TECHNOLOGY

IMPORTANT INFORMATION

KNURLING PROFILES

Knurling profiles according to DIN 82


RAA

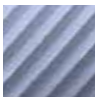

RBR30°

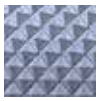

RBL30°


RGE30°

Additional profiles


RBR45°


RBL45°

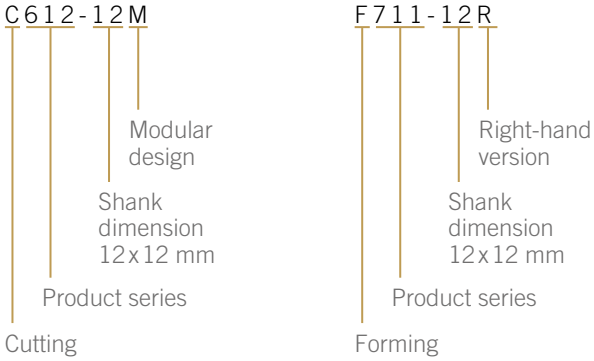

RGE45°

DOVETAIL GUIDE

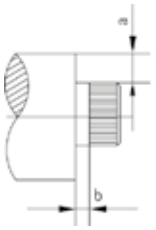
- Modular shank design: Shank can be exchanged quickly and easily by means of the dovetail guide
  1. Shank sizes 10 x 16 / 12 x 16 / 16 x 16 mm are suitable for the small knurling head
  2. Shank sizes 20 x 25 / 25 x 25 mm are suitable for the large knurling head
- Eccentric clamping
- For shank sizes 10 x 16 / 12 x 16 / 16 x 16 mm and 20 x 25 / 25 x 25 mm there is an adaptable coolant nozzle

EXPLANATION OF MODEL DESIGNATIONS

Each QUICK tool has a particular designation.
The following explanation is provided for your convenience.



INFLUENCING FACTORS



Clearance dimension for cut knurling – workpiece collar

Due to the design-related inclination (30°) of the knurling head and the overhang of the cover plate, knurling up to a collar is not possible with a cut knurling tool.

Dimension a corresponds to the increase in the step (mm).
Dimension b corresponds to the minimum clearance for the respective knurling wheel (Ø specified in mm).

Dimension a is calculated with shoulder-height and 1/2 pitsch with a flank angle of 90°.

a	b 8.9	b 14.5	b 21.5	b 32	b 42
1	1.0	1.3	2.0	1.5	1.8
2	2.5	1.8	2.6	2.5	3.0
3	3.0	2.2	3.0	3.1	4.3
4	3.0	2.6	3.8	3.8	5.7
5	3.0	2.8	4.5	4.5	6.7
6	3.0	3.1	4.7	5.1	7.5
7	3.0	3.1	5.0	6.2	8.1
8	3.0	3.1	5.3	7.6	8.6
9	3.0	3.1	5.3	9.4	9.1
10	3.0	3.1	5.3	9.8	9.5
11	3.0	3.1	5.3	10.4	9.8
12	3.0	3.1	5.3	10.6	10.1
13	3.0	3.1	5.3	10.8	12.2
14	3.0	3.1	5.3	11.1	13.1
15	3.0	3.1	5.3	11.1	13.6
16	3.0	3.1	5.3	11.1	14.1
17	3.0	3.1	5.3	11.1	14.4
18	3.0	3.1	5.3	11.1	14.6
19	3.0	3.1	5.3	11.1	14.8

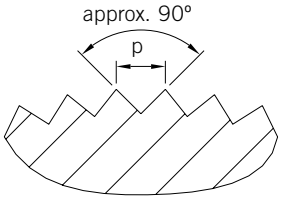
Dimension a = shoulder-height + 1/2 pitsch (flank angle 90°)

OPTIMISATION OF KNURLING

To guarantee optimal results, we recommend that you read the operating manual carefully before using our products. Correct assembly and handling of the tool will save you set-up time and allow you to achieve your desired results.

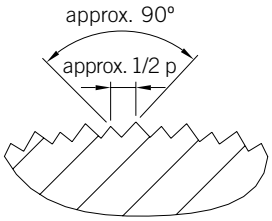
The pitch corresponds to the workpiece circumference

In many cases the user does not notice the relationship between the pitch and the workpiece circumference. The knurling wheel can compensate the distortion of the pitch to produce optimal knurling results (see figure).



The pitch does not correspond to the workpiece circumference at all, or is not optimal

This is an extreme case. The knurling wheel cannot compensate the unfavourable relationship between the pitch and the workpiece circumference, or the profile is heavily distorted. In the worst case this can result in “double knurling”. This happens when the knurling wheel does not engage in the knurling profile after one workpiece rotation, but instead engages in between. This is evident in the finer pitch of the knurling (see figure).



The knurling quality and the tool life can be improved substantially by optimising the knurling by changing the rough-turn diameter, the cutting values and/or the pitch.

1. Correction of the rough-turn diameter and the cutting values until optimal knurling is achieved.
If a correction is not possible due to inability to comply with the tolerances, then:

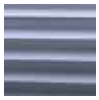
2. Check whether the pitch can be changed.
If it is not possible to change the pitch, it is necessary to manufacture a special knurling wheel with optimised pitch (defined number of teeth/outer diameter of knurling wheel).

Consultation is provided by the Hommel+Keller application engineer on the basis of a workpiece drawing and information about the machine.
The calculation of the optimal pitch is conducted on the basis of approximate formulas. Due to influencing factors (such as differences in materials) further optimisation may be necessary.

MATERIAL DISPLACEMENT IN FORM KNURLING PROCESS

Our empirical values for enlargement of the workpiece diameter

Knurling profile acc. to DIN 82: RAA (knurling profile on the workpiece)
Knurling wheels acc. to DIN 403: AA (knurling profile on knurling wheel)


RAA

Material	Workpiece Ø [mm]	Pitch [mm]										
		0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.2	1.5	1.6	2.0
		Enlargement of workpiece diameter [mm]										
Free-cutting steel	5	0.08	0.14	0.18	0.22	0.27	0.29	0.35	0.50	–	–	–
	15	0.08	0.14	0.18	0.23	0.30	0.40	0.44	0.50	0.60	0.65	0.70
	25	0.08	0.15	0.23	0.24	0.28	0.35	0.44	0.53	0.62	0.70	0.98
Stainless steel	5	0.10	0.15	0.20	0.25	0.28	0.30	0.42	0.41	–	–	–
	15	0.10	0.15	0.19	0.25	0.30	0.34	0.45	0.51	0.60	–	–
	25	0.10	0.14	0.20	0.26	0.31	0.33	0.43	0.50	0.62	–	–
Brass	5	0.08	0.12	0.18	0.20	0.21	0.22	0.25	0.28	–	–	–
	15	0.10	0.14	0.20	0.26	0.28	0.29	0.35	0.41	0.44	0.48	0.55
	25	0.10	0.15	0.20	0.25	0.28	0.30	0.36	0.43	0.46	0.50	0.53
Aluminium	5	0.09	0.15	0.19	0.23	0.28	0.30	0.41	0.40	–	–	–
	15	0.10	0.15	0.19	0.26	0.29	0.33	0.45	0.51	0.57	0.65	–
	25	0.09	0.15	0.19	0.26	0.29	0.32	0.45	0.52	0.59	0.65	0.75

Important notice: This information represents empirical values. Deviations are possible.

Knurling profile acc. to DIN 82: RBL30°/RBR30° (knurling profile on workpiece)
Knurling wheels acc. to DIN 403: BR30°/BL30° (knurling profile on knurling wheel)


RBR30°


RBL30°

Material	Workpiece Ø [mm]	Pitch [mm]										
		0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.2	1.5	1.6	2.0
		Enlargement of workpiece diameter [mm]										
Free-cutting steel	5	0.11	0.15	0.20	0.24	0.28	0.34	0.45	0.55	–	–	–
	15	0.11	0.15	0.22	0.26	0.30	0.35	0.45	0.52	0.67	0.73	0.85
	25	0.11	0.14	0.23	0.25	0.28	0.36	0.45	0.56	0.70	0.72	0.90
Stainless steel	5	0.09	0.14	0.19	0.25	0.31	0.34	0.45	0.52	–	–	–
	15	0.12	0.20	0.23	0.31	0.35	0.40	0.51	0.62	0.66	0.73	0.97
	25	0.12	0.18	0.24	0.27	0.37	0.39	0.49	0.59	0.80	0.84	0.96
Brass	5	0.10	0.14	0.20	0.23	0.24	0.28	0.33	0.37	–	–	–
	15	0.10	0.15	0.21	0.23	0.24	0.31	0.41	0.47	0.53	0.55	0.63
	25	0.11	0.15	0.22	0.22	0.25	0.30	0.40	0.45	0.55	0.61	0.68
Aluminium	5	0.12	0.14	0.21	0.24	0.29	0.34	0.41	0.51	–	–	–
	15	0.12	0.18	0.23	0.26	0.36	0.40	0.50	0.56	0.56	0.61	0.75
	25	0.12	0.18	0.25	0.28	0.37	0.39	0.50	0.58	0.77	0.82	0.96

Important notice: This information represents empirical values. Deviations are possible.

Knurling profile acc. to DIN 82: RGE30° (knurling profile on the workpiece)
Knurling wheels acc. to DIN 403: BR30°+ BL30° (knurling profile on knurling wheel)


RGE30°

Material	Workpiece Ø [mm]	Pitch [mm]										
		0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.2	1.5	1.6	2.0
		Enlargement of workpiece diameter [mm]										
Free-cutting steel	5	0.12	0.16	0.20	0.25	0.33	0.41	0.55	0.65	–	–	–
	15	0.13	0.22	0.30	0.32	0.35	0.41	0.52	0.62	0.67	0.81	0.95
	25	0.12	0.18	0.28	0.32	0.35	0.38	0.55	0.67	0.77	0.87	0.98
Stainless steel	5	0.11	0.20	0.25	0.30	0.36	0.39	0.55	0.55	–	–	–
	15	0.10	0.14	0.21	0.24	0.29	0.34	0.43	0.53	0.66	0.72	0.88
	25	0.11	0.13	0.20	0.25	0.28	0.32	0.44	0.52	0.67	0.70	0.83
Brass	5	0.12	0.13	0.16	0.20	0.24	0.28	0.32	0.38	–	–	–
	15	0.12	0.16	0.18	0.24	0.28	0.30	0.39	0.40	0.48	0.52	0.63
	25	0.12	0.17	0.22	0.23	0.27	0.30	0.38	0.41	0.48	0.50	0.63
Aluminium	5	0.10	0.15	0.21	0.25	0.33	0.36	0.50	0.57	–	–	–
	15	0.11	0.14	0.20	0.25	0.28	0.33	0.43	0.54	0.67	0.71	0.89
	25	0.11	0.15	0.22	0.25	0.29	0.34	0.44	0.53	0.68	0.69	0.88

Important notice: This information represents empirical values. Deviations are possible.

GUIDELINES FOR CUTTING SPEED AND FEED RATE

Cut knurling process

Material	Workpiece Ø [mm]	Knurling wheel Ø [mm]	Vc [m/min]		f [mm/U]					
					Radial		Axial			
							Pitch [mm]			
			from	to	from	to	> 0.3 < 0.5	> 0.5 < 1.0	> 1.0 < 1.5	> 1.5 < 2.0
Free-cutting steel	< 10	8.9 / 14.5 / 21.5	40	70	0.04	0.08	0.20	0.13	0.08	0.07
	10 – 40	8.9 / 14.5 / 21.5 / 32 / 42	50	90	0.05	0.10	0.28	0.18	0.14	0.10
	40 – 100	14.5 / 21.5 / 32 / 42	65	110	0.05	0.10	0.35	0.25	0.17	0.11
	100 – 250	21.5 / 32 / 42	65	110	0.05	0.10	0.42	0.28	0.18	0.13
	> 250	32 / 42	80	100	0.05	0.10	0.45	0.29	0.20	0.14
Stainless steel	< 10	8.9 / 14.5 / 21.5	22	40	0.04	0.08	0.14	0.09	0.06	0.05
	10 – 40	8.9 / 14.5 / 21.5 / 32 / 42	30	50	0.05	0.10	0.20	0.13	0.10	0.07
	40 – 100	14.5 / 21.5 / 32 / 42	35	60	0.05	0.10	0.25	0.18	0.12	0.08
	100 – 250	21.5 / 32 / 42	35	60	0.05	0.10	0.29	0.20	0.13	0.09
	> 250	32 / 42	45	55	0.05	0.10	0.31	0.21	0.14	0.10
Brass	< 10	8.9 / 14.5 / 21.5	55	100	0.04	0.08	0.22	0.14	0.09	0.08
	10 – 40	8.9 / 14.5 / 21.5 / 32 / 42	70	125	0.05	0.10	0.31	0.20	0.15	0.11
	40 – 100	14.5 / 21.5 / 32 / 42	90	155	0.05	0.10	0.39	0.28	0.18	0.12
	100 – 250	21.5 / 32 / 42	90	155	0.05	0.10	0.46	0.31	0.20	0.14
	> 250	32 / 42	115	140	0.05	0.10	0.49	0.32	0.22	0.15
Aluminium	< 10	8.9 / 14.5 / 21.5	70	120	0.04	0.08	0.12	0.08	0.05	0.04
	10 – 40	8.9 / 14.5 / 21.5 / 32 / 42	80	150	0.05	0.10	0.17	0.11	0.08	0.06
	40 – 100	14.5 / 21.5 / 32 / 42	110	160	0.05	0.10	0.21	0.15	0.10	0.07
	100 – 250	21.5 / 32 / 42	110	160	0.05	0.10	0.25	0.17	0.11	0.08
	> 250	32 / 42	130	150	0.05	0.10	0.27	0.18	0.12	0.08

Important notice: This information represents reference values. The optimal values are to be found in the application. Ensure effective cooling/lubrication to prevent chips from being rolled into the profile and to prolong the life of the knurling wheels.

Form knurling process

Material	Workpiece Ø [mm]	Knurling wheel Ø [mm]	Vc [m/min]		f [mm/U]					
					Radial		Axial			
							Pitch [mm]			
			from	to	from	to	> 0.3 < 0.5	> 0.5 < 1.0	> 1.0 < 1.5	> 1.5 < 2.0
Free-cutting steel	< 10	10 / 15 / 20	20	50	0.04	0.08	0.14	0.09	0.06	0.05
	10 – 40	10 / 15 / 20 / 25	25	55	0.05	0.10	0.20	0.13	0.10	0.07
	40 – 100	15 / 20 / 25	30	60	0.05	0.10	0.25	0.18	0.12	0.08
	100 – 250	20 / 25	30	60	0.05	0.10	0.30	0.20	0.13	0.09
Stainless steel	< 10	10 / 15 / 20	15	40	0.04	0.08	0.12	0.08	0.05	0.04
	10 – 40	10 / 15 / 20 / 25	20	50	0.05	0.10	0.17	0.11	0.09	0.06
	40 – 100	15 / 20 / 25	25	50	0.05	0.10	0.21	0.15	0.10	0.07
	100 – 250	20 / 25	25	50	0.05	0.10	0.26	0.17	0.11	0.08
Brass	< 10	10 / 15 / 20	30	75	0.04	0.08	0.15	0.09	0.06	0.05
	10 – 40	10 / 15 / 20 / 25	40	85	0.05	0.10	0.21	0.14	0.11	0.07
	40 – 100	15 / 20 / 25	45	90	0.05	0.10	0.26	0.19	0.13	0.08
	100 – 250	20 / 25	45	90	0.05	0.10	0.32	0.21	0.14	0.09
Aluminium	< 10	10 / 15 / 20	25	60	0.04	0.08	0.18	0.11	0.08	0.06
	10 – 40	10 / 15 / 20 / 25	30	65	0.05	0.10	0.25	0.16	0.13	0.09
	40 – 100	15 / 20 / 25	35	70	0.05	0.10	0.31	0.23	0.15	0.10
	100 – 250	20 / 25	35	70	0.05	0.10	0.38	0.25	0.16	0.11

Important notice: This information represents reference values. The optimal values are to be found in the application. Ensure effective cooling/lubrication to prevent chips from being rolled into the profile and to prolong the life of the knurling wheels.