best results, In Feed the knurling tool into the blank until the correct pattern is generated.



Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	H	L	L1	L2	L3	P	T	T1	Knurl Wheel Style	Knurl Pin Set		Set Screw
																Description	UPC No. 733101-	
FACEKT-20-2	21615	20	FACEKT-75-2	21620	0.750	Unlimited	1.000	4.375	4.100	1.375	0.265	0.050	0.750	1.530	SW2 *	SW2.0P-1S	29050	M3x.5
FACEKT-25-2	21625	25	FACEKT-100-2	21630	1.000	Unlimited	1.250	5.375	5.100	1.375	0.265	0.050	1.000	1.780	SW2 *	SW2.0P-1S	29050	M3x.5
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
FACEKT-25-4	21645	25	FACEKT-100-4	21650	1.000	Unlimited	1.500	5.500	5.100	1.500	0.405	0.050	1.000	2.000	SW4 **	SW4.0P-1S	29080	M5x.8

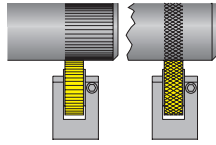
Supplied with one straight high speed TiN coated knurl wheel, * 30 TPI, ** 25 TPI. **Warning**, may cause deflection on small diameters, and too much pressure on large diameters.



Single Wheel Fixed & Heavy Duty Single Wheel Fixed Knurling Tool

SWFKT - Single Wheel Fixed Knurling Tool & HDSWFKT - Heavy Duty Single Wheel Fixed Knurling Tool

- Precision square shank with preset center height.
- Single wheel knurling tool for general purposes.
- Knurl wheel is mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.

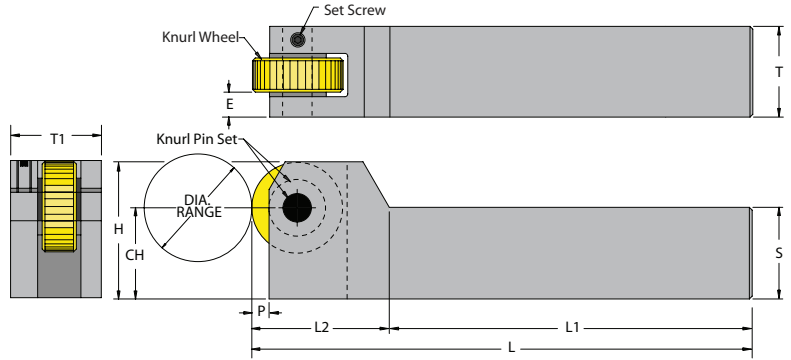


Resulting Knurl Pattern



Recommended Use:

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

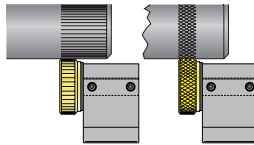


Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	Knurl Wheel Style	Knurl Pin Set		Set Screw
															Description	UPC No. 733101-	
SWFKT-831-B	21705	8	SWFKT-831-B	21705	0.312	Unlimited	.0800	0.500	2.625	2.000	0.625	0.030	0.500	B *	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	O **	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	O **	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

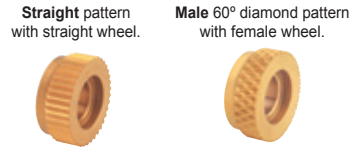
Supplied with one straight high speed beveled TiN coated knurl wheel, * 30 TPI, ** 25 TPI. **Warning**, may cause deflection on small diameters, and too much pressure on large diameters.

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.

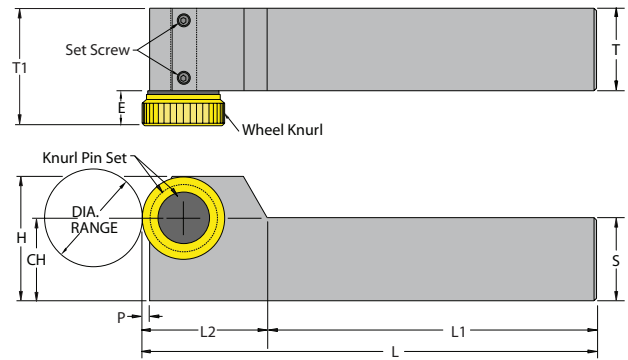


Resulting Knurl Pattern



Recommended Use:

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



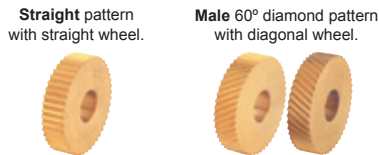
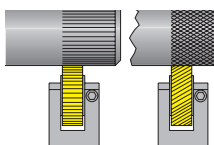
Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Pin Set		Set Screw
																Description	UPC No. 733101-	
SSWFKT-10-2	21775	10	SSWFKT-38-2	21777	0.375	Unlimited	0.265	0.625	3.125	2.500	0.625	0.050	0.500	0.765	SW2 *	SW2.0P-1S	29050	M3x.5
SSWFKT-12-2	21779	12	SSWFKT-50-2	21781	0.500	Unlimited	0.265	0.750	3.375	2.750	0.625	0.050	0.500	0.765	SW2 *	SW2.0P-1S	29050	M3x.5
SSWFKT-162-2	21783	16	SSWFKT-162-2	21783	0.625	Unlimited	0.265	0.875	3.625	3.000	0.625	0.050	0.625	0.890	SW2 *	SW2.0P-1S	29050	M3x.5
SSWFKT-20-4	21787	20	SSWFKT-75-4	21789	0.750	Unlimited	0.410	1.250	4.500	3.250	1.250	0.050	0.750	1.160	SW4 **	SW4.0P-1S	29080	M5x.8
SSWFKT-25-4	21791	25	SSWFKT-100-4	21793	1.000	Unlimited	0.410	1.500	5.250	4.000	1.250	0.050	1.000	1.410	SW4 **	SW4.0P-1S	29080	M5x.8
SSWFKT-32-4	21795	32	SSWFKT-125-4	21797	1.250	Unlimited	0.410	1.750	6.250	5.000	1.250	0.050	1.250	1.660	SW4 **	SW4.0P-1S	29080	M5x.8

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

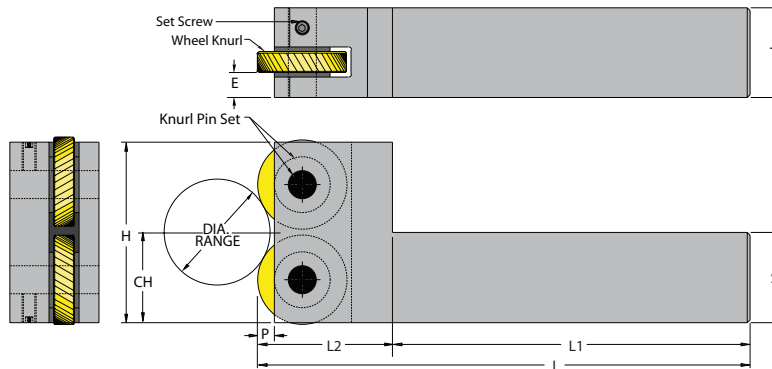


FKT - Fixed Knurling Tool HDFKT - Heavy Duty Fixed Knurling Tool	Resulting Knurl Pattern	Recommended Use:
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- Precision square shank with preset center height.
- Twin knurl wheels for Straight and Diamond pattern TiN coated.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.



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

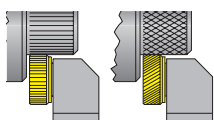


Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	Knurl Wheel Style	Knurl Pin Set		
															Description	UPC No. 733101-	Set Screw
FKT-10-D	21905	10	FKT-38-D	21910	0.375	1/4" & up 6,4mm & up	0.135	1.000	3.375	2.500	0.875	0.060	0.500	D *	KPS-18-50	28805	M3x.5
FKT-12-D	21915	12	FKT-50-D	21920	0.500		0.135	1.000	3.625	2.750	0.875	0.060	0.500	D *	KPS-18-50	28805	M3x.5
FKT-162-D	21955	16	FKT-162-D	21955	0.625		0.135	1.125	4.000	3.000	1.000	0.060	0.625	D *	KPS-18-62	28810	M3x.5
FKT-20-M	21925	20	FKT-75-M	21930	0.750	5/16" & up 8mm & up	0.250	2.000	4.750	3.250	1.500	0.190	0.750	M **	KPS-31-75	28840	M3x.5
FKT-25-M	21935	25	FKT-100-M	21940	1.000		0.250	2.000	5.500	4.000	1.500	0.190	1.000	M **	KPS-31-100	28845	M4x.7
FKT-32-O	21945	32	FKT-125-O	21950	1.250		0.305	2.500	6.375	5.000	1.375	0.190	1.250	O **	KPS-31-125	28850	M4x.7
HDFKT-20-O	22305	20	HDFKT-75-O	22310	0.750	3/4" & up 19mm & up	0.250	2.250	4.750	3.250	1.500	0.190	1.000	O **	KPS-31-100-C	28945	M5x.8
HDFKT-25-O	22315	25	HDFKT-100-O	22320	1.000		0.250	2.250	5.500	4.000	1.500	0.190	1.000	O **	KPS-31-100-C	28945	M5x.8
HDFKT-25-P	22325	25	HDFKT-100-P	22330	1.000		0.285	3.000	5.750	4.000	1.750	0.225	1.250	P **	KPS-50-125-C	28955	M5x.8

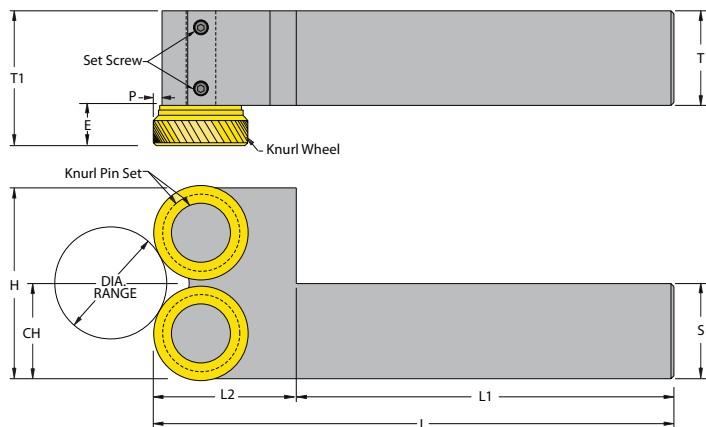
Supplied with one set of diagonal high speed beveled TiN coated knurl wheels, * 30 TPI, ** 25 TPI. **Warning**, may cause deflection on small diameters, and too much pressure on large diameters.

SFKT - Shoulder Fixed Knurling Tool	Resulting Knurl Pattern	Recommended Use:
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- 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.



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



Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Pin Set		
																Description	UPC No. 733101-	Set Screw
SFKT-10-2	22005	10	SFKT-38-2	22010	0.375	1/4" & up 6,4mm & up	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		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		0.265	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	5/16" & up 8mm & up	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		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		0.410	2.500	6.375	5.000	1.375	0.050	1.250	1.660	SW4 **	SW4.0P-2S	29085	M5x.8

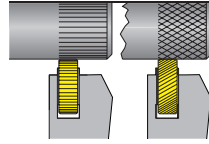
Supplied with one set of diagonal high speed beveled TiN coated knurl wheels, * 30 TPI, ** 25 TPI. **Warning**, may cause deflection on small diameters, and too much pressure on large diameters.



Self - Centering Knurling Tools for C.N.C. Lathes

SCKN - Self-Centering Knurling Tool & HDSCKN - Heavy Duty Self-Centering Knurling Tool

- Specifically designed for CNC lathe.
- Precision square shank with preset center height.
- Twin knurl wheels for Straight and Diamond pattern
- Knurl wheels are mounted between thrust washers to ensure smooth & even rotation of knurls while knurling is performed.
- Self-centering knurling head for a precise alignment.
- Head is reversible for right hand or left hand knurl application.



Straight pattern
with straight wheel.

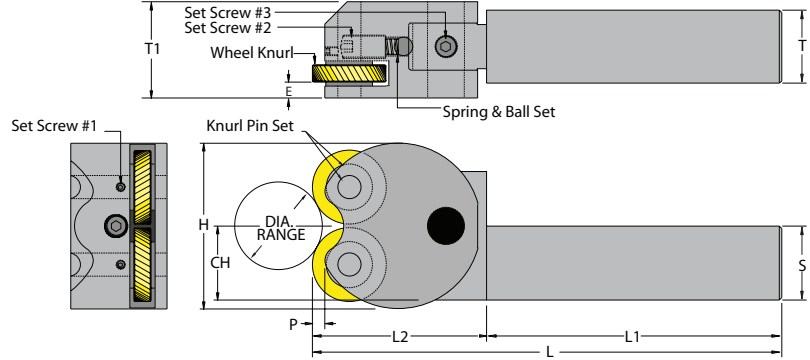


Male 60° diamond pattern
with diagonal wheels.



Resulting Knurl Pattern

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

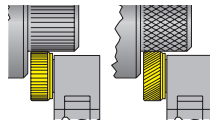


Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Pin Set			Spring & Ball Set	UPC No. 733101-		
																Description	UPC No. 733101-	#1			#2	#3
SCKN-10-DW-D	22161	10	SCKN-38-DW-D	22151	0.375	1/4" & up 6.4mm & up	.115	1.375	3.875	2.50	1.375	.030	0.500	0.750	D *	KPS-18-50	28805	M3x.5	M6x1.0	M5x.8	STBL-18	28525
SCKN-12-DW-D	22106	12	SCKN-50-DW-D	22111	0.500		.115	1.375	4.125	2.75	1.375	.030	0.625	0.750	D *	KPS-18-50	28805	M3x.5	M6-1.0	M5x.8	STBL-18	28525
SCKN-162-DW-D	22115	16	SCKN-162-DW-D	22115	0.625	5/16" & up 8mm & up	.115	1.375	4.375	3.00	1.375	.030	0.625	0.750	D *	KPS-18-50	28805	M3x.5	M6x1.0	M5x.8	STBL-18	28525
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	STBL-25	28530
SCKN-25-DW-M	22126	25	SCKN-100-DW-M	22131	1.000	3/4" & up 19mm & up	.211	2.250	6.375	4.00	2.375	.170	1.000	1.312	M **	KPS-31-100	28845	M3x.5	M8x1.25	M6x.1	STBL-25	28530
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	28530
HDSCK-20-DW-O	22405	20	HDSCK-75-DW-O	22410	0.750	1.0" & up 25mm & up	.437	2.750	5.875	3.25	2.625	.200	0.750	1.250	O **	KPS-31-125-C	28950	M4x.7	M8x1.25	M6x.1	STBL-25	28530
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	O **	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	5/16" & up 8mm & 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	28530
HDSCK-32-DW-P	22435	32	HDSCK-125-DW-P	22440	1.250		.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

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.

SSCK - Shoulder Self-Centering Knurling Tool

- Specifically designed for CNC Lathe.
- Designed to knurl against a square shoulder.
- Precision square shank with preset center height.
- Twin knurl wheels for Straight and Diamond pattern
- Knurl wheels are mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.
- Self-centering knurling head for a precise alignment



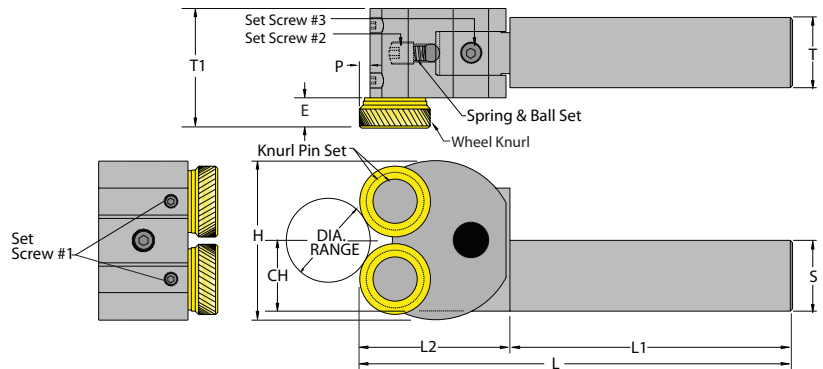
Straight pattern
with straight wheel.



Male 60° diamond pattern
with diagonal wheels.



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



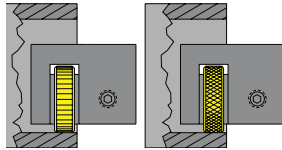
Metric Description	UPC No. 733101-	CH & S mm	Inch Description	UPC No. 733101-	CH & S inch	Dia. Range	E	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Pin Set			Spring & Ball Set	UPC No. 733101-		
																Description	UPC No. 733101-	#1			#2	#3
SSCK-10-DW-2	22205	10	SSCK-38-DW-2	22210	0.375	1/4" & up 6.4mm & up	.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		.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	22218	16	SSCK-162-DW-2	22218	0.625	5/16" & up 8mm & 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		.410	2.250	5.375	3.25	2.125	.050	0.750	1.660	SW4 **	SW4.0P-2S	29085	M5x.8	M8x1.25	M6x.1	STBL-25	28530
SSCK-25-DW-4	22245	25	SSCK-100-DW-4	22250	1.000	3/4" & up 19mm & 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		.410	2.250	7.125	5.00	2.125	.050	1.250	1.660	SW4 **	SW4.0P-2S	29085	M5x.8	M8x1.25	M6x.1	STBL-25	28530

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.



TIKT - True Internal Knurling Tool **Resulting Knurl Pattern** **Recommended Use:**

- For True internal knurling requiring a Straight or Diamond pattern.
- True Internal knurling is used to reduce oversize internal diameters or for specific knurling applications.
- Knurl wheel is mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.
- Single wheel knurling tool.



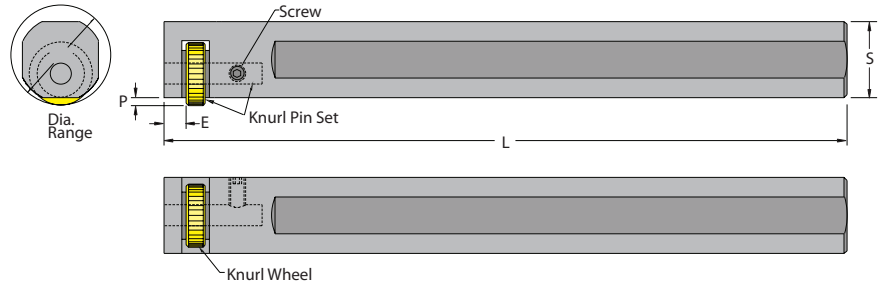
Straight pattern with straight wheel.



Male 60° diamond pattern with female wheel.



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

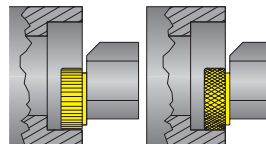


Metric Description	UPC No. 733101-	S mm	Inch Description	UPC No. 733101-	S inch	Dia. Range		E	L	P	Knurl Wheel Style	Knurl Pin Set		Set Screw
						in	mm					Description	UPC No. 733101-	
TIKT-12-B	22601	12	TIKT-50-B	22611	0.500	Min. 0.562	Min. 14,3	0.100	4.000	0.030	B *	KPS-12-38	28800	M3x.5
TIKT-20-D	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-25-75	28820	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-31-100	28845	M4x.7

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

SIKT - Shoulder Internal Knurling Tool **Resulting Knurl Pattern** **Recommended Use:**

- For internal knurling requiring a Straight or Diamond pattern.
- Designed to knurl against a square shoulder.
- Shoulder Internal knurling is used to reduce oversize internal diameters or for specific knurling applications.
- Knurl wheel are mounted between thrust washers to ensure a smooth and even rotation of the knurl while knurling is performed.
- Single wheel knurling tool.



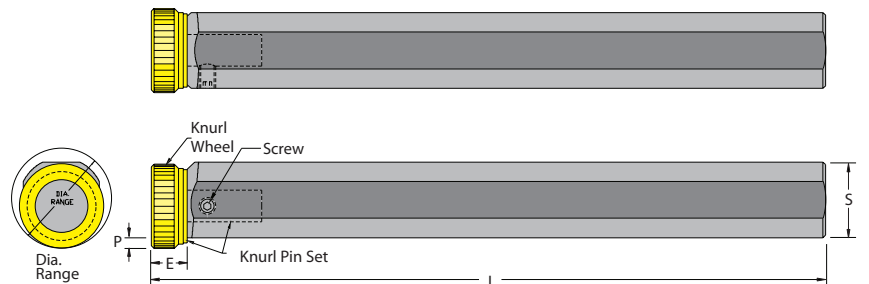
Straight pattern with straight wheel.



Male 60° diamond pattern with female wheel.



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



Metric Description	UPC No. 733101-	S mm	Inch Description	UPC No. 733101-	S inch	Dia. Range		E	L	P	Knurl Wheel Style	Knurl Pin Set		Set Screw
						in	mm					Description	UPC No. 733101-	
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

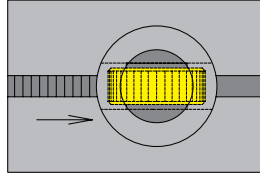
Supplied with one straight high speed beveled TiN coated knurl wheel, * 30 TPI, ** 25 TPI



Milling Machine Knurling Tool

MMKT - Milling Machine Knurling Tool

- Specifically designed to knurl a flat surface.
- Tool has been engineered to be used on milling machines.
- Ground Weldon shank to fit in the milling holders.
- Knurl wheel is mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.
- Single wheel knurling tool.



Resulting Knurl Pattern

Straight pattern with straight wheel.



Male 60° diamond pattern with female wheel.

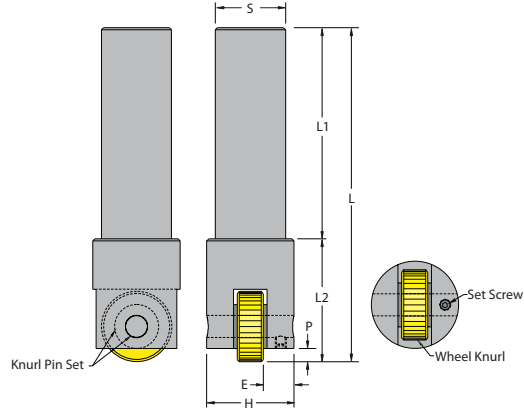


Female 60° diamond pattern with male wheel.



Recommended Use:

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



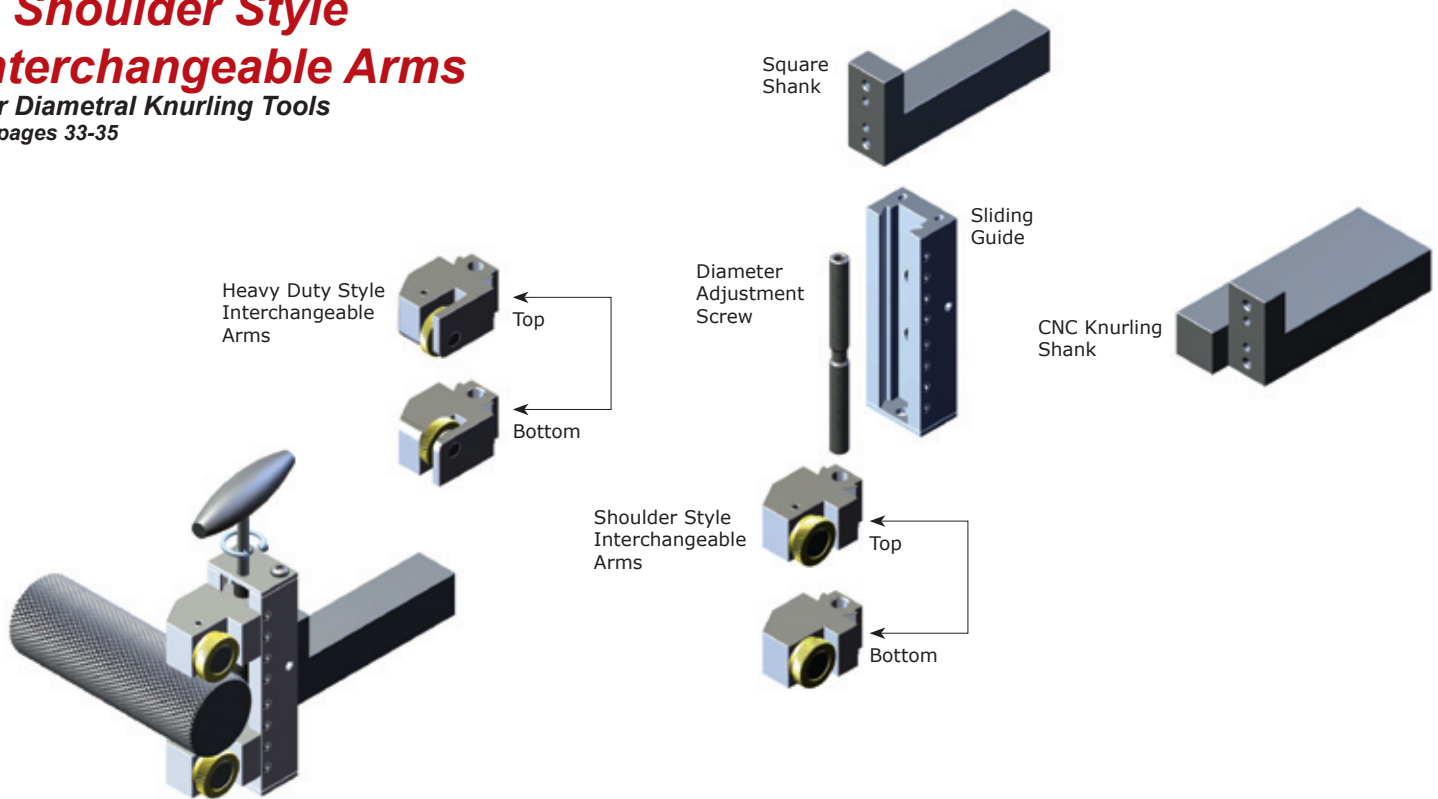
Metric Description	UPC No. 733101-	S mm	Inch Description	UPC No. 733101-	S inch	Dia. Range	E	H	L	L1	L2	P	Knurl Wheel Style	Knurl Pin Set		Set Screw
														Description	UPC No. 733101-	
MMKT-10-D	22505	10	MMKT-38-D	22510	0.375	N/A	0.235	0.625	2.375	1.500	0.875	0.060	D *	KPS-18-62	28810	M3x.5
MMKT-12-R	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 one straight high speed beveled TIN coated knurl wheel, * 30 TPI, ** 25 TPI



Heavy Duty & Shoulder Style Interchangeable Arms

For Diametral Knurling Tools on pages 33-35



Interchangeable W109 Arms Sets for 1.5 Diameter Capacity Tools						Heavy Duty Style	Shoulder Style
Heavy Duty Style Set							
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws		
W109-3-15-M	22844	M*	KPS-31-100	28845	M5-.8		
Shoulder Style Set							
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws		
W109-3-15-4	22846	SW4*	SW4.0P-2S	29085	M5-.8		

Interchangeable W109 Arms Sets for 2.5 Diameter Capacity Tools						Heavy Duty Style	Shoulder Style
Heavy Duty Style Set							
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws		
W109-3-25-M	22848	M*	KPS-31-100	28845	M5-.8		
Shoulder Style Set							
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws		
W109-3-25-4	22849	SW4*	SW4.0P-2S	29085	M5-.8		

Interchangeable W109 Arms Sets for 4.0 Diameter Capacity Tools						Heavy Duty Style	Shoulder Style
Heavy Duty Style Set							
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws		
W109-3-40-O	22855	O*	KPS-31-125	28850	M5-.8		
Shoulder Style Set							
Description	Part No. 733101-	Knurl Wheel Style	Knurl Pin Set	Part No.733101-	All Set Screws		
W109-3-40-4	22856	SW4*	SW4.0P-2S	29085	M5-.8		

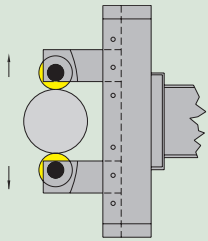
* Knurl wheels sold separately.



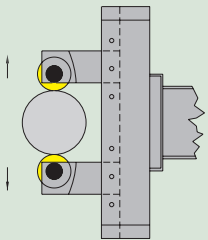
Diametral Knurling Tools A diametral adjustment screw regulates the depth of the knurl pattern and the diameter size. The floating head will allow the knurl wheel to self adjust on the work piece - even when the work piece is not perfectly concentric. However, the tool can be used for twin wheel applications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

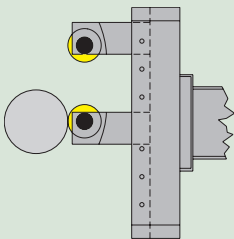
Heavy Duty Style Knurling Tool



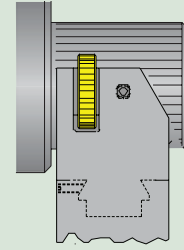
Straddle application is best when pressure and deflection are a problem. The knurling arms are able to "float" somewhat and center on the workpiece, compensating for any off-centering. It has been developed to make a perfect knurling pattern without putting any pressure on the spindle or on the lathe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



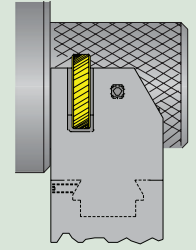
Bump application is best for narrow knurling applications. The knurling arms are moved closer together so that the tool can "bump" against the side of the working part with two wheels touching the part.



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.



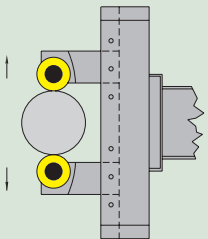
Uses 2 wheels for straight pattern



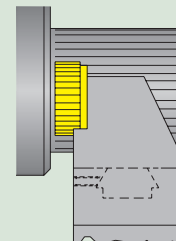
Uses 2 wheels for 60° diamond pattern
1 Diag. Lt.
1 Diag. Rt.

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.

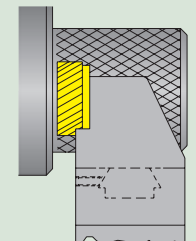
Shoulder Style Knurling Tool



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.



Uses 2 wheels for straight pattern



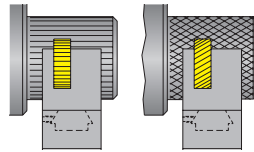
Uses 2 wheels for 60° diamond pattern
1 Diag. Lt.
1 Diag. Rt.

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)



KTW109_ Heavy Duty Style Straddle Square Shank Knurling Tool

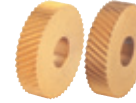
- Precision square shank with preset center height.
- Self-Centering knurling head for a precise alignment to the working part.
- Can be reversed for right or left hand operation.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.
- Twin knurl wheels for Straight and Diamond pattern



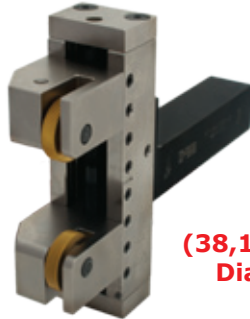
Straight pattern with straight wheel.



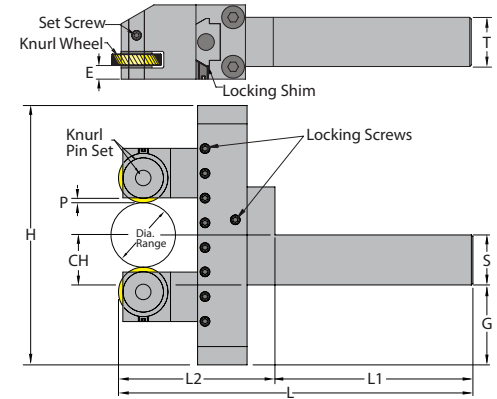
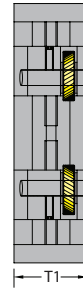
Male 60° diamond pattern with diagonal wheel.



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



1.5" & 2.5"
(38,1mm & 63,5mm)
Diameter Range

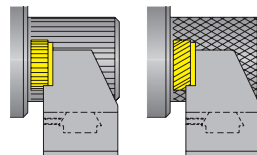


Metric Description	UPC No. 733101-	C.H. & S	Inch Description	UPC No. 733101-	C.H. & S	Dia. Range	E	G	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Arm Set **		Set Screw
																	Supplied	Optional	
1.5 Diameter Range																			
KTW109-20-15-M	22811	20	KTW109-75-15-M	22814	0.750	0-1.50" 0-38mm	0.250	1.250	4.000	6.375	3.250	3.125	0.188	1.00	1.50	M*	W109-3-15-M	W109-3-15-4	M5x.8
KTW109-25-15-M	22812	25	KTW109-100-15-M	22816	1.000		0.250	1.000	4.000	7.125	4.000	3.125	0.188	1.00	1.50	M*	W109-3-15-M	W109-3-15-4	M5x.8
KTW109-32-15-M	22813	32	KTW109-125-15-M	22818	1.250		0.250	0.750	4.000	8.125	5.000	3.125	0.188	1.25	1.50	M*	W109-3-15-M	W109-3-15-4	M5x.8
2.5 Diameter Range																			
KTW109-20-25-M	22819	20	KTW109-75-25-M	22823	0.750	1.25-2.50" 3.2-63mm	0.250	1.688	4.875	6.625	3.250	3.375	0.188	1.00	1.50	M*	W109-3-25-M	W109-3-25-4	M5x.8
KTW109-25-25-M	22821	25	KTW109-100-25-M	22824	1.000		0.250	1.437	4.875	7.375	4.000	3.375	0.188	1.00	1.50	M*	W109-3-25-M	W109-3-25-4	M5x.8
KTW109-32-25-M	22822	32	KTW109-125-25-M	22826	1.250		0.250	1.188	4.875	8.375	5.000	3.375	0.188	1.25	1.50	M*	W109-3-25-M	W109-3-25-4	M5x.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.

KTW109_ Shoulder Style Straddle Square Shank Knurling Tool

- Precision square shank with preset center height.
- Self-Centering knurling head for a precise alignment to the working part.
- Can be reversed for right or left hand operation.
- Twin knurl wheels for Straight and Diamond pattern.
- Knurl wheels are mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.



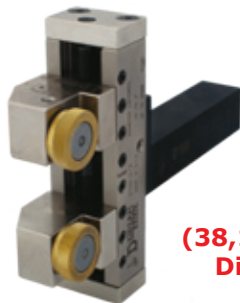
Straight pattern with straight wheel.



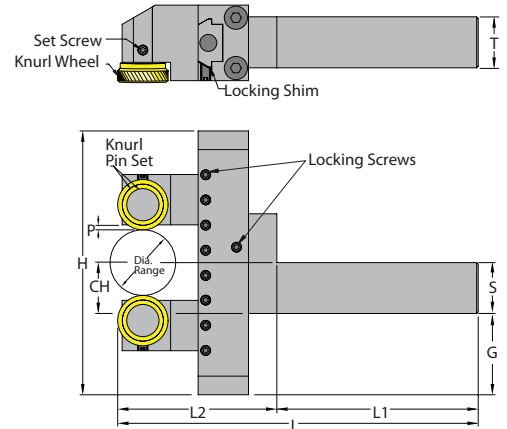
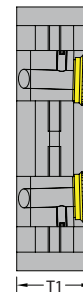
Male 60° diamond pattern with diagonal wheel.



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



1.5" & 2.5"
(38,1mm & 63,5mm)
Diameter Range



Metric Description	UPC No. 733101-	C.H. & S	Inch Description	UPC No. 733101-	C.H. & S	Dia. Range	G	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Arm Set **		Set Screw	
																Supplied	Optional		
1.5 Diameter Range																			
KTW109-20-15-4	22828	20	KTW109-75-15-4	22832	0.750	0-1.50" 0-38mm	1.250	4.000	6.375	3.250	3.125	0.050	1.00	1.50	SW4*	W109-3-15-4	W109-3-15-M	M5-.8	
KTW109-25-15-4	22829	25	KTW109-100-15-4	22833	1.000		1.000	4.000	7.125	4.000	3.125	0.050	1.00	1.50	SW4*	W109-3-15-4	W109-3-15-M	M5-.8	
KTW109-32-15-4	22831	32	KTW109-125-15-4	22834	1.250		0.750	4.000	8.125	5.000	3.125	0.050	1.25	1.50	SW4*	W109-3-15-4	W109-3-15-M	M5-.8	
2.5 Diameter Range																			
KTW109-20-25-4	22836	20	KTW109-75-25-4	22841	0.750	1.25-2.50" 3.2-63mm	1.688	4.875	6.625	3.250	3.375	0.050	1.00	1.50	SW4*	W109-3-25-4	W109-3-25-M	M5-.8	
KTW109-25-25-4	22838	25	KTW109-100-25-4	22842	1.000		1.437	4.875	7.375	4.000	3.375	0.050	1.00	1.50	SW4*	W109-3-25-4	W109-3-25-M	M5-.8	
KTW109-32-25-4	22839	32	KTW109-125-25-4	22843	1.250		1.188	4.875	8.375	5.000	3.375	0.050	1.25	1.50	SW4*	W109-3-25-4	W109-3-25-M	M5-.8	

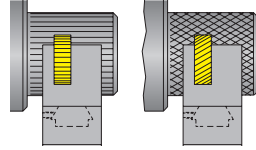
* Supplied with a set of diagonal high speed beveled TiN coated. knurl wheels, 25 TPI. The tool has the capability to adjust the wheels to touching (Ø Dia.). But, physically applying a knurl on the smallest diameters may not be possible. ** SEE PAGE 31 for optional arms and specifications.



Diametral Knurling Tools

KTW109-40-O - Heavy Duty Style Straddle Square Shank Knurling Tool

- Precision square shank with preset center height.
- Self-Centering knurling head for a precise alignment to the working part.
- Can be reversed for right or left hand operation.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.
- Twin knurl wheels for Straight and Diamond pattern.



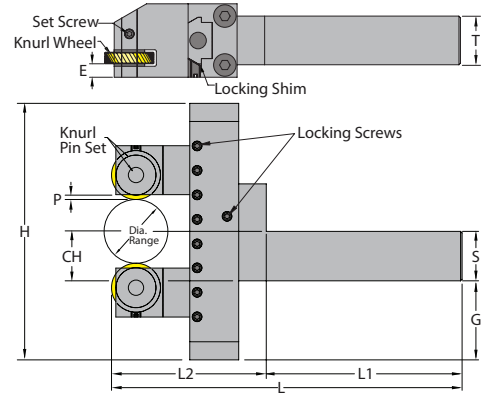
Straight pattern
with straight wheel.



Male 60° diamond pattern
with diagonal wheels.



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



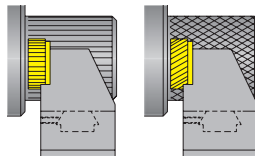
**4.0"
(100mm)
Diameter Range**

Metric Description	UPC No. 733101- & S	C.H. & S	Inch Description	UPC No. 733101- & S	C.H. & S	Dia. Range	E	G	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Arm Set **		Set Screw
																	Supplied	Optional	
4.0 Diameter Range																			
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	M5-.8
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	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.

KTW109-40-4 - Shoulder Style Straddle Square Shank Knurling Tool

- Precision square shank with preset center height.
- Self-Centering knurling head for a precise alignment to the working part.
- Can be reversed for right or left hand operation.
- Twin knurl wheels for Straight and Diamond pattern.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.



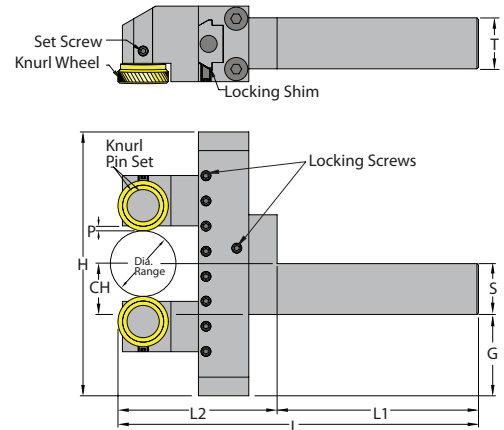
Straight pattern
with straight wheel.



Male 60° diamond pattern
with diagonal wheels.



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



**4.0"
(100mm)
Diameter Range**

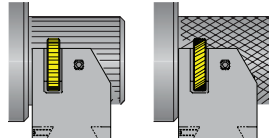
Metric Description	UPC No. 733101- & S	C.H. & S	Inch Description	UPC No. 733101- & S	C.H. & S	Dia. Range	G	H	L	L1	L2	P	T	T1	Knurl Wheel Style	Knurl Arm Set **		Set Screw	
																Supplied	Optional		
4.0 Diameter Range																			
KTW109-25-40-4	22871	25	KTW109-100-40-4	22873	1.000	.63-4.00"	2.173	6.347	9.875	5.000	4.875	0.050	1.25	2.00	SW4*	W109-3-40-4	W109-3-40-O	M5-.8	
KTW109-32-40-4	22872	32	KTW109-125-40-4	22874	1.250	16-100mm	1.923	6.347	9.875	5.000	4.875	0.050	1.25	2.00	SW4*	W109-3-40-4	W109-3-40-O	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.



CNC109_M - Side Mount Flange Style Square Shank Knurling Tool

- Precision square shank with preset center height is offset to the side of the tool to allow for better indexing clearance.
- Self-Centering knurling head for a precise alignment to the working part.
- Wheels are held in a flange for heavy duty knurling
- Twin knurl wheels for Straight and Diamond pattern.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.



Resulting Knurl Pattern

Straight pattern with straight wheel.

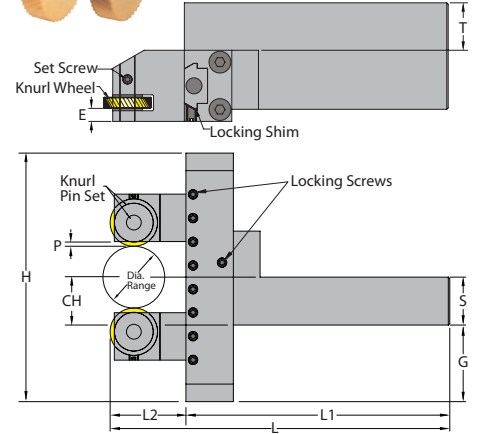


Male 60° diamond pattern with diagonal wheels.



Recommended Use:

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



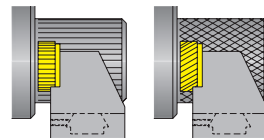
1.5" & 2.5"
(38,1mm & 63,5mm)
Diameter Range

Metric Description	UPC No. 733101- R.H. L.H.		CH & S mm	Inch Description	UPC No. 733101- R.H. L.H.		CH & S inch	DIA. Range	E	G	H	L	L1	L2	P	T	T1	T2	Knurl Wheel Style	Knurl Arm Set **		Set Screw
	Supplied	Optional																				
1.5 Diameter Range																						
CNC109-20-15-M-RH/LH	21443	21446	20	CNC109-75-15-M-RH/LH	21449	21452	0.75	0-1.50" 0-38mm	0.250	1.250	4.000	5.875	4.250	1.625	0.188	1.00	1.50	2.50	M*	W109-3-15-M	W109-3-15-4	M5-.8
CNC109-25-15-M-RH/LH	21444	21447	25	CNC109-100-15-M-RH/LH	21450	21453	1.00		0.250	1.000	4.000	6.625	5.000	1.625	0.188	1.00	1.50	2.50	M*	W109-3-15-M	W109-3-15-4	M5-.8
CNC109-32-15-M-RH/LH	21445	21448	32	CNC109-125-15-M-RH/LH	21451	21454	1.25		0.250	0.750	4.000	6.625	5.000	1.625	0.188	1.25	1.50	2.75	M*	W109-3-15-M	W109-3-15-4	M5-.8
2.5 Diameter Range																						
CNC109-20-25-M-RH/LH	21455	21458	20	CNC109-75-25-M-RH/LH	21461	21464	0.75	.125-2.50" 3.2-63mm	0.250	1.688	4.875	6.062	4.250	1.812	0.188	1.00	1.50	2.50	M*	W109-3-25-M	W109-3-25-4	M5-.8
CNC109-25-25-M-RH/LH	21456	21459	25	CNC109-100-25-M-RH/LH	21462	21465	1.00		0.250	1.437	4.875	6.812	5.000	1.812	0.188	1.00	1.50	2.50	M*	W109-3-25-M	W109-3-25-4	M5-.8
CNC109-32-25-M-RH/LH	21457	21460	32	CNC109-125-25-M-RH/LH	21463	21466	1.25		0.250	1.188	4.875	6.812	5.000	1.812	0.188	1.25	1.50	2.75	M*	W109-3-25-M	W109-3-25-4	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.

CNC109_4 - Side Mount Shoulder Style Square Shank Knurling Tool

- Precision square shank with preset center height is offset to the side of the tool to allow for better indexing clearance.
- Self-Centering knurling head for a precise alignment to the working part.
- Twin knurl wheels for Straight and Diamond pattern.
- Knurl wheels are mounted between the thrust washers to ensure a smooth and even rotation of the knurls while knurling is performed.



Resulting Knurl Pattern

Straight pattern with straight wheel.

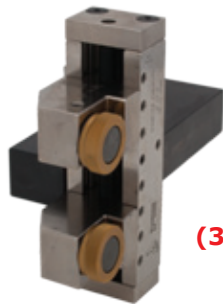
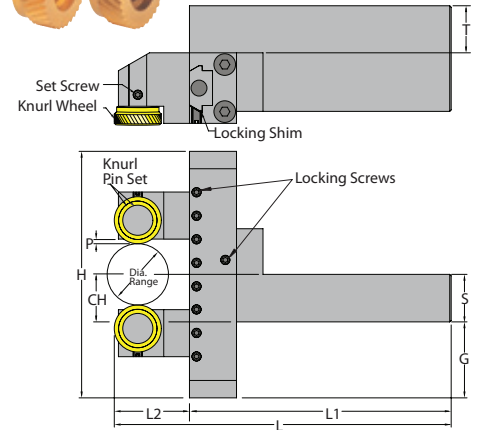


Male 60° diamond pattern with diagonal wheels.



Recommended Use:

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



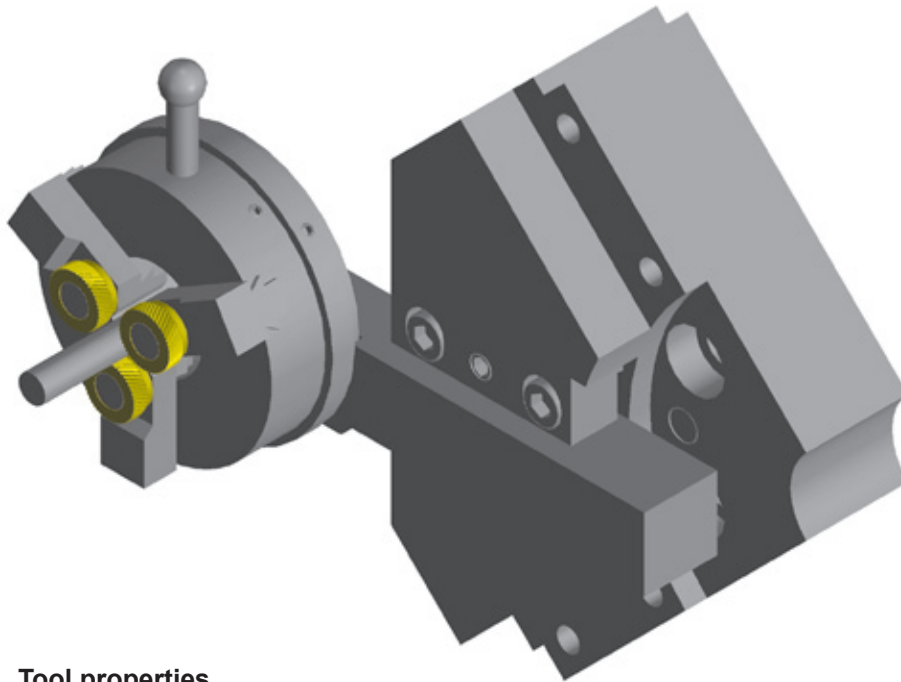
1.5" & 2.5"
(38,1mm & 63,5mm)
Diameter Range

Metric Description	UPC No. 733101- R.H. L.H.		CH & S mm	Inch Description	UPC No. 733101- R.H. L.H.		CH & S inch	DIA. Range	G	H	L	L1	L2	P	T	T1	T2	Knurl Wheel Style	Knurl Arm Set **		Set Screw	
	Supplied	Optional																				
1.5 Diameter Range																						
CNC109-20-15-4-RH/LH	21467	21470	20	CNC109-75-15-4-RH/LH	21473	21476	0.75	0-1.50" 0-38mm	1.250	4.000	5.875	4.250	1.625	0.050	1.00	1.500	2.50	SW4*	W109-3-15-4	W109-3-15-M	M5-.8	
CNC109-25-15-4-RH/LH	21468	21471	25	CNC109-100-15-4-RH/LH	21474	21477	1.00		1.000	4.000	6.625	5.000	1.625	0.050	1.00	1.500	2.50	SW4*	W109-3-15-4	W109-3-15-M	M5-.8	
CNC109-32-15-4-RH/LH	21469	21472	32	CNC109-125-15-4-RH/LH	21475	21478	1.25		0.750	4.000	6.625	5.000	1.625	0.050	1.25	1.500	2.75	SW4*	W109-3-15-4	W109-3-15-M	M5-.8	
2.5 Diameter Range																						
CNC109-20-25-4-RH/LH	21479	21482	20	CNC109-75-25-4-RH/LH	21485	21488	0.75	.125-2.50" 3.2-63mm	1.688	4.875	6.062	4.250	1.812	0.050	1.00	1.500	2.50	SW4*	W109-3-25-4	W109-3-25-M	M5-.8	
CNC109-25-25-4-RH/LH	21480	21483	25	CNC109-100-25-4-RH/LH	21486	21489	1.00		1.437	4.875	6.812	5.000	1.812	0.050	1.00	1.500	2.50	SW4*	W109-3-25-4	W109-3-25-M	M5-.8	
CNC109-32-25-4-RH/LH	21481	21484	32	CNC109-125-25-4-RH/LH	21487	21490	1.25		1.188	4.875	6.812	5.000	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]

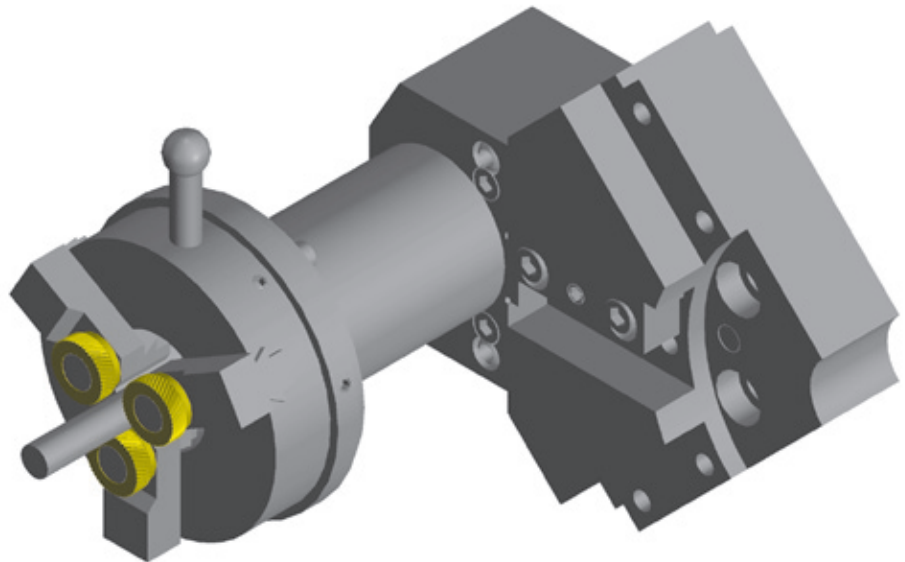


Features:



- 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

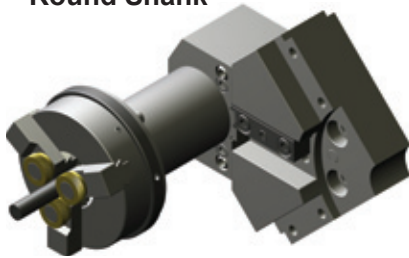




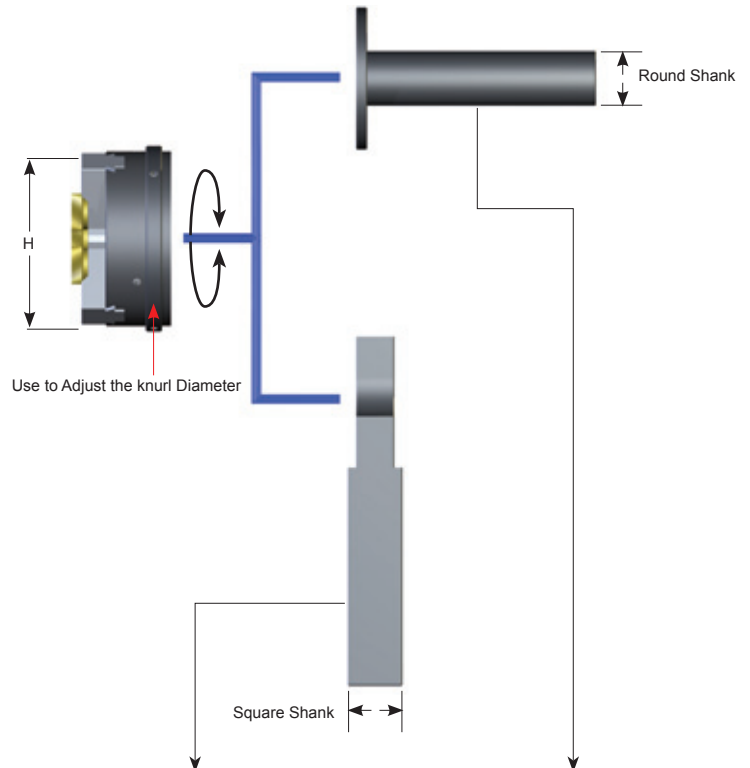
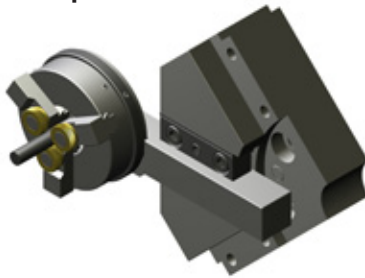
3WSKT -Three wheel knurling tool with optional round or square shanks	Resulting Knurl Pattern		Recommended Use:
<ul style="list-style-type: none"> Made of Heat Treated precision ground alloy steel. The dovetail guide and adjustable arms insure the most possible accuracy and rigidity. A precise scroll gear allows for infinite diameter settings. Scaled dial makes setting the diameter easy. This tool is engineered for most required knurling jobs in Screw Machine, C.N.C. Lathe, and Turret Lathe Applications. Square shank can be reversed for right hand or left hand operation. Square shank with preset center height. 	Straight pattern with straight wheel. 	Male 60° diamond pattern with diagonal wheels. 	For best results, use beveled knurl wheels. End Feed the knurling tool into the blank until the desired length of the knurl is done.

The Three Wheel Knurling Tools can knurl up to a shoulder, minimum diameter of .085" (2.16mm) up to 1-1/2" (38,1mm) diameter, and infinite lengths. For Screw Machine, C.N.C. Lathe, and Turret Lathe Applications.

Optional 3WRKT Round Shank



Optional 3WSKT Square Shank



3 Wheels Knurling Tool Head Specification						
Desc.	Part No. 733101-	Capacity	H	Knurl Wheel Style	Knurl Pin Set	Part No. 733101-
3WKT-06-2	23004	2.16mm to 6.4mm .085" to 0.250"	44.5mm 1.75"	SW2 *	SW2.0P-3S	29060
3WKT-12-2	23009	2.16mm to 12.7mm .085" to 0.50"	57.2mm 2.25"	SW2 *	SW2.0P-3S	29060
3WKT-25-2	23024	3.2mm to 25.4mm 0.125" to 1.00"	76.2mm 3.00"	SW2 *	SW2.0P-3S	29060
3WKT-40-2	23034	4.75mm to 38.1mm .187" to 1.50"	108mm 4.25"	SW2 *	SW2.0P-3S	29060

Optional Square Shank			
Desc.	Part No. 733101-	Shank Size	
		Square	Length
3WSKT-06-12	23096	12mm	75mm
3WSKT-06-50	23095	.500"	3.00"
3WSKT-06-162	23097	16mm .625"	88mm 3.50"
3WSKT-06-20	23098	20mm	100mm
3WSKT-06-75	23099	.750"	4.00"
3WSKT-12-162	23082	16mm .625"	88mm 3.50"
3WSKT-12-20	23100	20mm	100mm
3WSKT-12-75	23102	.750"	4.00"
3WSKT-12-25	23101	25mm	125mm
3WSKT-12-100	23078	1.00"	5.00"
3WSKT-25-20	23103	20mm	100mm
3WSKT-25-75	23079	.750"	4.00"
3WSKT-25-25	23104	25mm	125mm
3WSKT-25-100	23080	1.00"	5.00"
3WSKT-40-25	23113	25mm	125mm
3WSKT-40-100	23081	1.00"	5.00"

Optional Round Shank			
Desc.	Part No. 733101-	Shank Size	
		Dia.	Length
3WRKT-06-12	23105	12mm	75mm
3WRKT-06-50	23110	.500"	3.00"
3WRKT-06-162	23106	16mm .625"	88mm 3.50"
3WRKT-06-20	23107	20mm	100mm
3WRKT-06-75	23111	.750"	4.00"
3WRKT-12-162	23115	16mm .625"	88mm 3.50"
3WRKT-12-20	23116	20mm	100mm
3WRKT-12-75	23112	.750"	4.00"
3WRKT-12-25	23117	25mm	125mm
3WRKT-12-100	23114	1.00"	5.00"
3WRKT-25-20	23125	20mm	100mm
3WRKT-25-75	23130	.750"	4.00"
3WRKT-25-25	23126	25mm	125mm
3WRKT-25-100	23124	1.00"	5.00"
3WRKT-40-25	23135	25mm	125mm
3WRKT-40-100	23140	1.00"	5.00"

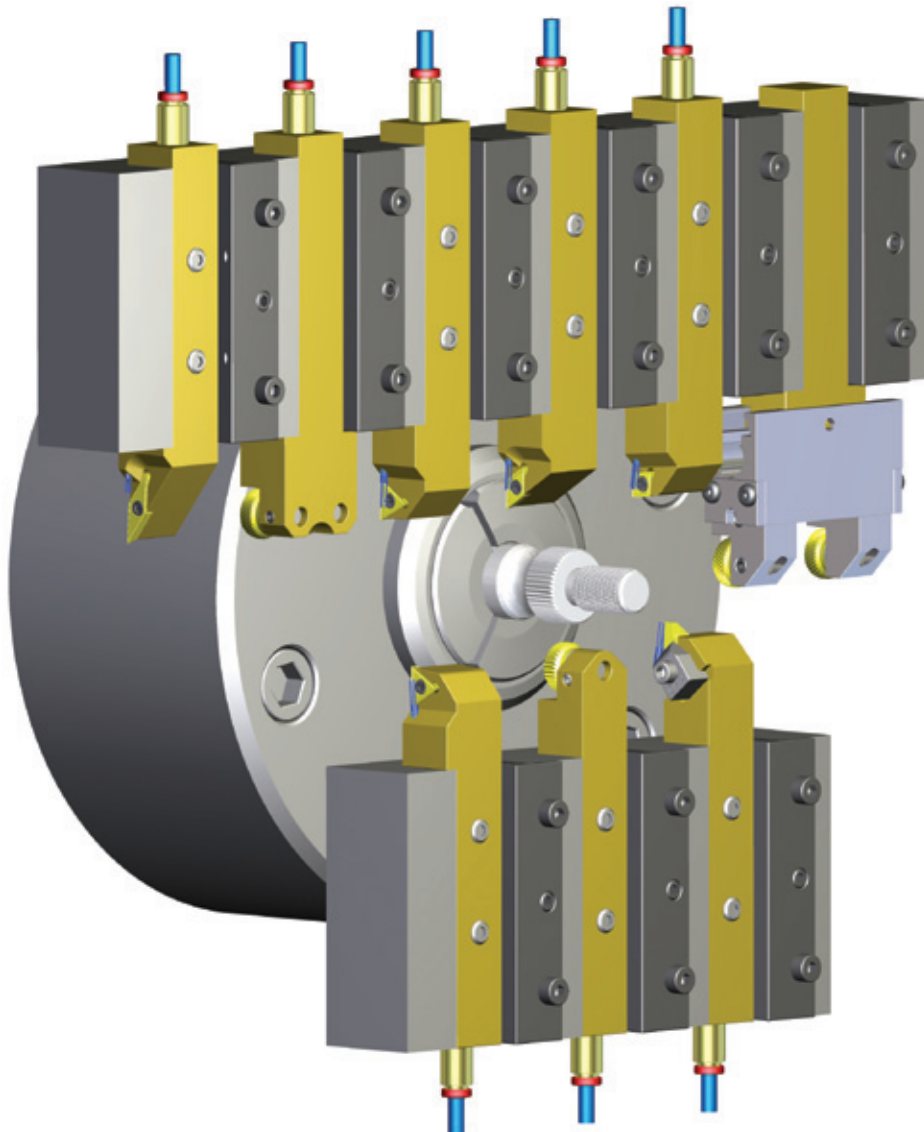
Knurl Tool Head and Optional Shanks are Sold Separately.
Supplied with 1 set of diagonal high speed knurl wheels, 30 TPI



Swiss Screw Machine

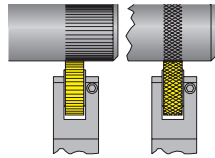
Knurling Tools

Featuring The New Jet-Stream™ Thru Coolant System

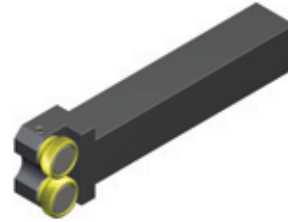




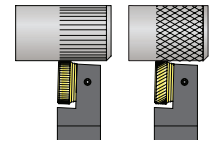
SWTCFKT_B : Single wheel thru coolant fixed knurling tool for swiss screw machines
Page 40



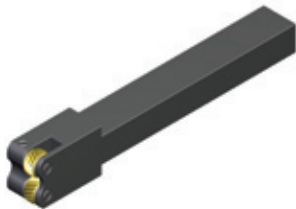
Knurl Wheel Style B



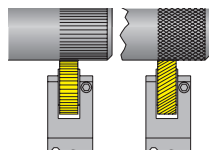
SDWTCFKT : Shoulder double wheel thru coolant fixed knurling tool for swiss screw machines
Page 41



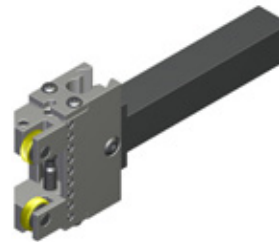
Knurl Wheel Style SW2



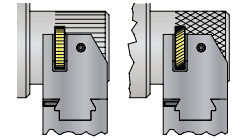
DWTCFKT_B : Double wheel thru coolant fixed knurling tool for swiss screw machines
Page 40



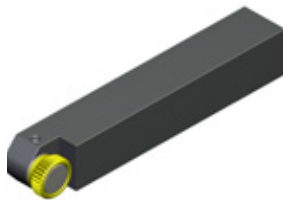
Knurl Wheel Style B



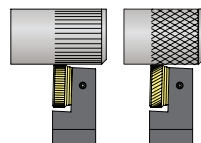
SSMCNC-7-D-0CL : Straddle CNC- Forming knurling tool with a symmetrical center Line for swiss screw machines
Page 42



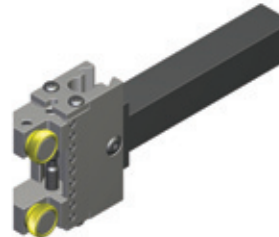
Knurl Wheel Style D



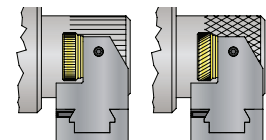
SSWTCFKT : Shoulder single wheel fixed thru coolant knurling tool for swiss screw machines
Page 41



Knurl Wheel Style SW2



SSMCNC 7-2-0CL : Straddle CNC-Shoulder knurling tool with a symmetrical center line for swiss screw machines
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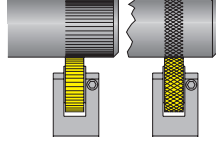
Knurl Wheel Style SW2



Knurling Tools For Swiss Screw Machines

SWTCFKT_B : Single wheel thru coolant fixed knurling tool

- 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.

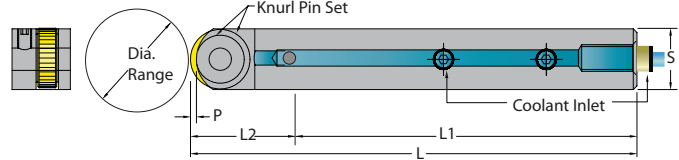
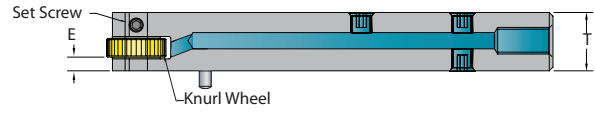
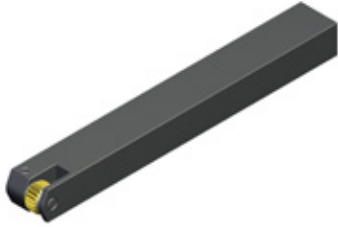


Resulting Knurl Pattern

Straight pattern with straight wheel. Male 60° diamond pattern with female wheel. Female 60° diamond pattern with male wheel.



Recommended Use: Best for straight pattern

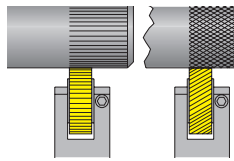


Description	UPC No. 733101-	S mm	S inch	Dia. Range	E	L	L1	Tool Stop L2	P	T	Knurl Wheel Style	Knurl Pin Set		
												Desc.	UPC No. 733101-	Set Screw
SWTCFKT-8-B	22925	8	0.315	Unlimited	0.08"	3.740"	2.953"	0.787"	0.040"	0.472"	B *	KPS-12-38-C	28900	M2.5x.45
SWTCFKT-10-B	22926	10	0.394	Unlimited	0.08"	3.937"	2.953"	0.984"	0.040"	0.472"	B *	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"	B *	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.

DWTCFKT_B : Double wheel thru coolant fixed knurling tool

- Specifically designed for Swiss style screw machines
- Twin knurl wheels for straight or diamond pattern
- Knurl wheels are mounted between thrust washers to ensure a smooth and even rotation of the knurl while knurling is performed.

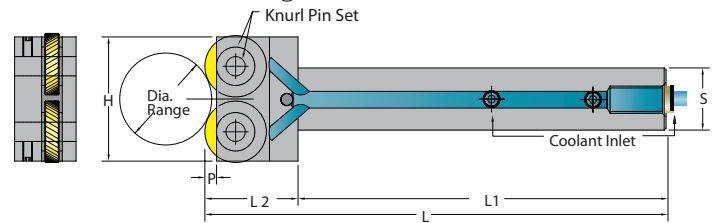
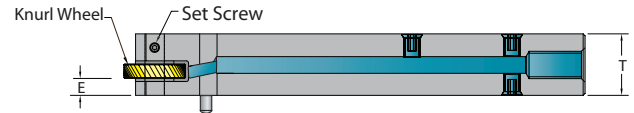


Resulting Knurl Pattern

Straight pattern with straight wheel. Male 60° diamond pattern with diagonal wheel.



Recommended Use: Best for diamond pattern



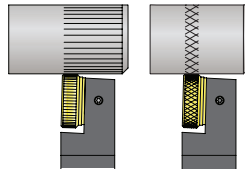
Description	UPC No. 733101-	S mm	S inch	Dia. Range	E	H	L	L1	Tool Stop L2	P	T	Knurl Wheel Style	Knurl Pin Set		
													Desc.	UPC No. 733101-	Set Screw
DWTCFKT-8-B	22935	8	0.315	.118" & up 3mm & up	0.08"	0.650"	3.740"	2.953"	0.787"	0.040"	0.472"	B *	KPS-12-38-C	28900	M2.5x.45
DWTCFKT-10-B	22936	10	0.394		0.08"	0.650"	3.937"	2.953"	0.984"	0.040"	0.472"	B *	KPS-12-38-C	28900	M2.5x.45
DWTCFKT-12-B	22937	12	0.472		0.08"	0.650"	3.937"	2.953"	0.984"	0.040"	0.472"	B *	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"	B *	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.



SSWTCFKT : Shoulder single wheel fixed thru coolant knurling tool **Resulting Knurl Pattern** **Recommended Use:**

- Specifically designed for Swiss style screw machines
- Designed to knurl up to a shoulder and up against the guide bushing
- Precision square shank
- Single knurl wheel for general purpose
- Knurl wheel is mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.



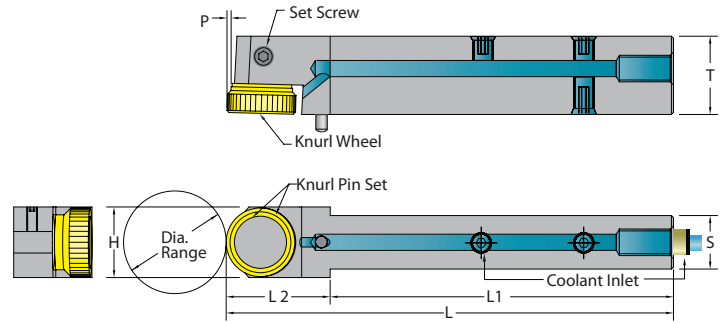
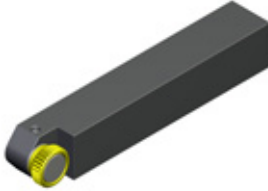
Straight pattern with straight wheel.



Male 60° diamond pattern with female wheel.



Best for straight pattern

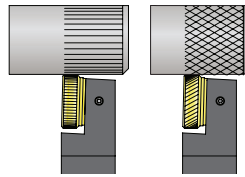


Description	UPC No. 733101-	S mm	S inch	Dia. Range	H	L	L1	Tool Stop L2	P	T	Knurl Wheel Style	Knurl Pin Set		Set Screw
												Desc.	UPC No. 733101-	
SSWTCFKT-10-2	22945	10	0.394	Unlimited	0.500"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-1S	29050	M3x.5
SSWTCFKT-12-2	22946	12	0.472	Unlimited	0.500"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

SDWTCFKT : Shoulder double wheel thru coolant fixed knurling tool **Resulting Knurl Pattern** **Recommended Use:**

- Specifically designed for Swiss style screw machines
- Designed to knurl up to a shoulder and up against the guide bushing
- Precision square shank
- Twin knurl wheels for straight or diamond pattern
- Knurl wheels are mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.



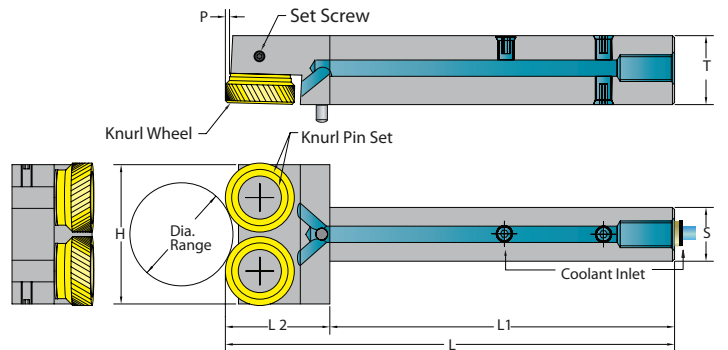
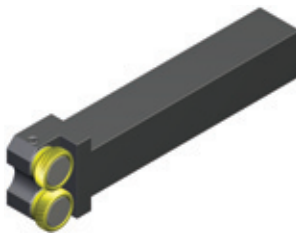
Straight pattern with straight wheel.



Male 60° diamond pattern with diagonal wheel.



Best for diamond pattern



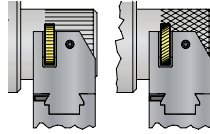
Description	UPC No. 733101-	S mm	S inch	Dia. Range	H	L	L1	Tool Stop L2	P	T	Knurl Wheel Style	Knurl Pin Set		Set Screw
												Desc.	UPC No. 733101-	
SDWTCFKT-10-2	22955	10	0.394	.250" & up 6.4mm & up	0.984"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-2S	29055	M3x.5
SDWTCFKT-12-2	22956	12	0.472		0.984"	3.937"	2.953"	0.984"	0.050"	0.562"	SW2	SW2.0P-2S	29055	M3x.5
SDWTCFKT-16-2	22957	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.



SMSCNC-7-D-OCL : Straddle CNC- Forming knurling tool with a symmetrical center line

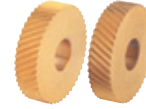
- Specifically designed for Swiss style screw machines
- Precision square shank
- Twin knurl wheels for straight or diamond pattern.
- Knurl wheels are mounted between thrust washers to ensure a smooth and even rotation of the knurl while knurling is performed.
- Forked style holding arms hold the wheel with maximum rigidity while knurling is performed during heavy knurling
- Straddle style application best for very small diameters where the opposing wheels offer more support on the part.



Straight pattern with straight wheel.

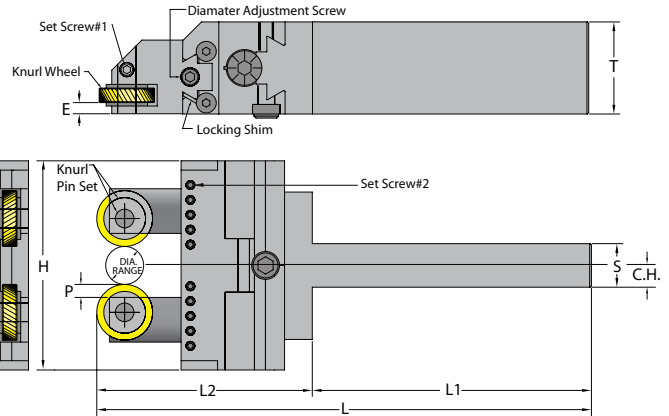
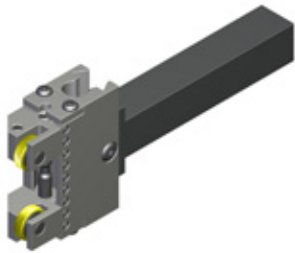


Male 60° diamond pattern with diagonal wheels.



Recommended Use:

Best for heavy duty knurling and/or when deflection of the material is a concern.



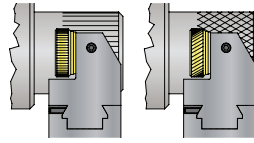
Description	UPC No. 733101-	C.H. & S mm	C.H. & S inch	Dia. Range	E	H	L	L1	Tool Stop L2	P	T	Knurl Wheel Style	Knurl Pin Set		Set Screw #1	Set Screw #2
													Desc.	UPC No. 733101-		
SMSCNC-10-7-D-OCL	20230	10	0.39	up to .500" up to 12mm	0.125"	2.062"	4.500"	2.500"	2.000"	0.098"	.750"	D *	KPS-18-50-C	28905	M4x.7	M3x.5
SMSCNC-12-7-D-OCL	20235	12	0.47		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-OCL	20240	16	0.63		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-OCL	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.



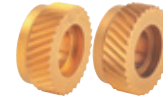
SMSCNC-7-2-OCL : Straddle CNC-Shoulder knurling tool with a symmetrical center line **Resulting Knurl Pattern** **Recommended Use:**

- Specifically designed for Swiss style screw machines
- Designed to knurl up to a shoulder and up against the guide bushing
- Precision square shank
- Twin knurl wheels for straight or diamond pattern
- Knurl wheels are mounted on a thrust washer to ensure a smooth and even rotation of the knurl while knurling is performed.
- Straddle style application best for very small diameters where the opposing wheels offer more support on the part.

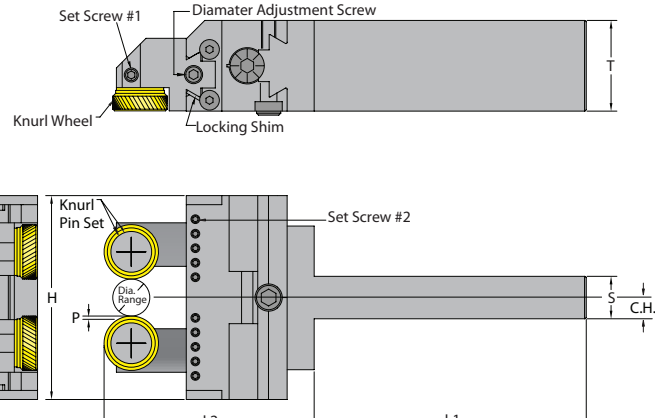
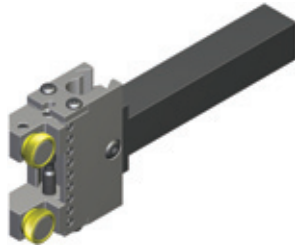


Straight pattern
with straight wheel.

Male 60° diamond pattern
with diagonal wheels.



Best for knurling up to a shoulder and/or when deflection of the material is a concern.



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



Knurling Wheel Styles

Straight Tooth	30° Diaognal Helix Angle		60° Diamond Angle	
	R.H.	L.H.	Male	Female



Resulting Knurl Pattern

Straight * Pattern	L.H. Knurl Pattern	R.H. Knurl Pattern	Female Diamond ** Knurl Pattern	Male Diamond ** Knurl Pattern
	Or Male Diamond Pattern When R.H. & L.H. are used in pairs*			

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

Circular Pitch Inch and Metric

Knurl Pattern	Course					Medium			Fine				
	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°	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	

Diametral Pitch

	DP	64	96	128	160
	Tooth Angle	80°	80°	80°	80°

- **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.

Knurling Wheel Identification

Knurl Pattern					TPI	Edge Prep	
S- Straight	DR- Diagonal Right	DL- Diagonal Left	M- Male Diamond	F- Female Diamond	TPI is the number of teeth per inch. Circular Pitch is the distance between tooth to tooth	Full Faced	Beveled

D - **DL** - **25** - **C** **B**

Dorian Tool	Knurl Wheel Series											Material
	A	B	C	D	M	O	P	R	S	SW2	SW4	
DIA.	.750	.3125	.500	.500	1.00	1.00	1.25	.750	.750	.500	1.00	
THK.	.375	.1562	.1875	.1562	.236	.375	.500	.197	.250	.250	.375	
HOLE	.250	.125	.1875	.1875	.3125	.3125	.500	.250	.250	.250	.500	

C - Cobalt (TiN Coated)
HS - High Speed (TiN Coated)



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.



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.



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

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

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.

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 11

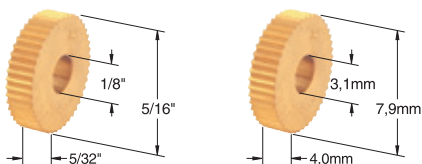
SFM Knurl Cutting

For speed and feed, See Page 11



B 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 Knurl Pitch		Included Tooth Angle	Knurl Pattern	B Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond		
Inch	Metric				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	
20 (TPI)	1,2mm	90°	Medium	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	
				Tracking Data	19T / .0168"	19T / .0168"	17T / .0188"	17T / .0188"	17T / .0188"	17T / .0188"	17T / .0188"	17T / .0188"	
				Full Faced	-	24148	-	-	-	-	-	-	
Beveled	-	24171		-	-	-	-	-	-				
25 (TPI)	1,0mm	90°		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	
				Tracking Data	25T / .0128"	25T / .0128"	21T / .0152"	21T / .0152"	21T / .0152"	21T / .0152"	21T / .0152"	21T / .0152"	
				Full Faced	24104	24150	-	-	-	-	-	-	
Beveled	24127	24173		-	-	-	-	-	-				
30 (TPI)	0,8mm	90°		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	
			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					
35 (TPI)	0,7mm	90°	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		
			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	-	-					
40 (TPI)	0,6mm	90°	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		
			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	-	-		
Beveled	24133	24179	24225	24271	24317	24363	-	-					
50 (TPI)	0,5mm	70°	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		
			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					
80 (TPI)	0,3mm	70°	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		
			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					
Diametral Pitch													
96	0,8mm	80°	Medium	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	
				Tracking Data	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	30T / .0104"	
				Full Faced	24116	24162	24208	24254	24300	24346	24392	24438	
Beveled	24139	24185		24231	24277	24323	24369	24415	24461				
128	0,6mm	80°		Fine	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
					Tracking Data	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"	40T / .0078"
					Full Faced	24118	24164	24210	24256	24302	24348	24394	24440
Beveled	24141	24187			24233	24279	24325	24371	24417	24463			
160	0,5mm	80°			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
			Tracking Data		50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	50T / .0063"	
			Full Faced		24120	24166	24212	24258	24304	24350	24396	24442	
Beveled	24143	24189	24235		24281	24327	24373	24419	24465				



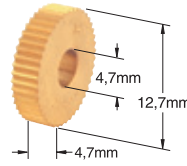
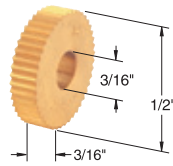
C Series

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.



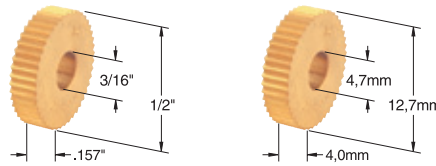
Knurl wheels are TIN coated to reduce the co-efficient of friction when knurling, increasing the quality and the force of knurling as well as the life of the knurl wheels.

Circular Knurl Pitch		Included Tooth Angle	Knurl Pattern	C Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond	
Inch	Metric				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
16 (TPI)	1,6mm	90°	Course	Description	CS-16-HS	CS-16-C	CDR-16-HS	CDR-16-C	CDL-16-HS	CDL-16-C	CM-16-HS	CF-16-HS
				Tracking Data	25T / .0204"	25T / .0204"	22T / .0232"	22T / .0232"	22T / .0232"	22T / .0232"	22T / .0232"	22T / .0232"
				Full Faced	24502	24556	24610	24664	24718	24772	-	-
				Beveled	24529	24583	24637	24691	24745	24799	-	-
20 (TPI)	1,2mm	90°	Medium	Description	CS-20-HS	CS-20-C	CDR-20-HS	CDR-20-C	CDL-20-HS	CDL-20-C	CM-20-HS	CF-20-HS
				Tracking Data	31T / .0164"	31T / .0164"	27T / .0188"	27T / .0188"	27T / .0188"	27T / .0188"	27T / .0188"	27T / .0188"
				Full Faced	24504	24558	24612	24666	24720	24774	24828	24882
				Beveled	24531	24585	24639	24693	24747	24801	24855	24909
25 (TPI)	1,0mm	90°	Medium	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
				Tracking Data	38T / .0133"	38T / .0133"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"
				Full Faced	24506	24560	24614	24668	24722	24776	24830	24884
				Beveled	24533	24587	24641	24695	24749	24803	24857	24911
30 (TPI)	0,8mm	90°	Medium	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"
				Full Faced	24508	24562	24616	24670	24724	24778	24832	24886
				Beveled	24535	24589	24643	24697	24751	24805	24859	24913
35 (TPI)	0,7mm	90°	Medium	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"
				Full Faced	24510	24564	24618	24672	24726	24780	-	-
				Beveled	24537	24591	24645	24699	24753	24807	-	-
40 (TPI)	0,6mm	90°	Fine	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"
				Full Faced	24512	24566	24620	24674	24728	24782	24836	24890
				Beveled	24539	24593	24647	24701	24755	24809	24863	24917
50 (TPI)	0,5mm	70°	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
				Tracking Data	79T / .0064"	79T / .0064"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"	68T / .0074"
				Full Faced	24514	24568	24622	24676	24730	24784	24838	24892
				Beveled	24541	24595	24649	24703	24757	24811	24865	24919
80 (TPI)	0,3mm	70°	Fine	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
				Tracking Data	125T / .0040"	125T / .0040"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"
				Full Faced	24516	24570	24624	24678	24732	24786	-	24894
				Beveled	24543	24597	24651	24705	24759	24813	-	24921
Diametral Pitch												
64	1,2mm	80°	Medium	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
				Tracking Data	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"	32T / .0156"
				Full Faced	24518	24572	24626	24680	24734	24788	24842	24896
				Beveled	24545	24599	24653	24707	24761	24815	24869	24923
96	0,8mm	80°	Medium	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
				Tracking Data	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"	48T / .0104"
				Full Faced	24520	24574	24628	24682	24736	24790	24844	24898
				Beveled	24547	24601	24655	24709	24763	24817	24871	24925
128	0,6mm	80°	Fine	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
				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
				Beveled	24549	24603	24657	24711	24765	24819	24873	24927
160	0,5mm	80°	Fine	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
				Tracking Data	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"	80T / .0063"
				Full Faced	24524	24578	24632	24686	24740	24794	24848	24902
				Beveled	24551	24605	24659	24713	24767	24821	24875	24929



D 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.



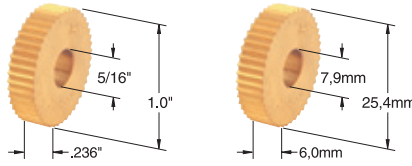
Knurl wheels are TIN coated to reduce the co-efficient of friction when knurling, increasing the quality and the force of knurling as well as the life of the knurl wheels.

Circular Knurl Pitch		Included Tooth Angle	Knurl Pattern	D Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond	
Inch	Metric				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	DS-16-HS	DS-16-C	DDR-16-HS	DDR-16-C	DDL-16-HS	DDL-16-C	DF-16-HS	DF-16-C
				Tracking Data	25T / .0204"	25T / .0204"	22T / .0232"	22T / .0232"	22T / .0232"	22T / .0232"	22T / .0232"	22T / .0232"
				Full Faced	25001	25002	25055	25056	25109	25110	-	-
				Beveled	25028	25029	25082	25083	25136	25137	-	-
20 (TPI)	1,2mm	90°	Medium	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
				Tracking Data	31T / .0164"	31T / .0164"	27T / .0188"	27T / .0188"	27T / .0188"	27T / .0188"	27T / .0188"	27T / .0188"
				Full Faced	25003	25004	25057	25058	25111	25112	25165	-
				Beveled	25030	25031	25084	25085	25138	25139	25192	-
25 (TPI)	1,0mm	90°	Medium	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
				Tracking Data	38T / .0133"	38T / .0133"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"	34T / .0149"
				Full Faced	25005	25006	25059	25060	25113	25114	25167	25168
				Beveled	25032	25033	25086	25087	25140	25141	25194	25195
30 (TPI)	0,8mm	90°	Medium	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
				Tracking Data	47T / .0107"	47T / .0107"	40T / .0126"	40T / .0126"	40T / .0126"	40T / .0126"	40T / .0126"	40T / .0126"
				Full Faced	25007	25008	25061	25062	25115	25116	25169	25170
				Beveled	25034	25035	25088	25089	25142	25143	25196	25197
35 (TPI)	0,7mm	90°	Medium	Description	DS-35-HS	DS-35-C	DDR-35-HS	DDR-35-C	DDL-35-HS	DDL-35-C	DF-35-HS	DF-35-C
				Tracking Data	55T / .0092"	55T / .0092"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"	47T / .0107"
				Full Faced	25009	25010	25063	25064	25117	25118	-	-
				Beveled	25036	25037	25090	25091	25144	25145	-	-
40 (TPI)	0,6mm	90°	Medium	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
				Tracking Data	63T / .0080"	63T / .0080"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"	55T / .0092"
				Full Faced	25011	25012	25065	25066	25119	25120	25173	25174
				Beveled	25038	25039	25092	25093	25146	25147	25200	25201
50 (TPI)	0,5mm	70°	Medium	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
				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
80 (TPI)	0,3mm	70°	Medium	Description	DS-80-HS	DS-80-C	DDR-80-HS	DDR-80-C	DDL-80-HS	DDL-80-C	DF-80-HS	DF-80-C
				Tracking Data	125T / .0040"	125T / .0040"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"	107T / .0047"
				Full Faced	25015	25016	25069	25070	25123	25124	25177	25178
				Beveled	25042	25043	25096	25097	25150	25151	25204	25205
Diametral Pitch												
64	1,2mm	80°	Medium	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"
				Full Faced	25017	25018	25071	25072	25125	25126	25179	-
				Beveled	25044	25045	25098	25099	25152	25153	-	-
96	0,8mm	80°	Medium	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
				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	-	-
128	0,6mm	80°	Medium	Description	DS-128-HS	DS-128-C	DDR-128-HS	DDR-128-C	DDL-128-HS	DDL-128-C	DF-128-HS	DF-128-C
				Tracking Data	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"	64T / .0078"
				Full Faced	25021	25022	25075	25076	25129	25130	25183	-
				Beveled	25048	25049	25102	25103	25156	25157	-	-
160	0,5mm	80°	Medium	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"
				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.



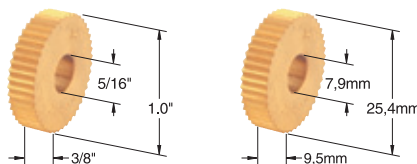
Knurl wheels are TiN coated to reduce the co-efficient of friction when knurling, increasing the quality and the force of knurling as well as the life of the knurl wheels.

Circular Knurl Pitch		Included Tooth Angle	Knurl Pattern	M Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond	
Inch	Metric				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°	Course	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
				Tracking Data	31T / .0326"	31T / .0326"	26T / .0389"	26T / .0389"	26T / .0389"	26T / .0389"	26T / .0389"	26T / .0389"
				Full Faced	25303	25304	25369	-	25435	-	-	-
Beveled	25336	25337		25402	-	25468	-	-	-			
12 (TPI)	2,0mm	90°		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"	33T / .0306"	33T / .0306"	33T / .0306"	33T / .0306"	33T / .0306"
				Full Faced	25305	25306	25371	25372	25437	25438	-	-
Beveled	25338	25339		25404	25405	25470	25471	-	-			
14 (TPI)	1,8mm	90°		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
				Tracking Data	44T / .0230"	44T / .0230"	46T / .0220"	46T / .0220"	46T / .0220"	46T / .0220"	46T / .0220"	46T / .0220"
				Full Faced	25307	25308	25373	25374	25439	25440	-	-
Beveled	25340	25341		25406	25407	25472	25473	-	-			
16 (TPI)	1,6mm	90°	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	
			Tracking Data	50T / .0202"	50T / .0202"	45T / .0224"	45T / .0224"	45T / .0224"	45T / .0224"	45T / .0224"	45T / .0224"	
			Full Faced	25309	25310	25375	25376	25441	25442	-	-	
Beveled	25342	25343	25408	25409	25474	25475	-	-				
20 (TPI)	1,2mm	90°	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	
			Tracking Data	61T / .0165"	61T / .0165"	54T / .0187"	54T / .0187"	54T / .0187"	54T / .0187"	54T / .0187"	54T / .0187"	
			Full Faced	25311	25312	25377	25378	25443	25444	25509	25510	
Beveled	25344	25345	25410	25411	25476	25477	25542	25543				
25 (TPI)	1,0mm	90°	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	
			Tracking Data	78T / .0129"	78T / .0129"	68T / .0148"	68T / .0148"	68T / .0148"	68T / .0148"	68T / .0148"	68T / .0148"	
			Full Faced	25313	25314	25379	25380	25445	25446	25511	-	
Beveled	25346	25347	25412	25413	25478	25479	25544	-				
30 (TPI)	0,8mm	90°	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	
			Tracking Data	95T / .0106"	95T / .0106"	81T / .0124"	81T / .0124"	81T / .0124"	81T / .0124"	81T / .0124"	81T / .0124"	
			Full Faced	25315	25316	25381	25382	25447	25448	25513	25514	
Beveled	25348	25349	25414	25415	25480	25481	25546	25547				
35 (TPI)	0,7mm	90°	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	
			Tracking Data	110T / .0091"	110T / .0091"	95T / .0106"	95T / .0106"	95T / .0106"	95T / .0106"	95T / .0106"	95T / .0106"	
			Full Faced	25317	25318	-	-	-	-	-	-	
Beveled	25350	25351	-	-	-	-	-	-				
40 (TPI)	0,6mm	90°	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	
			Tracking Data	124T / .0081"	124T / .0081"	108T / .0093"	108T / .0093"	108T / .0093"	108T / .0093"	108T / .0093"	108T / .0093"	
			Full Faced	25319	-	-	-	-	-	-	-	
Beveled	25352	-	-	-	-	-	-	-				
50 (TPI)	0,5mm	70°	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	
			Tracking Data	158T / .0063"	158T / .0063"	135T / .0074"	135T / .0074"	135T / .0074"	135T / .0074"	135T / .0074"	135T / .0074"	
			Full Faced	25321	25322	-	-	-	-	-	-	
Beveled	25354	25355	-	-	-	-	-	-				
Diametral Pitch												
64	1,2mm	80°	Medium	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"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"
				Full Faced	25323	25324	-	-	-	-	-	-
Beveled	25356	25357		-	-	-	-	-	-			
96	0,8mm	80°		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"
				Full Faced	25325	25326	25391	25392	25457	25458	25523	-
Beveled	25358	25359		25424	25425	25490	25491	25556	-			
128	0,6mm	80°		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"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"
				Full Faced	25327	25328	-	-	-	-	-	-
Beveled	25360	25361		-	-	-	-	-	-			



O 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 Knurl Pitch		Included Tooth Angle	Knurl Pattern	O Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond	
Inch	Metric				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
10 (TPI)	2,5mm	90°	Course	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
				Tracking Data	31T / .0326"	31T / .0326"	26T / .0389"	26T / .0389"	26T / .0389"	26T / .0389"	26T / .0389"	26T / .0389"
				Full Faced	25604	25670	25736	-	25868	-	-	-
Beveled	25637	25703		25769	-	25901	-	-	-			
12 (TPI)	2,0mm	90°		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
				Tracking Data	37T / .0273"	37T / .0273"	33T / .0306"	33T / .0306"	33T / .0306"	33T / .0306"	33T / .0306"	33T / .0306"
				Full Faced	25606	25672	25738	25804	25870	25936	-	-
Beveled	25639	25705		25771	25837	25903	25969	-	-			
14 (TPI)	1,8mm	90°		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
				Tracking Data	44T / .0230"	44T / .0230"	46T / .0220"	46T / .0220"	46T / .0220"	46T / .0220"	46T / .0220"	46T / .0220"
				Full Faced	25608	25674	25740	25806	25872	25938	-	-
Beveled	25641	25707		25773	25839	25905	25971	-	-			
16 (TPI)	1,6mm	90°	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	
			Tracking Data	50T / .0202"	50T / .0202"	45T / .0224"	45T / .0224"	45T / .0224"	45T / .0224"	45T / .0224"	45T / .0224"	
			Full Faced	25610	25676	25742	25808	25874	25940	-	-	
Beveled	25643	25709	25775	25841	25907	25973	-	-				
20 (TPI)	1,2mm	90°	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	
			Tracking Data	61T / .0165"	61T / .0165"	54T / .0187"	54T / .0187"	54T / .0187"	54T / .0187"	54T / .0187"	54T / .0187"	
			Full Faced	25612	25678	25744	25810	25876	25942	26008	26074	
Beveled	25645	25711	25777	25843	25909	25975	26041	26107				
25 (TPI)	1,0mm	90°	Description	OS-25-HS	OS-25-C	ODR-25-HS	ODR-25-C	ODL-25-HS	ODL-25-C	OM-25-HS	OF-25-HS	
			Tracking Data	78T / .0129"	78T / .0129"	68T / .0148"	68T / .0148"	68T / .0148"	68T / .0148"	68T / .0148"	68T / .0148"	
			Full Faced	25614	25680	25746	25812	25878	25944	26010	26076	
Beveled	25647	25713	25779	25845	25911	25977	26043	26109				
30 (TPI)	0,8mm	90°	Description	OS-30-HS	OS-30-C	ODR-30-HS	ODR-30-C	ODL-30-HS	ODL-30-C	OM-30-HS	OF-30-HS	
			Tracking Data	95T / .0106"	95T / .0106"	81T / .0124"	81T / .0124"	81T / .0124"	81T / .0124"	81T / .0124"	81T / .0124"	
			Full Faced	25616	25682	25748	25814	25880	25946	26012	26078	
Beveled	25649	25715	25781	25847	25913	25979	26045	26111				
35 (TPI)	0,7mm	90°	Description	OS-35-HS	OS-35-C	ODR-35-HS	ODR-35-C	ODL-35-HS	ODL-35-C	OM-35-HS	OF-35-HS	
			Tracking Data	110T / .0091"	110T / .0091"	95T / .0106"	95T / .0106"	95T / .0106"	95T / .0106"	95T / .0106"	95T / .0106"	
			Full Faced	25618	25684	-	-	-	-	-	-	
Beveled	25651	25717	-	-	-	-	-	-				
40 (TPI)	0,6mm	90°	Description	OS-40-HS	OS-40-C	ODR-40-HS	ODR-40-C	ODL-40-HS	ODL-40-C	OM-40-HS	OF-40-HS	
			Tracking Data	124T / .0081"	124T / .0081"	108T / .0093"	108T / .0093"	108T / .0093"	108T / .0093"	108T / .0093"	108T / .0093"	
			Full Faced	25620	-	-	-	-	-	-	-	
Beveled	25653	-	-	-	-	-	-	-				
50 (TPI)	0,5mm	70°	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"	135T / .0074"	135T / .0074"	135T / .0074"	135T / .0074"	135T / .0074"	
			Full Faced	25622	25688	-	-	-	-	-	-	
Beveled	25655	25721	-	-	-	-	-	-				
Diametral Pitch												
64	1,2mm	80°	Medium	Description	OS-64-HS	OS-64-C	ODR-64-HS	ODR-64-C	ODL-64-HS	ODL-64-C	OM-64-HS	OF-64-HS
				Tracking Data	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"	64T / .0156"
				Full Faced	25624	25690	-	-	-	-	-	-
Beveled	25657	25723		-	-	-	-	-	-			
96	0,8mm	80°		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"	96T / .0104"	96T / .0104"	96T / .0104"	96T / .0104"	96T / .0104"	96T / .0104"	96T / .0104"
				Full Faced	25626	25692	25758	25824	25890	25956	26022	26088
Beveled	25659	25725		25791	25857	25923	25989	26055	26121			
128	0,6mm	80°		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
				Tracking Data	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"	128T / .0078"
				Full Faced	25628	25694	-	-	-	-	-	-
Beveled	25661	25727		-	-	-	-	-	-			



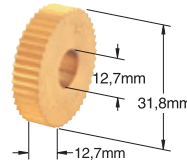
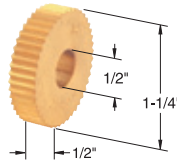
P Series

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.



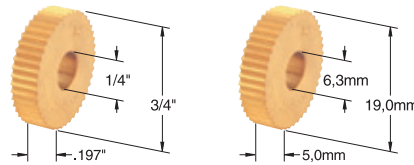
Knurl wheels are TIN coated to reduce the co-efficient of friction when knurling, increasing the quality and the force of knurling as well as the life of the knurl wheels.

Circular Knurl Pitch		Included Tooth Angle	Knurl Pattern	P Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond	
Inch	Metric				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
10 (TPI)	2,5mm	90°	Course	Description	PS-10-HS	PS-10-C	PDR-10-HS	PDR-10-C	PDL-10-HS	PDL-10-C	PM-10-HS	PF-10-HS
				Tracking Data	39T / .0323"	39T / .0323"	34T / .0371"	34T / .0371"	34T / .0371"	34T / .0371"	34T / .0371"	34T / .0371"
				Full Faced	26198	-	-	-	-	-	-	-
Beveled	26215	-		-	-	-	-	-	-			
12 (TPI)	2,0mm	90°		Description	PS-12-HS	PS-12-C	PDR-12-HS	PDR-12-C	PDL-12-HS	PDL-12-C	PM-12-HS	PF-12-HS
				Tracking Data	47T / .0268"	47T / .0268"	41T / .0307"	41T / .0307"	41T / .0307"	41T / .0307"	41T / .0307"	41T / .0307"
				Full Faced	26200	26234	26268	26302	26336	26370	26404	-
Beveled	26217	26251		26285	26319	26353	26387	26421	-			
14 (TPI)	1,8mm	90°		Description	PS-14-HS	PS-14-C	PDR-14-HS	PDR-14-C	PDL-14-HS	PDL-14-C	PM-14-HS	PF-14-HS
				Tracking Data	55T / .0229"	55T / .0229"	55T / .0229"	55T / .0229"	55T / .0229"	55T / .0229"	55T / .0229"	55T / .0229"
				Full Faced	26202	26236	26270	26304	26338	26372	-	-
Beveled	26219	26253		26287	26321	26355	26389	-	-			
16 (TPI)	1,6mm	90°	Description	PS-16-HS	PS-16-C	PDR-16-HS	PDR-16-C	PDL-16-HS	PDL-16-C	PM-16-HS	PF-16-HS	
			Tracking Data	63T / .0200"	63T / .0200"	53T / .0238"	53T / .0238"	53T / .0238"	53T / .0238"	53T / .0238"	53T / .0238"	
			Full Faced	26204	26238	26272	26306	26340	26374	26408	26442	
Beveled	26221	26255	26289	26323	26357	26391	26425	26459				
20 (TPI)	1,2mm	90°	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	
			Tracking Data	79T / .0159"	79T / .0159"	68T / .0185"	68T / .0185"	68T / .0185"	68T / .0185"	68T / .0185"	68T / .0185"	
			Full Faced	26206	26240	26274	26308	26342	26376	26410	26444	
Beveled	26223	26257	26291	26325	26359	26393	26427	26461				
25 (TPI)	1,0mm	90°	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	
			Tracking Data	97T / .0130"	97T / .0130"	85T / .0148"	85T / .0148"	85T / .0148"	85T / .0148"	85T / .0148"	85T / .0148"	
			Full Faced	26208	26242	26276	26310	26344	26378	26412	26446	
Beveled	26225	26259	26293	26327	26361	26395	26429	26463				
30 (TPI)	0,8mm	90°	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	
			Tracking Data	117T / .0107"	117T / .0107"	103T / .0122"	103T / .0122"	103T / .0122"	103T / .0122"	103T / .0122"	103T / .0122"	
			Full Faced	26210	26244	26278	26312	26346	26380	26414	26448	
Beveled	26227	26261	26295	26329	26363	26397	26431	26265				
Diametral Pitch												
64	1,2mm	80°	Medium	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
				Tracking Data	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"	81T / .0156"
				Full Faced	26212	26246	26280	-	26348	-	-	-
Beveled	26229	26263		26297	-	26365	-	-	-			
96	0,8mm	80°		Description	PS-96-HS	PS-96-C	PDR-96-HS	PDR-96-C	PDL-96-HS	PDL-96-C	PM-96-HS	PF-96-HS
				Tracking Data	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"	121T / .0104"
			Full Faced	26214	26248	26282	26316	26350	26384	26418	26452	
Beveled	26231	26265	26299	26333	26367	26401	26435	26469				



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



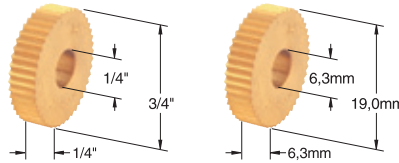
S Series

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.



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 Knurl Pitch		Included Tooth Angle	Knurl Pattern	S Series Knurl Wheel	Straight		Diagonal Right		Diagonal Left		Diamond	
Inch	Metric				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
10 (TPI)	2,5mm	90°	Course	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
				Tracking Data	23T / .0330"	23T / .0330"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"	20T / .0380"
				Full Faced	26802	26862	26924	26986	27048	27110	-	-
Beveled	26833	26893		26955	27017	27079	27141	-	-			
12 (TPI)	2,0mm	90°		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"
				Full Faced	26804	26864	26926	26988	27050	27112	-	-
Beveled	26835	26895		26957	27019	27081	27143	-	-			
14 (TPI)	1,8mm	90°		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"
				Full Faced	26806	26866	26928	26990	27052	27114	-	-
Beveled	26837	26897		26959	27021	27083	27145	-	-			
16 (TPI)	1,6mm	90°	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"	
			Full Faced	26808	26868	26930	26992	27054	27116	27178	27240	
Beveled	26839	26899	26961	27023	27085	27147	27209	27271				
20 (TPI)	1,2mm	90°	Description	SS-20-HS	SS-20-C	SDR-20-HS	SDR-20-C	SDL-20-HS	SDL-20-C	SM-20-HS	SF-20-HS	
			Tracking Data	47T / .0161"	47T / .0161"	41T / .0185"	41T / .0185"	41T / .0185"	41T / .0185"	41T / .0185"	41T / .0185"	
			Full Faced	26810	26870	26932	26994	27056	27118	27180	27242	
Beveled	26841	26901	26963	27025	27087	27149	27211	27273				
25 (TPI)	1,0mm	90°	Description	SS-25-HS	SS-25-C	SDR-25-HS	SDR-25-C	SDL-25-HS	SDL-25-C	SM-25-HS	SF-25-HS	
			Tracking Data	59T / .0128"	59T / .0128"	51T / .0148"	51T / .0148"	51T / .0148"	51T / .0148"	51T / .0148"	51T / .0148"	
			Full Faced	26812	26872	26934	26996	27058	27120	27182	27244	
Beveled	26843	26903	26965	27027	27089	27151	27213	27275				
30 (TPI)	0,8mm	90°	Description	SS-30-HS	SS-30-C	SDR-30-HS	SDR-30-C	SDL-30-HS	SDL-30-C	SM-30-HS	SF-30-HS	
			Tracking Data	71T / .0106"	71T / .0106"	61T / .0124"	61T / .0124"	61T / .0124"	61T / .0124"	61T / .0124"	61T / .0124"	
			Full Faced	26814	26874	26936	26998	27060	27122	27184	27246	
Beveled	26845	26905	26967	27029	27091	27153	27215	27277				
35 (TPI)	0,7mm	90°	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	
			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	-	-				
40 (TPI)	0,6mm	90°	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	
			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				
50 (TPI)	0,5mm	70°	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	
			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				
Diametral Pitch												
64	1,2mm	80°	Medium	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
				Tracking Data	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156	48T / .0156
				Full Faced	26822	26882	26944	27006	27068	27130	-	27254
Beveled	26853	26913		26975	27037	27099	27161	-	27285			
96	0,8mm	80°		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
				Tracking Data	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"	72T / .0104"
				Full Faced	26824	26884	26946	27008	27070	27132	27194	27256
Beveled	26855	26915		26977	27039	27101	27163	27225	27287			
128	0,6mm	80°		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"
				Full Faced	26826	26886	26948	27010	27072	27134	-	27258
Beveled	26857	26917		26979	27041	27103	27165	-	27289			
160	0,5mm	80°	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"	
			Full Faced	26828	26888	26950	27012	27074	27136	-	27260	
Beveled	26859	26919	26981	27043	27105	27167	-	27291				



SW2 Series

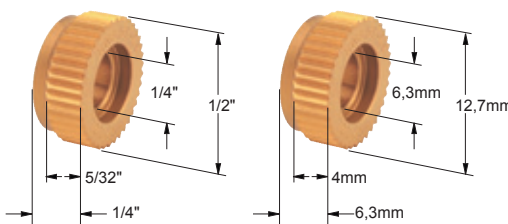
For knurl cutting, use full faced knurl wheels only.

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.

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



SW4 Series

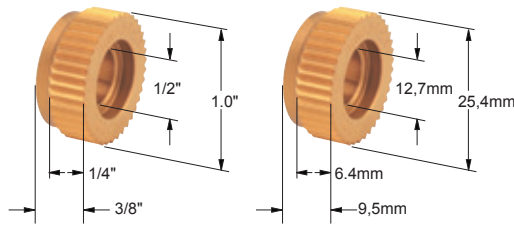
For knurl cutting, use full faced knurl wheels only.

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.

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



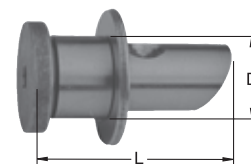
CNC Modular Knurling Tool Adjustment Screw

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



PSW Series Knurling Pin Set

High Speed		D	L
Description	Part No. 733101-		
PSW-2.0S	29005	1/4	5/8
PSW-4.0S	29015	1/2	1-1/8



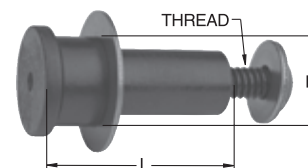
CNC Modular Knurling Tool Lock Screw

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



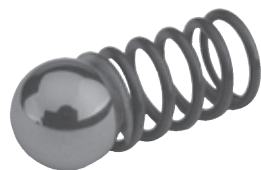
SKPS Series Knurling Pin Set

High Speed		D	L	Screw Length
Description	Part No. 733101-			
SKPS-50-2	29020	1/4	5/8	1/4
SKPS-50-3	29025	1/4	5/8	3/8
SKPS-50-4	29030	1/4	5/8	1/2
SKPS-75-4	29035	3/8	1.0	1/2
SKPS-75-6	29040	3/8	1.0	3/4
SKPS-100-6	29045	1/2	1-1/8	3/4



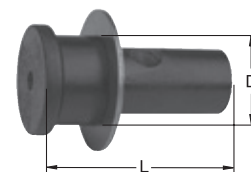
Spring & Ball Plunger For Self-Centering Knurl Tools

Description	Part No. 733101-	Reference Knurling Tool
STBL-18	28525	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



SW Series Knurling Pin Set

High Speed		D	L
Description	Part No. 733101-		
SW2.0P-1S	29050	1/4	1/2
SW2.0P-2S	29055		
SW2.0P-3S	29060		
SW4.0P-1S	29080	1/2	1-1/8
SW4.0P-2S	29085		
SW4.0P-3S	29090		



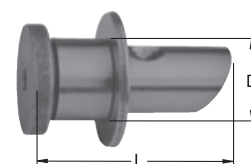
KPS Series Knurling Pin Set

High Speed		Carbide		D	L
Description	Part No. 733101-	Description	Part No. 733101-		
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



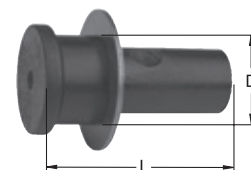
PSW Series Knurling Pin Set Cobalt

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



SW Series Knurling Pin Set Cobalt

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





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 = 43,560 sq. feet
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 = 35.31 cu. feet
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 = 1,000,000,000 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

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 = 8,766 hours
1 year = 525,960 minutes
1 year = 31,557,600 seconds



From Inch to Metric Formula				
	Inch Value		Metric Value	
	1.000	x 25.4	=	25.400
	1.000	÷ 0.03937	=	25.400
From Inch to Metric Values				
	Inch		Millimeter	
	0.00001	x 25.4	=	0.000254
	0.0001	x 25.4	=	0.00254
	0.001	x 25.4	=	0.0254
	0.01	x 25.4	=	0.254
	0.1	x 25.4	=	2.54
	1.00	x 25.4	=	25.40
	1.125	x 25.4	=	28.58
	1.250	x 25.4	=	31.75
	1.375	x 25.4	=	34.93
	1.500	x 25.4	=	38.10
	1.625	x 25.4	=	41.28
	1.750	x 25.4	=	44.45
	1.875	x 25.4	=	47.63
	2.00	x 25.4	=	50.80
	3.00	x 25.4	=	76.20
	4.00	x 25.4	=	101.60
	5.00	x 25.4	=	127.00
	6.00	x 25.4	=	152.40
	7.00	x 25.4	=	177.80
	8.00	x 25.4	=	203.20
	9.00	x 25.4	=	228.60
	10.00	x 25.4	=	254.00
	11.00	x 25.4	=	279.40
	12.00	x 25.4	=	304.80
	13.00	x 25.4	=	330.20
	14.00	x 25.4	=	355.60
	15.00	x 25.4	=	381.00
	16.00	x 25.4	=	406.40
	17.00	x 25.4	=	431.80
	18.00	x 25.4	=	457.20
	19.00	x 25.4	=	482.60
	20.00	x 25.4	=	508.00
	21.00	x 25.4	=	533.40
	22.00	x 25.4	=	558.80
	23.00	x 25.4	=	584.20
	24.00	x 25.4	=	609.60
	25.00	x 25.4	=	635.00
1-Foot	12.00	x 25.4	=	304.80
1-Yard	36.00	x 25.4	=	914.40

From Metric to Inch Formula				
	Metric Value		Inch Value	
	1.000	÷ 25.4	=	0.03937
	1.000	x 0.03937	=	0.03937
From Metric to Inch Values				
	Millimeter		Inch	
	0.00001	÷ 25.4	=	0.00000039
	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	=	0.0394
	1.1	÷ 25.4	=	0.0433
	1.2	÷ 25.4	=	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

Metric Description	UPC 733101-	Inch Description	UPC 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-32-1-2	20425	CNC-125-1-2	20430	19
CNC-20-2-R	20505	CNC-75-2-R	20510	19
CNC-25-2-R	20515	CNC-100-2-R	20520	19
CNC-32-2-R	20525	CNC-125-2-R	20530	19
CNC-20-3-M	20605	CNC-75-3-M	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-O	20710	19
CNC-25-5-O	20715	CNC-100-5-O	20720	19
CNC-32-5-O	20725	CNC-125-5-O	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	20795	CNC-125-6-4	20800	19
CNC-20-7-R	20905	CNC-75-7-R	20910	19
CNC-25-7-R	20915	CNC-100-7-R	20920	19
CNC-32-7-R	20925	CNC-125-7-R	20930	19

CNC Modular Knurling Tool Shank

CNC-20	21005	CNC-75	21010	20
CNC-25	21015	CNC-100	21020	20
CNC-32	21025	CNC-125	21030	20

CNC Modular Knurling Heads

CNCKH-1-2	21035	20
CNCKH-2-R	21040	20
CNCKH-3-M	21045	20
CNCKH-4-M	28947	20
CNCKH-5-O	21050	20
CNCKH-6-4	21056	20
CNCKH-7-R	21060	20

Small Modular Knurling Tools

SCNC-10-1-2	20005	SCNC-37-1-2	20010	23
SCNC-12-1-2	20015	SCNC-50-1-2	20020	23
SCNC-162-1-2	20025	SCNC-162-1-2	20025	23
SCNC-10-6-2	20105	SCNC-37-6-2	20110	23
SCNC-12-6-2	20115	SCNC-50-6-2	20120	23
SCNC-162-6-2	20125	SCNC-162-6-2	20125	23
SCNC-10-7-D	20205	SCNC-37-7-D	20210	23
SCNC-12-7-D	20215	SCNC-50-7-D	20220	23
SCNC-162-7-D	20225	SCNC-162-7-D	20225	23

Small CNC Modular Knurling Tool Shank

SCNC-10	20305	SCNC-37	20310	22
SCNC-12	20315	SCNC-50	20320	22
SCNC-162	20325	SCNC-162	20325	22

Small CNC Modular Knurling Heads

SCNCKH-1-2	20335	23
SCNCKH-6-2	20340	23
SCNCKH-7-D	20345	23

Straight Cutting Knurling Tools

Metric Description	UPC 733101-	Inch Description	UPC 733101-	Page		
107ST-12-R-RH/LH	21105	21205	107ST-50-R-RH/LH	21110	21210	24
107ST-162-R-RH/LH	21115	21215	107ST-162-R-RH/LH	21115	21215	24
107ST-20-M-RH/LH	21125	21225	107ST-75-M-RH/LH	21130	21230	24
107ST-25-M-RH/LH	21135	21235	107ST-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/LH	21136	21236	107ST-100-4-RH/LH	21141	21241	24
107ST-32-4-RH/LH	21146	21246	107ST-125-4-RH/LH	21151	21251	24

Revolving Knurling Tools

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

Face Knurling Tools

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

Single Wheel Fixed Knurling Tools

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
SWFKT-20-M	21735	SWFKT-75-M	21740	26
SWFKT-25-O	21745	SWFKT-100-O	21750	26
SWFKT-32-O	21755	SWFKT-125-O	21760	26
HDSWFKT-20-O	21805	HDSWFKT-75-O	21810	26
HDSWFKT-25-P	21815	HDSWFKT-100-P	21820	26
HDSWFKT-32-P	21825	HDSWFKT-125-P	21830	26

Single Shoulder Wheel Knurling Tools

SSWFKT-10-2	21775	SSWFKT-38-2	21777	26
SSWFKT-12-2	21779	SSWFKT-50-2	21781	26
SSWFKT-162-2	21783	SSWFKT-162-2	21783	26
SSWFKT-20-4	21787	SSWFKT-75-4	21789	26
SSWFKT-25-4	21791	SSWFKT-100-4	21793	26
SSWFKT-32-4	21795	SSWFKT-125-4	21797	26

Double Wheel Fixed Knurling Tools

FKT-10-D	21905	FKT-38-D	21910	27
FKT-12-D	21915	FKT-50-D	21920	27
FKT-162-D	21955	FKT-162-D	21955	27
FKT-20-M	21925	FKT-75-M	21930	27
FKT-25-M	21935	FKT-100-M	21940	27
FKT-32-O	21945	FKT-125-O	21950	27
HDFKT-20-O	22305	HDFKT-75-O	22310	27
HDFKT-25-O	22315	HDFKT-100-O	22320	27
HDFKT-25-P	22325	HDFKT-100-P	22330	27

Double Wheel Shoulder Fixed Knurling Tools

SFKT-10-2	22005	SFKT-38-2	22010	27
SFKT-12-2	22015	SFKT-50-2	22020	27
SFKT-162-2	22055	SFKT-162-2	22055	27
SFKT-20-4	22025	SFKT-75-4	22030	27
SFKT-25-4	22035	SFKT-100-4	22040	27
SFKT-32-4	22045	SFKT-125-4	22050	27

Self Centering Knurling Tools

SCKN-10-DW-D	22161	SCKN-38-DW-D	22151	28
SCKN-12-DW-D	22106	SCKN-50-DW-D	22111	28
SCKN-162-DW-D	22115	SCKN-162-DW-D	22115	28
SCKN-20-DW-M	22116	SCKN-75-DW-M	22121	28
SCKN-25-DW-M	22126	SCKN-100-DW-M	22131	28
SCKN-32-DW-M	22136	SCKN-125-DW-M	22141	28
HDSCK-20-DW-O	22405	HDSCK-75-DW-O	22410	28
HDSCK-25-DW-O	22415	HDSCK-100-DW-O	22420	28
HDSCK-25-DW-P	22425	HDSCK-100-DW-P	22430	28
HDSCK-32-DW-P	22435	HDSCK-125-DW-P	22440	28

Shoulder Self Centering Knurling Tools

SSCK-10-DW-2	22205	SSCK-38-DW-2	22210	28
SSCK-12-DW-2	22215	SSCK-50-DW-2	22220	28
SSCK-162-DW-2	22218	SSCK-162-DW-2	22218	28
SSCK-20-DW-4	22235	SSCK-75-DW-4	22240	28
SSCK-25-DW-4	22245	SSCK-100-DW-4	22250	28
SSCK-32-DW-4	22255	SSCK-125-DW-4	22260	28

True Internal Knurling Tools

Metric Description	UPC 733101-	Inch Description	UPC 733101-	Page
TIKT-12-B	22601	TIKT-50-B	22611	29
TIKT-20-D	22616	TIKT-75-D	22621	29
TIKT-25-R	22626	TIKT-100-R	22631	29
TIKT-32-M	22636	TIKT-125-M	22641	29

Shoulder Internal Knurling Tools

SIKT-12-2	22605	SIKT-50-2	22610	29
SIKT-20-4	22615	SIKT-75-4	22620	29
SIKT-25-4	22625	SIKT-100-4	22630	29
SIKT-32-4	22635	SIKT-125-4	22640	29

Milling Machine Knurling Tools

MMKT-10-D	22505	MMKT-38-D	22510	30
MMKT-12-R	22515	MMKT-50-R	22520	30
MMKT-20-O	22525	MMKT-75-O	22530	30
MMKT-25-O	22535	MMKT-100-O	22540	30
MMKT-32-P	22545	MMKT-125-P	22550	30

Interchangeable Arms for Diametral Knurling Tools

W109-3-15-M	22844	31
W109-3-15-4	22846	31
W109-3-25-M	22848	31
W109-3-25-4	22849	31
W109-3-40-O	22855	31
W109-3-40-4	22856	31

Diametral Knurling Tools - Heavy Duty Style Straddle

KTW109-20-15-M	22811	KTW109-75-15-M	22814	33
KTW109-25-15-M	22812	KTW109-100-15-M	22816	33
KTW109-32-15-M	22813	KTW109-125-15-M	22818	33
KTW109-20-25-M	22819	KTW109-75-25-M	22823	33
KTW109-25-25-M	22821	KTW109-100-25-M	22824	33
KTW109-32-25-M	22822	KTW109-125-25-M	22826	33
KTW109-25-40-O	22867	KTW109-100-40-O	22869	34
KTW109-32-40-O	22868	KTW109-125-40-O	22870	34

Diametral Knurling Tools - Shoulder Style Straddle

KTW109-20-15-4	22828	KTW109-75-15-4	22832	33
KTW109-25-15-4	22829	KTW109-100-15-4	22833	33
KTW109-32-15-4	22831	KTW109-125-15-4	22834	33
KTW109-20-25-4	22836	KTW109-75-25-4	22841	33
KTW109-25-25-4	22838	KTW109-100-25-4	22842	33
KTW109-32-25-4	22839	KTW109-125-25-4	22843	33
KTW109-25-40-4	22871	KTW109-100-40-4	22873	34
KTW109-32-40-4	22872	KTW109-125-40-4	22874	34

Diametral Knurling Tools - Side Mount Flange Style

CNC109-20-15-M-RH/LH	21443	21446	CNC109-75-15-M-RH/LH	21449	21452	35
CNC109-25-15-M-RH/LH	21444	21447	CNC109-100-15-M-RH/LH	21450	21453	35
CNC109-32-15-M-RH/LH	21445	21448	CNC109-125-15-M-RH/LH	21451	21454	35
CNC109-20-25-M-RH/LH	21455	21458	CNC109-75-25-M-RH/LH	21461	21464	35
CNC109-25-25-M-RH/LH	21456	21459	CNC109-100-25-M-RH/LH	21462	21465	35
CNC109-32-25-M-RH/LH	21457	21460	CNC109-125-25-M-RH/LH	21463	21466	35

Diametral Knurling Tools - Side Mount Shoulder Style

CNC109-20-15-4-RH/LH	21467	21470	CNC109-75-15-4-RH/LH	21473	21476	35
CNC109-25-15-4-RH/LH	21468	21471	CNC109-100-15-4-RH/LH	21474	21477	35
CNC109-32-15-4-RH/LH	21469	21472	CNC109-125-15-4-RH/LH	21475	21478	35
CNC109-20-25-4-RH/LH	21479	21482	CNC109-75-25-4-RH/LH	21485	21488	35
CNC109-25-25-4-RH/LH	21480	21483	CNC109-100-25-4-RH/LH	21486	21489	35
CNC109-32-25-4-RH/LH	21481	21484	CNC109-125-25-4-RH/LH	21487	21490	35

Three Wheel Knurling Tools

Description	UPC 733101-	Page
3WKT-06-2	23004	37
3WKT-12-2	23009	37
3WKT-25-2	23024	37
3WKT-40-2	23034	37

Optional Square Shank

3WSKT-06-12	23096	37
3WSKT-06-50	23095	37
3WSKT-06-162	23097	37
3WSKT-06-20	23098	37
3WSKT-06-75	23099	37
3WSKT-12-162	23082	37
3WSKT-12-20	23100	37
3WSKT-12-75	23102	37
3WSKT-12-25	23101	37
3WSKT-12-100	23078	37
3WSKT-25-20	23103	37
3WSKT-25-75	23079	37
3WSKT-25-25	23104	37
3WSKT-25-100	23080	37
3WSKT-40-25	23113	37
3WSKT-40-100	23081	37

Optional Round Shank

3WRKT-06-12	23105	37
3WRKT-06-50	23110	37
3WRKT-06-162	23106	37
3WRKT-06-20	23107	37
3WRKT-06-75	23111	37
3WRKT-12-162	23115	37
3WRKT-12-20	23116	37
3WRKT-12-75	23112	37
3WRKT-12-25	23117	37
3WRKT-12-100	23114	37
3WRKT-25-20	23125	37
3WRKT-25-75	23130	37
3WRKT-25-25	23126	37
3WRKT-25-100	23124	37
3WRKT-40-25	23135	37
3WRKT-40-100	23140	37

Knurling Tools for Swiss Screw Machines

SWTCFKT-8-B	22925	40
SWTCFKT-10-B	22926	40
SWTCFKT-12-B	22927	40
SWTCFKT-16-B	22928	40
DWTCFKT-8-B	22935	40
DWTCFKT-10-B	22936	40
DWTCFKT-12-B	22937	40
DWTCFKT-16-B	22938	40
SSWTCFKT-10-2	22945	41
SSWTCFKT-12-2	22946	41
SSWTCFKT-16-2	22947	41
SDWTCFKT-10-2	22955	41
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SMSCNC-16-7-D-0CL	20240	42
SMSCNC-20-7-D-0CL	20245	42
SMSCNC-10-7-2-0CL	20255	43
SMSCNC-12-7-2-0CL	20260	43
SMSCNC-16-7-2-0CL	20265	43
SMSCNC-20-7-2-0CL	20270	43

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:

Since 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













Contact Name:

e-mail address:

Company Name:

Phone Number:

Mailing Address:

Catalog	Quantity	Catalog	Quantity
<p>Tool Guide for Everyday Machining</p>  <p>Our most current Volume will be sent to you. Products offered per volume may vary depending on demand and featured items.</p> <p>Inside this Tool Guide You will find High Performance cutting tools, inserts and machine tool accessories for every day machining. Additionally this catalog will give you an excellent overview of our complete line of tooling.</p> <p>2012 Version Coming Soon</p>		<p>2011 Jet-Stream Thru Coolant System</p>  <p>Dorian Tool's Jet-Stream™ Thru Coolant Cutting Tools use a patented thru-coolant locking clamp which is precisely aimed to direct high pressure, high velocity coolant exactly onto the cutting edge of the carbide insert, from a short distance of 1/4" (6mm). This catalog offers a vast range Jet-Stream™ Thru Coolant Cutting Tools for Turning, Boring and Threading applications.</p>	
<p>2011 Turning & Boring Cutting Tools & Inserts</p>  <p>Dorian Tool offers a complete selection of indexable cutting tools. Our wide variety of Turning, Boring 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.</p> <p>2012 Version Coming Soon featuring a new line of carbide Inserts!</p>		<p>2011 Threading, Grooving & API Cutting Tools & Inserts</p>  <p>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. Profiling, Chuck Work and Between Center Work Machining Operations.</p>	
<p>2008 CNC Adjustable Angle Heads</p>  <p>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 offered in ER25 and ER32 collet toolholding systems. The use of the Universal CNC Adjustable Angle Heads increases productivity and quality by eliminating 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 taper toolholding system.</p>		<p>NEW 2012 knurling Tools & Wheels</p>  <p>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.</p> <p>Includes NEW Knurling Tools for Swiss Screw Machines</p>	
<p>2006 Perfetta Live Centers & Bull Nose</p>  <p>These live centers, which have already been recognized 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.</p>		<p>2011 Lathe Accessories Catalog</p>  <p>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, electro-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.</p> <p>This catalog replaces all three Dorian Tool post catalogs as well as the 2005 MTA (Machine Tool Accessories) catalog.</p>	
<p>NEW 2012 Swiss Screw Machine Tools and Advanced Technology Catalog</p>  <p>Featuring Jet-Stream™ Thru Coolant System for Turning, Threading and Cut-off Toolholders. Designed for Swiss Screw Machines.</p>		<p>NEW 2012 Tunable DVI Boring & Threading Bars for Difficult Deep Boring and Threading Applications!</p>  <p>Featuring internal working parts that can be adjusted during the application!</p>	<p>COMING SOON</p>

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 merchantability 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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East Bernard, TX

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Anaheim, CA

Birmingham, AL

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