

ZEUS
Knurling wheels



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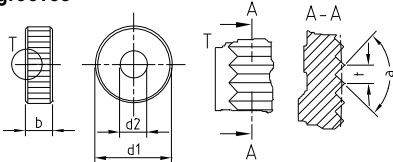
THE TOOLING SPECIALISTS FOR PRECISION COMPONENT MACHINING

Profiles and knurling pitches

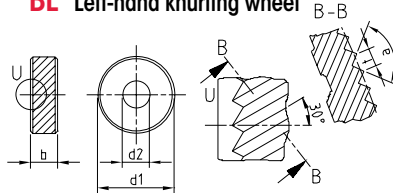


DIN 403 describes and specified the knurling profile on the knurling wheel.
 DIN 403 defines knurling forms AA, BL, BR, GE, GV, KE and KV. Knurling wheels that deviate from DIN 403 are considered special knurling tools and are custom manufactured by Hommel+Keller based on customer drawings.

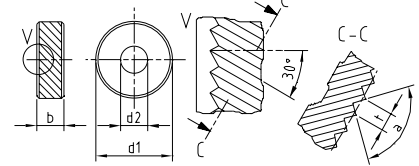
AA Knurling wheel with axially parallel grooves



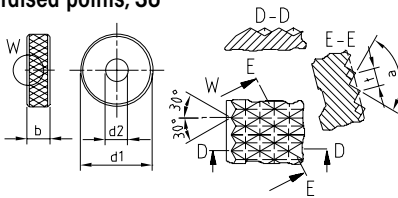
BL Left-hand knurling wheel



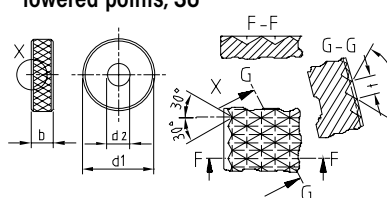
BR Right-hand knurling wheel



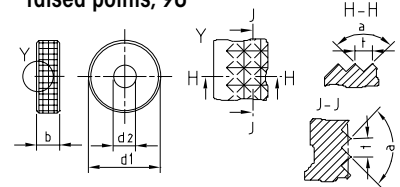
GE Left/right-hand knurling wheel, raised points, 30°



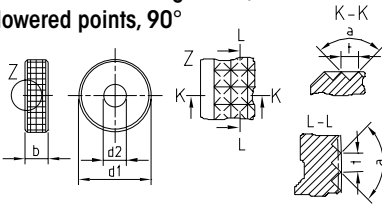
GV Left/right-hand knurling wheel, lowered points, 30°



KE Cross knurling wheel, raised points, 90°



KV Cross knurling wheel, lowered points, 90°



The knurling profile on the knurling wheel according to DIN 403 is based on the desired knurling profile on the workpiece (DIN 82) and the tool holder that is used.

The knurling pitch p refers to the distance between tooth crests. The pitches = 0.5/0.6/0.8/1.0/1.2/1.6 are standardised according to DIN 403. The Hommel+Keller product spectrum includes other pitches as well. They are listed below in mm and TPI. Other pitches are available as custom manufactured versions.

Standard pitches from Hommel+Keller

mm 0.3	0.4	0.5	0.6	0.7	0.8	mm 0.3	0.4	0.5	0.6	0.7	0.8
TPI 84.7	63.5	50.8	42.3	36.3	31.8	TPI 84.7	63.5	50.8	42.3	36.3	31.8
mm 1.0	1.2	1.5	1.6	2.0		mm 1.0	1.2	1.5	1.6	2.0	
TPI 25.4	21.2	16.9	15.9	12.7		TPI 25.4	21.2	16.9	15.9	12.7	

Form knurling – non-cutting process



Knurling wheels, milled, with 45° chamfer – PM

Standard variants	Profile		Dimension [mm]			Pitches [mm]
			Ø	Width	Bore	
No. 11	AA		10	4	4	○
No. 11			15	4	4	○
No. 11			15	6	4	○
No. 11			15	6	6A8	□
No. 11			15	6	6A11	□
No. 11			20	6	6	○
No. 11			20	8	6	●
No. 11			20	8	6A13	□
No. 11			20	10	6	□
No. 11			25	6	6	□
No. 11			25	8	6	□
No. 11			25	10	6	□
No. 11			BL	30°	10	4
No. 11	15	4			4	□
No. 11	20	6			6	□
No. 11	20	8			6	■
No. 11	BL	45°	10	4	4	□
No. 11			15	4	4	□
No. 11			20	8	6	□
No. 11	BR	30°	10	4	4	○
No. 11			15	4	4	□
No. 11			20	6	6	□
No. 11			20	8	6	□
No. 11			20	8	6	■
No. 11			10	4	4	□
No. 11	BR	45°	15	4	4	□
No. 11			20	8	6	□
No. 11			20	8	6	□

Standard pitches/profile angle 90°

- 0.3/0.4/0.5/0.6/0.7/0.8/1.0/1.2/1.5/1.6/2.0
- 0.3/0.4/0.5/0.6/0.7/0.8/1.0/1.2/1.5
- 0.5/0.6/0.8/1.0/1.2/1.5/1.6/2.0
- 0.5/0.6/0.8/1.0/1.2/1.5
- ◆ 0.5/0.6/0.8/1.0
- ☑ On request

Other variants available on request

Variants

Knurling wheel variants (PM)

No.	Version
13	milled, without chamfer
30	ground with 45° chamfer
32	ground, without chamfer
95	milled, with 60° chamfer

Knurling wheel variants (HSS)

No.	Version
10	milled, with 45° chamfer
12	milled, without chamfer
94	milled, with 60° chamfer

Knurling wheel variants (HM)

No.	Version
50	ground with 45° chamfer
52	ground, without chamfer

Form knurling with 60° chamfer

When forming knurling profiles with a larger pitch in the axial machining direction it can be advantageous to apply a 60° chamfer to the knurling wheel. The flatter chamfer achieves a better material flow.

Wheel geometries – see "Technology", page 44

Form knurling – non-cutting process



Knurling wheels, milled, with 45° chamfer – PM

Standard variants	Profile		Dimension [mm]			Pitches [mm]
			Ø	Width	Bore	
No. 11	GE	30°	15	4	4	◆
No. 11			15	6	4	◆
No. 11			20	6	6	◆
No. 11			20	8	6	□
No. 11	GE	45°	20	8	6	□
No. 11	KE		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Variants

Knurling wheel variants (PM)

No.	Version
13	milled, without chamfer
30	ground with 45° chamfer
32	ground, without chamfer

Knurling wheel variants (HSS)

No.	Version
10	milled, with 45° chamfer
12	milled, without chamfer

Knurling wheel variants (HM)

No.	Version
50	ground with 45° chamfer
52	ground, without chamfer

Standard pitches/profile angle 90°

- 0.3/0.4/0.5/0.6/0.7/0.8/1.0/1.2/1.5/1.6/2.0
- 0.3/0.4/0.5/0.6/0.7/0.8/1.0/1.2/1.5
- 0.5/0.6/0.8/1.0/1.2/1.5/1.6/2.0
- 0.5/0.6/0.8/1.0/1.2/1.5
- ◆ 0.5/0.6/0.8/1.0
- On request

Other variants available on request



Knurling wheels, formed, with 45° chamfer – PM

Standard variants	Profile		Dimension [mm]			Pitches [mm]
			Ø	Width	Bore	
No. 21	GV	30°	15	4	4	◆
No. 21			15	6	4	◆
No. 21			20	6	6	◆
No. 21			20	8	6	□
No. 21	GV	45°	20	8	6	◆
No. 21	KV		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Variants

Knurling wheel variants (PM)

No.	Version
23	formed, without chamfer

Knurling wheel variants (HSS)

No.	Version
20	formed, with 45° chamfer
22	formed, without chamfer

Cut knurling – cutting process



Knurling wheels, milled, without chamfer – PM

Standard variants	Profile		Dimension [mm]			Pitches [mm]
			Ø	Width	Bore	
No. 16	AA		8.9	2.5	4	○
No. 16			10	3	6	○
No. 16			14.5	3	5	■
No. 16			15	4	8	○
No. 16			21.5	5	8	■
No. 16			25	6	8	■
No. 16	BL	15°	10	3	6	◆
No. 16			15	4	8	□
No. 16			21.5	5	8	□
No. 16	BL	30°	25	6	8	■
No. 16			10	3	6	◆
No. 16			14.5	3	5	◆
No. 16			15	4	8	○
No. 16	BR	15°	21.5	5	8	□
No. 16			25	6	8	■
No. 16			10	3	6	◆
No. 16			15	4	8	□
No. 16	BR	30°	21.5	5	8	□
No. 16			25	6	8	■
No. 16			10	3	6	◆
No. 16			14.5	3	5	◆

Standard pitches/profile angle 90°

● 0.3/0.4/0.5/0.6/0.7/0.8/1.0/1.2/1.5/1.6/2.0

○ 0.3/0.4/0.5/0.6/0.7/0.8/1.0/1.2/1.5

■ 0.5/0.6/0.7/0.8/1.0/1.2/1.5/2.0

□ 0.5/0.6/0.8/1.0/1.2/1.5

◆ 0.5/0.6/0.8/1.0

☑ On request

Other variants available on request

Variants

Knurling wheel variants (PM)

N°	Version
18	milled, with 10° chamfer
35	ground, without chamfer
37	ground with 10° chamfer

Knurling wheel variants (HSS)

N°	Version
15	milled, without chamfer
17	milled, with 10° chamfer

Knurling wheel variants (HM)

N°	Version
55	ground, without chamfer
57	ground with 10° chamfer

Form knurling – with 10° chamfer

When cutting knurling profiles with a larger pitch in the axial machining direction it can be advantageous to apply a 10° chamfer to the knurling wheel.

For wheel geometries, see "Technology" on page 44

Special knurling wheels



HV



HHV

Bead knurl – No. 60

Note: Please indicate the bead diameter when ordering.



KAA



KGE



KBR



KBL

Conical knurling wheels – No. 70

Note: The completeness of the teeth on the workpiece is always dependent on the width/pitch of the knurling wheel.



C*



DL 20° *



DR 20° *

* Only radiuses > 3 mm are possible.



E



FL 20°



FR 20°

In the DL, DR, FL and FR versions the spiral angle must not exceed 20°.

Concave and convex knurling wheels – No. 80



Nr. 90



Nr. 92

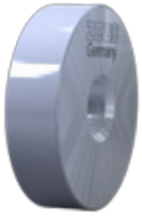


Nr. 93

Special knurling wheels – No. 90/92/93

Note: The picture of knurling wheel no. 90 is provided as an example. It represents all special forms not covered by no. 92 (single stepped) and no. 93 (double stepped).

Burnishing rolls



RRA



RRE

zeus burnishing rolls can be used in standard zeus form knurling tools. On request, we can develop and produce a custom holding system.

Use in this tool system is suitable for machining cylindrical workpieces, bores, end faces, conical workpieces and for convex and concave outer contours.

Applications:

zeus burnishing rolls are used primarily for roller-burnishing and supporting round material during machining on lathes.

Result:

- Improved surface quality
- Increased dimensional stability
- Increased hardness of surfaces

Advantages:

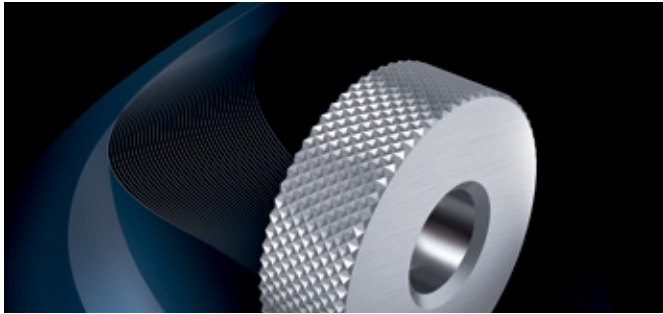
- Burnished workpieces exhibit low friction and increased resistance to corrosion after machining
- Reworking, such as grinding, honing and lapping can be replaced by simple roller-burnishing machining
- When used as support rolls, they reduce wear on the bearings and clamping devices and minimise the pressure on the workpiece

Burnishing roll type RRA – cylindrical

Type	Dimension [mm]			Version		
	Ø	Width	Bore	N° 04 turned & polished, Rz 4 µm	N° 05 ground, Rz 2–3 µm	N° 06 ground & polished, Rz 1 µm
RRA	10	4	4	✓	✓	✓
	15	4	4	✓	✓	✓
	20	8	6	✓	✓	✓
	25	8	6	✓	✓	✓

Burnishing roll type RRE – convex

Type	Dimension [mm]			R	Version		
	Ø	Width	Bore		N° 04 turned & polished, Rz 4 µm	N° 05 ground, Rz 2–3 µm	N° 06 ground & polished, Rz 1 µm
RRE	10	4	4	2	✓	✓	✓
	15	4	4	2	✓	✓	✓
	20	8	6	6	✓	✓	✓
	25	8	6	6	✓	✓	✓



Advantages:

- Longer tool life
- Reduction of tool costs
- Reduction of set-up costs

In addition to the standard variants of powder metal, HSS, and carbide versions are also available on request.

zeus Premium materials

As your supplier of premium tool products we insist on materials that allow machining of hard-to-machine and pressure resistant materials. All knurling wheels in the standard zeus product line are therefore made of power metal.

The material features high hot hardness and compression strength, as well as durability and resistance to wear.

Surface treatment

Suitable treatment based on your individual application can have a positive effect on the life of the knurling wheel. We offer different treatment processes.

TENIFER® salt-bath nitriding heat treatment

Treatment of the knurling wheel in a salt bath based on the TENIFER® process increases the resistance to wear and the fatigue strength. The salt-bath nitrocarburising process achieves a high case hardness.



PVD coatings

Suitable PVD coating of the knurling wheels offers the user additional possibilities for increasing tool life. These variants are available on request. PVD coatings are suitable primarily for cut knurling applications.



Polished knurling wheels

The use of finely polished knurling wheels can be effective for machining of adhesive materials that require optimal chip sliding. This process achieves very smooth surfaces, with a low coefficient of friction. Edge radiusing on the tooth flanks prevents built-up edges from forming and therefore premature tooth breakage.

