KOMET® GROUP

KomGuide – Technical Manual

Drilling, Threading, Reaming, Milling

Precision has a name

Precision and qualitiy do not allow any compromises in universal cutting operations.

KOMET GROUP is a leading system supplier going global for precision tools and offers individual problem solvings and innovative top engineering. This guarantees consistent quality and economic efficiency.

Precision tools for drilling into the solid, boring, fine boring, reaming, milling, turning, threading and for special applications – this is represented by the name of KOMET GROUP.

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Selecting the Material – Threading / Milling

Material group		Strength Rm (N/mm²)	Hardness HB	Material
P	1.1	≤ 400	≤ 120	magnetic soft iron
	1.2	≤ 700	≤ 200	structural, case hardened steel
	1.3	≤ 850	≤ 250	carbon steel
	1.4	≤ 850	≤ 250	alloy steel
	1.5	> 850, ≤ 1200	> 250, ≤ 350	alloy / heat treated steel
	1.6	> 1200	>350	alloy / heat treated steel
H	1.7	≤ 1400	≤ 400	hardened steel to 45 HRC
	1.8	≤ 2200	≤ 600	hardened steel to 58 HRC
M	2.1	≤ 850	≤ 250	stainless steel, sulphuretted
	2.2	≤ 850	≤ 250	stainless steel, austentic
	2.3	≤ 1000	≤ 300	stainless steel, ferritic, ferritic & austentic, martensitic
K	3.1	≤ 500	≤ 150	grey cast iron
	3.2	> 500, ≤ 1000	> 150, ≤ 300	grey cast iron, heat treated
	3.3	400-500	200-250	vermicular cast iron
	3.4	≤ 700	≤ 200	spheroidal graphite cast iron
	3.5	> 700, ≤ 1000	> 200, ≤ 300	spheroidal graphite cast iron, heat treated
	3.6	≤ 700	≤ 200	malleable iron
	3.7	> 700, <1000	> 200, ≤ 300	malleable iron, heat treated
S	4.1	≤ 700	≤ 200	pure titanium
	4.2	≤ 900	≤ 270	titanium alloys
	4.3	> 900, ≤ 1250	> 270, ≤ 300	titanium alloys
	5.1	≤ 500	≤ 150	pure nickel
	5.2	≤ 900	< 270	nickel alloys, heat resistant
	5.3	> 900, ≤ 1200	> 270, ≤ 350	nickel alloys, high heat resistant
N	6.1	≤ 350	≤ 100	non-alloy copper
	6.2	≤ 700	≤ 200	short chip, brass, bronze, red brass
	6.3	≤ 700	≤ 200	long chip brass
	6.4	≤ 500	≤ 470	Cu-Al-Fe-alloy (Ampco)
	7.1	≤ 350	≤ 100	Al, Mg, non-alloy
	7.2	≤ 600	≤ 180	Al wrought alloy, breaking strain (A5) < 14%
	7.3	≤ 600	≤ 180	Al wrought alloy, breaking strain (A5) ≥ 14%
	7.4	≤ 600	< 180	Al cast alloy, Si < 10%
	7.5	≤ 600	≤ 180	Al cast alloy, Si ≥ 10%
	8.1			Thermoplastics
	8.2			Thermosetting plastics
	8.3			Fibre reinforced plastics

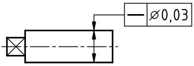
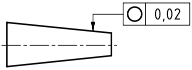
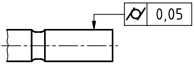
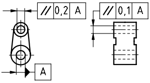
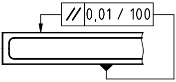
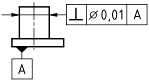
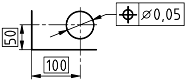
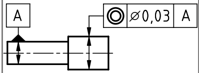
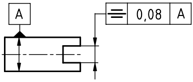
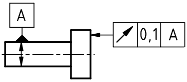
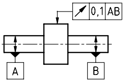
Important: For more application details and safety notes see 86-87!

Selecting the Material – Drilling / Reaming / Milling

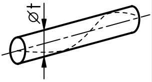
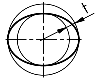
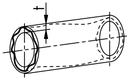
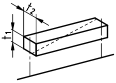
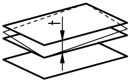
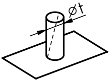
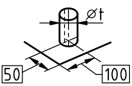
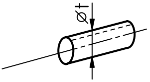
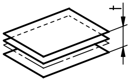
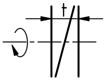
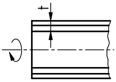
	Material group	Strength Rm (N/mm²)	Hardness HB	Material *Material example material code/DIN*
P	1.0	≤ 500		non-alloy steels *St37-2/1.0037; 9SMn28/1.0715; St44-2/1.0044*
	2.0	500-900		non-alloy / low alloy steels *St52-2/1.0050; C55/1.0525; 16MnCr5/1.7131*
	2.1	< 500		lead alloys *9SMnPb28/1.0718*
	3.0	> 900		non alloy / low alloy steels: heat resistant structural, heat treated, nitride and tools steels *42CrMo4/1.7225; CK60/1.1221*
	4.0	> 900		high alloy steels *X6CrMo4/1.2341; X165CrMoV12/1.2601*
	4.1			HSS
S	5.0		250	special alloys *Inconel 718/2.4668; Nimonic 80A/2.4631*
	5.1	400		titanium, titanium alloys *TiAl5Sn2/3.7114*
M	6.0	≤ 600		stainless steels *X2CrNi189/1.4306; X5CrNiMo1810/1.4401*
	6.1	< 900		stainless steels *X8CrNb17/1.4511; X10CrNiMoTi1810/1.4571*
	7.0	> 900		stainless / fireproof steels *X10CrAl7/1.4713; X8CrS-38-18/1.4862*
K	8.0		180	gray cast iron *GG-25/0.6025; GG-35/0.6035*
	8.1		250	alloy gray cast iron *GG-NiCr202/0.6660*
	9.0	≤ 600	130	spheroidal graphite cast iron (ferritic) *GGG-40/0.7040*
	9.1		230	spheroidal graphite cast iron (ferritic/perlitic) *GGG-50/0.7050; GGG-55/0.7055; GTW-55/0.8055*
	10.0	> 600	250	spheroidal graphite cast iron (perlitic), malleable iron *GGG-60/0.7060; GTS-65/0.8165*
	10.1		200	alloyed spheroidal graphite cast iron *GGG-NiCr20-2/0.7661*
	10.2		300	vermicular cast iron *GGV Ti<0,2; GGV Ti>0,2*
N	12.0		90	copper alloy, brass, lead-alloy bronze, lead bronze (good cut) *CuZn36Pb3/2.1182; G-CuPb15Sn/2.1182*
	12.1		100	copper alloy, brass, bronze (average cut) *CuZn40Al1/2.0550; E-Cu57/2.0060*
	13.0		60	wrought aluminium alloys *AlMg1/3.3315; AlMnCu/3.0517*
	13.1		75	cast aluminium alloy (Si-content <10%), magnesium alloy *G-AlMg5/3.3561; G-AlSi9Mg/3.2373*
	14.0		100	cast aluminium alloy (Si-content >10%) *G-AlSi10Mg/3.2381*
H	15.0	1400		hardened steels (< 45 HRC)
	16.0	1800		hardened steels (> 45 HRC)

Important: For more application details and safety notes see 86-87!

Form and Positional Tolerances

Tolerance type		Symbols and characteristics to tolerance		Drawing details
Form tolerances		—	**Straightness** of a line or axis	
Form tolerances		○	**Circular form** of a disc, a cylinder, a cone, etc.	
Form tolerances		⌭	**Cylindrical form**	
Positional tolerances	Directional tolerances	//	**Parallelism** of a line (axis) with reference to a basic straight line	
Positional tolerances	Directional tolerances	//	**Parallelism** of a surface with reference to a basic plane	
Positional tolerances	Location tolerances	⊥	**Rectangularity** of a line (axis) with reference to a basic plane	
Positional tolerances	Location tolerances	⌖	**Position** of lines, axes or surfaces in relation to one another or to one or several basic elements	
Positional tolerances	Location tolerances	◎	**Concentricity** of an axis or a point in relation to a basic axis (basic point)	
Positional tolerances	Location tolerances	⌯	**Symmetry** of a central plane or line (axis) in relation to a basic straight line or plane	
Positional tolerances	Run-out tolerances	↗	**Face/axial run-out** Lateral movement of an element in relation to the rotary axis	
Positional tolerances	Run-out tolerances	↗	**Radial run-out** Radial movement of an element in relation to the rotary axis	

Further informations see DIN/ISO 1101

	Explanation	Tolerance zone
	The axis of the cylindrical part of the pin must lie within the cylinder to t = 0.03 mm	
	The circumference line of any cross section must be contained in a circular ring with a width to t = 0.02 mm	
	The surface to tolerance must lie within two coaxial cylinders which have a radial spacing to t = 0.05 mm	
	The top axis must lie in a square-shaped area, within 0.1 mm in the vertical and 0.2 mm in the horizontal direction. The area will lie parallel to the basic axis of bore A.	
	Any 100 mm long section of the top surface must lie with a gap of 0.01 mm between two parallel planes. The planes will lie parallel to the lower surface (basic surface).	
	The axis of the cylinder must lie in a cylindrical area with a diameter of 0.01 mm. The area will be vertical to the basic plane A.	
	The axis of the hole must lie within a cylinder with a diameter to tolerance t = 0.05 mm, whose axis lies at the precise geometrical place (with dimensions as shown in boxes).	
	The axis of the part of the shaft to tolerance must lie within a cylinder with a diameter to tolerance t = 0.03 mm, whose axis aligns with the base axis.	
	The central plane of the slot must lie between two parallel planes which are spaced to t = 0.08 mm and be symmetrical to the central plane of the base.	
	The lateral run-out of the face surface should not exceed tolerance t = 0.1 mm when the workpiece rotates around the basic axis A.	
	The concentricity deviation must not be greater than 0.1 mm in any measurement plane for a complete revolution around the shared basic axis of cylinder A and B.	

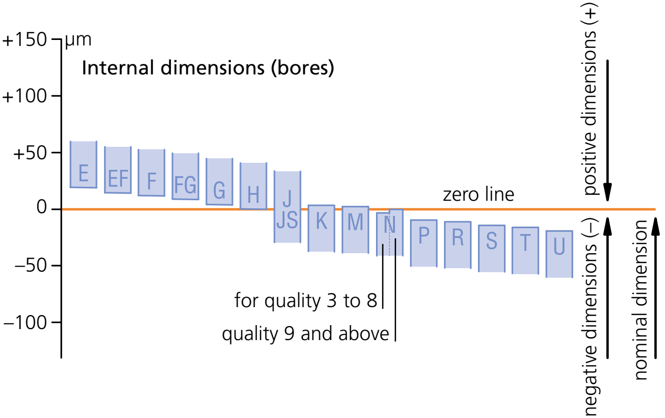
Further informations see DIN/ISO 1101

IT Tolerance Class

Nominal dimension range mm	IT tolerance class											
	1	2	3	4	5	6	7	8	9	10	11	12
1–3	0,8	1,2	2	3	4	6	10	14	25	40	60	100
> 3–6	1	1,5	2,5	4	5	8	12	18	30	48	75	120
> 6–10	1	1,5	2,5	4	6	9	15	22	36	58	90	150
> 10–18	1,2	2	3	5	8	11	18	27	43	70	110	180
> 18–30	1,5	2,5	4	6	9	13	21	33	52	84	130	210
> 30–50	1,5	2,5	4	7	11	16	25	39	62	100	160	250
> 50–80	2	3	5	8	13	19	30	46	74	120	190	300
> 80–120	2,5	4	6	10	15	22	35	54	87	140	220	350
> 120–180	3,5	5	8	12	18	25	40	63	100	160	250	400
> 180–250	4,5	7	10	14	20	29	46	72	115	185	290	460
> 250–315	6	8	12	16	23	32	52	81	130	210	320	520

Position of Tolerance Field to Zero Line

Example for nominal dimension range 6 to 10 mm



Further informations see DIN 7155

Nominal dimension range mm above...up to	Limit allowances in µm for tolerance classes The tolerance classes printed in **bold** correspond to series 1 in DIN 7157; they are to be preferably used.							
	C11	**D10**	**E9**	**F8**	G7	H6	**H7**	**H8**
up to 3	+ 120 + 60	+ 60 + 20	+ 39 + 14	+ 20 + 6	+ 12 + 2	+ 6 0	+ 10 0	+ 14 0
3...6	+ 145 + 70	+ 78 + 30	+ 50 + 20	+ 28 + 10	+ 16 + 4	+ 8 0	+ 12 0	+ 18 0
6...10	+ 170 + 80	+ 98 + 40	+ 61 + 25	+ 35 + 13	+ 20 + 5	+ 9 0	+ 15 0	+ 22 0
10...18	+ 205 + 95	+ 120 + 50	+ 75 + 32	+ 43 + 16	+ 24 + 6	+ 11 0	+ 18 0	+ 27 0
18...30	+ 240 + 110	+ 149 + 65	+ 92 + 40	+ 53 + 20	+ 28 + 7	+ 13 0	+ 21 0	+ 33 0

Nominal dimension range mm above...up to	Limit allowances in µm for tolerance classes The tolerance classes printed in **bold** correspond to series 1 in DIN 7157; they are to be preferably used.								
	J7	J9 / JS9	K7	M7	N7	N9	P9	R7	S7
up to 3	+ 4 – 6	+ 12,5 – 12,5	0 – 10	– 2 – 12	– 4 – 14	– 4 – 29	– 6 – 31	– 10 – 20	– 14 – 24
3...6	+ 6 – 6	+ 15 – 15	+ 3 – 9	0 – 12	– 4 – 16	0 – 30	– 12 – 42	– 11 – 23	– 15 – 27
6...10	+ 8 – 7	+ 18 – 18	+ 5 – 10	0 – 15	– 4 – 19	0 – 36	– 15 – 51	– 13 – 28	– 17 – 32
10...18	+ 10 – 8	+ 21,5 – 21,5	+ 6 – 12	0 – 18	– 5 – 23	0 – 43	– 18 – 61	– 16 – 34	– 21 – 39
18...30	+ 12 – 9	+ 26 – 26	+ 6 – 15	0 – 21	– 7 – 28	0 – 52	– 22 – 74	– 20 – 41	– 27 – 48

cf. DIN ISO 286-2 (1990-11)

Fits, 1/100th dimension

Existing reamers can be used for different fits. Example:
Existing reamer with Ø 4.02 mm → mark all values with **4,02** in the table

C8	C9	C10	C11	CD7	D7	D8	D9	D10	D11	D12
1,07	1,07	1,08	1,10	1,04	1,02	1,03	–	1,04	1,06	1,08
2,07	2,07	2,08	2,10	2,04	2,02	2,03	–	2,04	2,06	2,08
3,07	3,07	3,08	3,10	3,04	3,02	3,03	–	3,04	3,06	3,08
4,08	4,09	–	–	4,05	4,04	4,04	4,05	4,06	4,08	4,10
5,08	5,09	–	–	5,05	5,04	5,04	5,05	5,06	5,08	5,10
6,08	6,09	–	–	6,05	6,04	6,04	6,05	6,06	6,08	6,10
7,09	7,10	–	–	7,06	7,05	7,05	7,06	7,08	7,10	–
8,09	8,10	–	–	8,06	8,05	8,05	8,06	8,08	8,10	–
9,09	9,10	–	–	9,06	9,05	9,05	9,06	9,02	9,10	–
10,09	10,10	–	–	10,06	10,05	10,05	10,06	10,08	10,10	–
–	–	–	–	–	11,06	–	11,08	11,10	–	–
–	–	–	–	–	12,06	–	12,08	12,10	–	–

E7	E8	E9	EF8	F7	F8	F9	F10	G6	G7	H5
1,02	1,02	1,03	1,02	1,01	1,01	1,02	–	–	1,01	1,00
2,02	2,02	2,03	2,02	2,01	2,01	2,02	–	–	2,01	2,00
3,02	3,02	3,03	3,02	3,01	3,01	3,02	–	–	3,01	3,00
–	4,03	4,04	4,03	–	**4,02**	4,03	4,04	4,01	4,01	4,00
–	5,03	5,04	5,03	–	5,02	5,03	5,04	5,01	5,01	5,00
–	6,03	6,04	6,03	–	6,02	6,03	6,04	6,01	6,01	6,00
7,03	7,04	7,05	7,03	7,02	7,03	–	7,05	7,01	7,01	7,00
8,03	8,04	8,05	8,03	8,02	8,03	–	8,05	8,01	8,01	8,00
9,03	9,04	9,05	9,03	9,02	9,03	–	9,05	9,01	9,01	9,00
10,03	10,04	10,05	10,03	10,02	10,03	–	10,05	10,01	10,01	10,00
11,04	11,05	11,06	–	–	11,03	11,04	11,06	11,01	–	11,00
12,04	12,05	12,06	–	–	12,03	12,04	12,06	12,01	–	12,00

H6	H7	H8	H9	H10	H11	H12	H13	J6	J7	J8
1,00	–	1,01	–	1,02	1,04	1,06	1,09	1,00	1,00	1,00
2,00	–	2,01	–	2,02	2,04	2,06	2,09	2,00	2,00	2,00
3,00	–	3,01	–	3,02	3,04	3,06	3,09	3,00	3,00	3,00
4,00	–	4,01	**4,02**	4,03	4,05	4,08	–	4,00	4,00	4,00
5,00	–	5,01	5,02	5,03	5,05	5,08	–	5,00	5,00	5,00
6,00	–	6,01	6,02	6,03	6,05	6,08	–	6,00	6,00	6,00
7,00	7,01	7,01	7,02	7,04	7,06	7,10	–	7,00	7,00	7,00
8,00	8,01	8,01	8,02	8,04	8,06	8,10	–	8,00	8,00	8,00
9,00	9,01	9,01	9,02	9,04	9,06	9,10	–	9,00	9,00	9,00
10,00	10,01	10,02	10,02	10,04	10,06	10,10	–	10,00	10,00	10,00
–	11,01	11,02	11,03	11,05	11,07	–	–	11,00	11,00	11,00
–	12,01	12,02	12,03	12,05	12,07	–	–	12,00	12,00	12,00

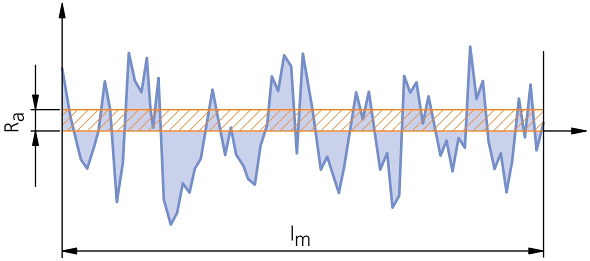
→ read off the fit in the column heading. Fits can then be created with reamer F8 and H9.

JS7	JS8	JS9	K6	K7	K8	M6	M7	M8	N6	N7
1,00	1,00	1,00	–	–	0,99	–	–	0,99	0,99	0,99
2,00	2,00	2,00	–	–	1,99	–	–	1,99	1,99	1,99
3,00	3,00	3,00	–	–	2,99	–	–	2,99	2,99	2,99
4,00	4,00	4,00	4,00	4,00	4,00	3,99	–	3,99	3,99	3,99
5,00	5,00	5,00	5,00	5,00	5,00	4,99	–	4,99	4,99	4,99
6,00	6,00	6,00	6,00	6,00	6,00	5,99	–	5,99	5,99	5,99
7,00	7,00	–	–	7,00	7,00	6,99	6,99	6,99	–	6,99
8,00	8,00	–	–	8,00	8,00	7,99	7,99	7,99	–	7,99
9,00	9,00	–	–	9,00	9,00	8,99	8,99	8,99	–	8,99
10,00	10,00	–	–	10,00	10,00	9,99	9,99	9,99	–	9,99
11,00	11,00	–	–	11,00	11,00	10,99	10,99	10,99	–	10,99
12,00	12,00	–	–	12,00	12,00	11,99	–	11,99	–	11,99

N8	P6	P7	P8	R6	R7	S6	S7	U6	U7	X7
0,99	0,99	0,99	0,99	–	–	0,98	0,98	0,98	0,98	–
1,99	1,99	1,99	1,99	–	–	1,98	1,98	1,98	1,98	–
2,99	2,99	2,99	2,99	–	–	2,98	2,98	2,98	2,98	–
3,99	–	–	3,98	–	–	3,98	3,98	–	–	3,97
4,99	–	–	4,98	–	–	4,98	4,98	–	–	4,97
5,99	–	–	5,98	–	–	5,98	5,98	–	–	5,97
6,99	–	–	–	6,98	6,98	–	–	6,97	6,97	–
7,99	–	–	–	7,98	7,98	–	–	7,97	7,97	–
8,99	–	–	–	8,98	8,98	–	–	8,97	8,97	–
9,99	–	–	–	9,98	9,98	–	–	9,97	9,97	–
10,99	10,98	10,98	10,97	–	–	10,97	10,97	–	–	10,96
11,99	11,98	11,98	11,97	–	–	11,97	11,97	–	–	11,96

X8	X9	Z7	Z8	Z9	Z10	ZA7	ZA8	ZA9	ZB8	ZB9
0,97	0,97	0,97	0,97	–	0,96	0,96	–	–	0,95	0,95
1,97	1,97	1,97	1,97	–	1,96	1,96	–	–	1,95	1,95
2,97	2,97	2,97	2,97	–	2,96	2,96	–	–	2,95	2,95
–	3,96	3,96	3,96	3,95	3,95	3,96	–	–	3,94	3,94
–	4,96	4,96	4,96	4,95	4,95	4,96	–	–	4,94	4,94
–	5,96	5,96	5,96	5,95	5,95	5,96	–	–	5,94	5,94
6,96	6,96	6,96	6,96	–	6,94	6,94	6,94	–	–	6,92
7,96	7,96	7,96	7,96	–	7,94	7,94	7,94	–	–	7,92
8,96	8,96	8,96	8,96	–	8,94	8,94	8,94	–	–	8,92
9,96	9,96	9,96	9,96	–	9,94	9,94	9,94	–	–	9,92
10,95	–	10,95	10,94	–	10,93	–	10,93	–	10,90	10,90
11,95	–	11,95	11,94	–	11,93	–	11,93	–	11,90	11,90

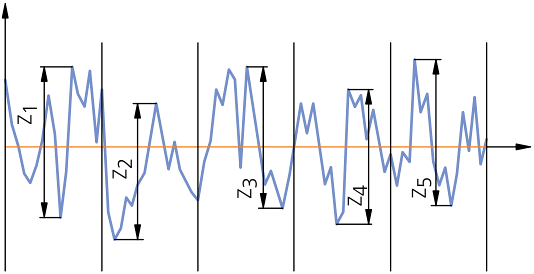
Mean surface finish R_a



$$\mathbf{R_a = \frac{1}{l_m} \int_0^{l_m} |y| dx}$$

The arithmetic mean for the absolute values of all profile ordinates within the overall measurement distance after filtering out form deviations and coarse ripple factor percentage.

Average surface uniformity R_z



$$R_z = \frac{1}{5}\,(Z_1+Z_2+Z_3+Z_4+Z_5)$$

Arithmetic mean from the individual surface uniformity values of five adjacent, equal length, individual measuring distances after filtering out form deviations and coarse ripple factor.

Further informations see DIN/ISO 1302

Achievable Surface Finish R_a

Mean surface finish R_a	Average surface uniformity R_z	Drilling	Roughing	Fine boring	Reaming	Grinding	Honing	Rolling
25	100	normal workshop practice	rough machining					
12,5	63	normal workshop practice	rough machining	rough machining				
6,3	40	normal workshop practice	normal workshop practice	rough machining	rough machining			
3,2	25	fine machining	normal workshop practice	normal workshop practice	rough machining	rough machining		
	16	fine machining	fine machining	normal workshop practice	normal workshop practice	rough machining	rough machining	
1,6	10	fine machining	fine machining	normal workshop practice	normal workshop practice	normal workshop practice	rough machining	
0,8	6,3			fine machining	normal workshop practice	normal workshop practice	normal workshop practice	
	4			fine machining	fine machining	normal workshop practice	normal workshop practice	
0,4	2,5			fine machining	fine machining	normal workshop practice	normal workshop practice	
0,2	1,6				fine machining	fine machining	normal workshop practice	rough machining
0,1	1				fine machining	fine machining	fine machining	normal workshop practice
0,05	0,63					fine machining		normal workshop practice
0,025	0,25							fine machining

Surface finish from:
- rough machining
- normal workshop practice
- fine machining (achieved with extra special care)

Further informations see DIN/ISO 1302

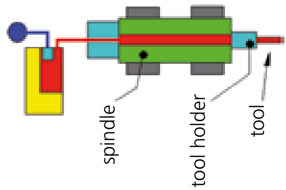
Minimal Lubrication (MLC)

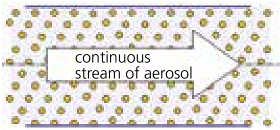
As machining with coolant represents a considerable cost factor in today’s production, the use of MLC offers the potential to reduce unit costs.

MLC does not involve an immersion lubrication system, as with lubrication using emulsion, but is a lubrication system using very finely distributed lubricant which is applied to the cutting edge in a stream of air; there are basically two different systems for producing the aerosol.

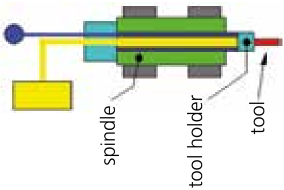
Aerosol	Lubricant	Air supply

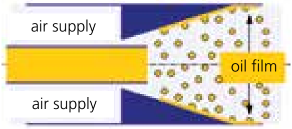
1-channel system





2-channel system





Further informations see DIN 69069

Minimal Lubrication (MLC)

Tools from the KOMET GROUP can also be supplied in an optimised form for use with minimal lubrication (MLC).

For details please contact your KOMET® applications engineer, who will be able to advise you on the technology.

	Advantage	Disadvantage
	• switching between MLC and standard coolant system not a problem • continuous supply of aerosol • no pollution problem within restricted limits • droplet size approx. 1 µm (caution: should not be breathed in)	• suitable for small bore ∅ of <0.7 mm under certain conditions • special extraction equipment required • longer tool change times because spindle needs to be vented (approx. 1 sec.) • condensation from aerosol on walls (oil on walls) • only suitable for spindle speeds of >16,000 min^{-1} under certain conditions
	• reliable use in production up to 40,000 min^{-1} • suitable for small bore diameters • faster tool change (0.1 secs)	• time-consuming changeover to standard coolant system • significant negative effect when changing direction • droplet size 2 – 5 µm • extraction system required in working area

Further informations see DIN 69069

International Material Classification (to VDI 3323 standard)

Material			DIN	AISI / SAAE	BS EN
P	1.0	1.0038	RSt37-2	A570-36	4360 40C
	1.0	1.0116	St37-3	A573-81 65	4360 40B
	1.0	1.0144	St44-3	A573-81	4360 43C
	1.0	1.0201	St36	1006	
	1.0	1.0345	H1	A515 65	1 501 161
	2.0	1.0401	C15	1015;1016;1017	080M15
	2.0	1.0402	C22	1020;1023	055M15;070M20 ... 2C
	2.0	1.0436	Ast45	A662C	1 501 224
	2.0	1.0443	GS-45	A27 65-35	A1
	2.0	1.0473	19Mn6	A537 1	1 501 224
	2.0	1.0501	C35	1035	060A35
	2.0	1.0503	C45	1043	080M46
	2.0	1.0503	C45	1045	080M46
	2.0	1.0511	C40	1040	080M40
	2.0	1.0535	C55	1055	070M55
	2.0	1.0551	GS-52	A27 70-36	A2
	2.0	1.0553	GS-60	A148 80-40	A3
	2.0	1.0577	Ast 52	A738	1 501 224
	2.0	1.0601	C60	1060	080A62 ... 43D
	2.0	1.0841	St52-3	5120	150M19
	2.0	1.1121	Ck10	1010	045M10
	2.0	1.1133	20Mn5	1022;1518	120M19
	2.0	1.1141	CK 15	1015, 1017	080M15
	2.0	1.1158	C25E;Ck25	1025	070M26
	2.0	1.1183	Cf35	1035	060A35
	2.0	1.1191	Ck45	1042	080A47
	2.0	1.1545	C105W1	W110	BW1A
	2.0	1.5415	15Mo3	ASTM A204Gr.A	1501-240
	2.0	1.5423	16Mo5	4520	1503-245-420
	2.0	1.5622	14Ni6	ASTM A350LF5	
	2.1	1.0715	9 SMn28	1213	230M07
	2.1	1.0718	9 SMnPb28	12 L 13	
	2.1	1.0722	10 SPb20	11 L 08	
	2.1	1.0726	35S20	1140	212M36 ... 8M
	2.1	1.0727	45S20	1146	
	2.1	1.0736	9SMn36	1215	240M07 ... 1b
	2.1	1.0737	9SMnPb36	12 L 14	
	3.0	1.0904	55Si7	9255	250A53 ... 45
	3.0	1.0961	60SiCr8	9262	
	3.0	1.1157	40Mn4	1039	150M36 ... 15
	3.0	1.1167	36Mn5	1335	150M36
	3.0	1.1170	28Mn6	1330	150M28 ... 14A
	3.0	1.1203	Ck55	1055	070M55
	3.0	1.1213	Cf53	1050	060A52

AFNOR	SS	UNI	UNE	JIS
E24-2NE	1311			
E24-U	1312			
E28-4	1412			
Fd5	1160			
A37CP	1330			
CC12	1350	C15C16	F.111	
AF42C20;XC25;1C22	1450	C20; C21; C25	1C22F.112	S20C; S22C
A48FP	2103			
E23-45M				
A52CP	2101			
CC35	1550	C35	F.113	
AF65C45	1650	C45	F.5110	
CC45	1650	C45	F.114	
AF60C40		C40	F.114.A	
	1655	C55	F.115	
280-480M	1505			
320-560M	1606			
A52FP	2107			
CC55		C60		
20MC5	2172	Fe52	F.431	
XC10	1265	C10	F.1510-C10K	
20M5	1132	G22Mn3;20Mn7	F.1515-20Mn6	SMnC420
XC18	1370		F.1511	
2C25;XC25	1450	C25	F.1120-C25k	S25C; S28C
XC38TS	1572	C36		S35C
XC45	1660	C45	F.1140	
Y105	1880	C36KU	F.5118	SK3
15D3	2912	16Mo3KW	16Mo3	STBA 12
		16Mo5	16Mo5	
16N6		14Ni6	15Ni6	
S250	1912	CF9SMn28	11SMn28	SUM22
S250Pb	1914	CF9SMnPb28	11SMnPb28	SUM22,3,4L
10PbF2		CF10 SPb20	10SPb20	
35M F6	1957		F.210.G	
45M F4	1973			
S300		CF9SMn36	12SMn35	SUM25
S300Pb	1926	CF9SMnPb36	12SMnP35	
55S7	2085	55Si8	56Si7	
60SC6		60SiCr8	60SiCr8	
35M5				
40M5	2120		36Mn5	SMn438(H)
20M5		C28Mn		SCMn1
XC55		C50	F.1203-36MnG	S55C
XC48TS	1674	C53		S50C

International Material Classification (to VDI 3323 standard)

	Material		DIN	AISI / SAAE	BS EN
P	3.0	1.1221	Ck60	1064	060A62
	3.0	1.1231	Ck67	1070	070A72
	3.0	1.1248	Ck75	1080	060A78
	3.0	1.1274	Ck101	1095	060A96
	3.0	1.2713	55NiCrMoV6	L6	
	3.0	1.2721	50NiCr13	L6	
	3.0	1.3401	G-X120Mn12	ASTM A128 75	BW10
	3.0	1.3505	100Cr6	52100	534A99 ... 31
	3.0	1.5662	X8Ni9	ASM A353	502-650
	3.0	1.5680	12Ni19	2515 (2517)	12Ni19
	3.0	1.5710	36NiCr6	3135	640A35 ... 111A
	3.0	1.5732	14NiICr10	3415	
	3.0	1.5752	14NiICr14	3310	655M13 ... 36A
	3.0	1.6511	36CrNiMo4	9840	816M40 ... 110
	3.0	1.6523	21NiCrMo2	8620, 8617	805M20 ... 362
	3.0	1.6546	40NiCrMo22	8740, 8640, 8742	311-Type 7
	3.0	1.6582	35CrNiMo6	4340	817M40 ... 24
	3.0	1.6587	17CrNiMo6	4317	820A16
	3.0	1.6657	14NiCrMo13-4	9310	832M13 ... 36C
	3.0	1.7015	15Cr3	5015	523M15
	3.0	1.7033	34Cr4	5132	530A32 ... 18B
	3.0	1.7035	41Cr4	5140	530M40 ... 18
	3.0	1.7039	34MoCrS4 G	L1	524A14
	3.0	1.7045	42Cr4	5140	
	3.0	1.7131	16MnCr5	5115	(527M20)
	3.0	1.7139	16MnCr5		
	3.0	1.7176	55Cr3	5155	527A60 ... 48
	3.0	1.7218	25CrMo4	4130	1717CDS110
	3.0	1.7220	34CrMo4	4135, 4137	34CrMo4
	3.0	1.7223	41CrMo4	4142	
	3.0	1.7225	42CrMo4	4140	708M40 ... 19A
	3.0	1.7262	15CrMo5		
	3.0	1.7335	13CrMo4 4	ASTM A182 F-12	
	3.0	1.7337	16CrMo44	ASTM A387 12-2	1501 620
	3.0	1.7361	32CrMo12		722M24 ... 40B
	3.0	1.7715	14MoV6 3		1503-660-440
	3.0	1.8159	50CrV4	6150	
	3.0	1.8509	41CrAlMo7	ASTM A290	905M39 ... 41B
	3.0	1.8515	31 CeMo 12		722M24
	3.0	1.8523	39CrMoV13 9		897M39 ... 40C
	4.0	1.2067	100Cr6	L3	BL3
	4.0	1.2080	X210Cr12	D3	BD3
	4.0	1.2083	X42Cr13		
	4.0	1.2344	X40CrMoV5 1	H13	BH13

AFNOR	SS	UNI	UNE	JIS
XC65	1678	C60	F.1150	
XC68	1770	C70	F.141	
XC75	1774		F.5107	
XC100	1870		F.5117	
55NCDV7			F.520.S	SKT4
55NCV6	2550		F.528.S	
Z120M12	2183	GX120Mn12	AM-X120Mn12	SCMnH/1
100C6	2258	100Cr6	F.131	SUJ2
9 Ni		X10Ni9	F.2645	SL9N60(53)
Z18N5		12Ni19	12Ni19	SL5N60
35NC6				SNC236
14NC11		16NiCr11	15NiCr11	SNC415(H)
12NC15				SNC815(H)
40NCD3		36NiCrMo4(KB)	F.128	
20NCD2	2506	20NiCrMo2	20NiCrMo2	SNCM220(H)
40NCD2		40NiCrMo2(KB)	F.129	SNCM240
35NCD6	2541	35NiCrMo6(KB)	F.127	
18NCD6			14NiCrMo13	
		15NiCrMo13	14NiCrMo131	
12C3				SCr415(H)
32C4		34Cr4(KB)	35Cr4	SCr430(H)
42C4		41Cr4	42Cr4	SCr440(H)
	2092	105WCR 5		
	2245		42Cr4	SCr440
16MC5	2511	16MnCr5	16MnCr5	
	2127			
55C3				SUP9(A)
25CD4	2225	25CrMo4(KB)	55Cr3	SCM420/430
34CD4	2234	35CrMo4	34CrMo4	SCM435TK
		41CrMo4	42CrMo4	SNB 22-1
42CD4	2244	42CrMo4	42CrMo4	SCM440(H)
12CD4	2216		12CrMo4	SCM415(H)
		14CrMo4 5	14CrMo45	
15CD 4.5	2216	12CrMo910		
30CD12	2240	32CrMo12	F.124.A	
			13MoCrV6	
		50CrV4	F.143	
40CAD6, 12	2940	41CrAlMo7	41CrAlMo7	
30 CD 12	2240	30CrMo12	F.01712	
		36CrMoV12		
Y100C6			100Cr6	
Z200C12		X210Cr13KU	X210Cr12	SKD1
X40Cr14	2314		F.5263	
Z40CDV5	2242	X40CrMoV511KU	F.5318	SKD61

International Material Classification (to VDI 3323 standard)

Material			DIN	AISI / SAAE	BS EN
P	4.0	1.2363	X100CrMoV5 1	A2	BA2
P	4.0	1.2379	X155CrVMo121	D2	BD2
P	4.0	1.2419	105WCr6		
P	4.0	1.2436	X210 CrW 12	D4 (D6)	BD6
P	4.0	1.2542	45WCrV7	S1	BS1
P	4.0	1.2581	X30WCrV9 3	H21	BH21
P	4.0	1.2601	X165CrMoV12		
P	4.1	1.3243	S6/5/2/5	M35	BM35
P	4.1	1.3343	S6/5/2	M2	BM2
P	4.1	1.3348	S2/9/2	M7	
S	5.0	–	CoCr22W14	AMS 5772	
S	5.0	1.4362	X2CrNiN23 4	S32304	
S	5.0	1.4460	X8CrNiMo27-5	S32900	
S	5.0	1.4462	X2CrNiMoN2253	S31803	
S	5.0	2.4375	NiCu30Al	4676	3072-76
S	5.0	2.4603	NiCr 30 FeMo	5390A	
S	5.0	2.4630	NiCr20Ti		HR5,203-4
S	5.0	2.4631	NiCr20TiAk		Hr40,601
S	5.0	2.4856	NiCr22Mo9N	5666	
S	5.0	2.4973	NiCr19Co11	AMS 5399	
S	5.0	LW2 467	S-NiCr13A16	5391	3146-3
S	5.0	LW2.466	NiFe35Cr14	5660	
S	5.0	LW2.466	NiCr19Fe19	5383	HR8
S	5.0	LW2.466	NiCr19Fe19	AMS 5544	
S	5.0	LW2.467	NiCo15Cr10	AMS 5397	
S	5.0	LW2.496	CoCr20W15	5537C	
S	5.1	–	TiAl4Mo4Sn4Si0.5		
S	5.1	–	TiAl6V4ELI	AMS R56401	TA11
S	5.1	3.7114	TiAl5Sn2.5	AMS R54520	TA14/17
S	5.1	3.7164	TiAl6V4	AMS R56400	TA10-13/TA2
M	6.0	1.4000	X7Cr13	403	403S17
M	6.0	1.4006	X10Cr13	410	410S21 ... 56A
M	6.0	1.4021	X20Cr13	420	420S37
M	6.0	1.4034	X46Cr13		420S45 ... 56D
M	6.0	1.4057	X22CrNi17	431	431S29 ... 57
M	6.0	1.4104	X12CrMoS17	430F	
M	6.0	1.4112	X90 CrMoV 18	440B	
M	6.0	1.4113	X6CrMo17	434	434S17
M	6.0	1.4305	X12CrNiS18 8	303	303S21 ... 58M
M	6.0	1.4306	X2CrNiN18 9	304L	304S12
M	6.0	1.4310	X12CrNi17 7	301	
M	6.0	1.4311	X4CrNiN18 10	304LN	304S62
M	6.0	1.4313	X5CrNi13 4		425C11
M	6.0	1.4350	X5CrNi189	304	304S31 ... 58E

AFNOR	SS	UNI	UNE	JIS
Z100CDV5	2260	X100CrMoV51KU	F.5227	SKD12
Z160CDV12	2310	X155CrVMo12 1KU	F.520.A	SKD11
105WC13	2140	107WCr5	105WCr5	SKS31
Z200CD12-01	2312	X215CrW12 1KU	F.5213	
45WCrV8	2710	45WCrV8KU	F.524	
Z30WCV9		X30WCrV9 3KU	F.526	SKD5
	2310	X165CrMoW12KU	F.5211	
6-5-2-5	2723	HS6 5 2 5	F.5613	SKH55
Z85WDCV	2722	HS6 5 2	F.5604	SKH51
2 9 2	2782	HS2 9 2		
KC22				
Z2CN23-04AZ	2327			
	2324			
Z2CND22-05-03	2377			
NC22FeD				
NC20T				
NC20TA				
NC22FeDNB				
NC19KDT				
NC12AD				
ZSNCDT42				
NC19FeNb				
NC20K14				
KC20WN				
T-A5E				
T-A6V				
Z6C13	2301	X6Cr13	F.3110	SUS403
Z10C14	2302	X12Cr13	F.3401	SUS410
Z20C13	2303	X20Cr13		
Z40CM	2304	X40Cr14	F.3405	SUS420J2
Z15CNi6.02	2321	X16CrNi16	F.3427	SUS431
Z10CF17	2383	X10CrS17	F.3117	SUS430F
Z8CD17.01	2325	X8CrMo17		SUS434
Z10CNF18.09	2346	X10CrNiS18.09	F.3508	SUS303
Z2CrNi18 10	2352	X2CrNi18 11	F.3503	SCS19
Z12CN17.07	2331	X12CrNi17 07	F.3517	SUS301
Z2CN18.10	2371			SUS304LN
Z4CND13.4M				SCS5
Z6CN18.09	2332/2333	X5CrNi18 10	F.3551	SUS304

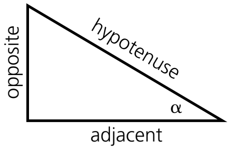
International Material Classification (to VDI 3323 standard)

Material			DIN	AISI / SAAE	BS EN
M	6.0	1.4401	X5CrNiMo18 10	316	316S16 ... 58J
M	6.1	1.4429	X2CrNiMoN1813	316LN	
M	6.1	1.4435	X2CrNiMo18 12	316L	316S13
M	6.1	1.4438	X2CrNiMo18 16	317L	317S12
M	6.1	1.4541	X10CrNiTi18 9	321	321S12 ... 58B
M	6.1	1.4542/1.4548	X5CrNiCuNb17-4-4	630	
M	6.1	1.4550	X10CrNiNb	347	347S17 ... 58F
M	6.1	1.4568/1.4504	X12CrNiAl177	17-7PH	316S111
M	6.1	1.4571	X10CrNiMoTi18	316Ti	320S17 ... 58J
M	6.1	1.4583	X10CrNiMoNb18	318	
M	7.0	1.4718	X45CrSi9 3	HW 3	401S45 ... 52
M	7.0	1.4724	X10CrA113	405	403S17
M	7.0	1.4742	X10CrA118	430	439S15 ... 60
M	7.0	1.4747	X80CrNiSi20	HNV6	443S65 ... 59
M	7.0	1.4762	X10CrA124	446	
M	7.0	1.4828	X15CrNiSi20 12	309	309S24
M	7.0	1.4845	X12CrNi25 21	310S	310S24
M	7.0	1.4864	X12NiCrSi	330	
M	7.0	1.4865	G-X40NiCrSi		330C11
M	7.0	1.4871	X53CrMnNiN219	EV8	349S54
K	8.0	0.6010	GG10	A48 20 B	
K	8.0	0.6015	GG15	A48 25 B	Grade 150
K	8.0	0.6020	GG20	A48 30 B	Grade 220
K	8.0	0.6025	GG25	A48 35 B	Grade 260
K	8.0	0.6030	GG30	A48 45 B	Grade 300
K	8.0	0.6035	GG35	A48 50 B	Grade 350
K	8.0	0.6040	GG40	A48 60 B	Grade 400
K	9.0	0.7033	GGG35.3		
K	9.0	0.7040	GGG40	60-40-18	SNG420/12
K	9.0	0.7043	GGG40.3	0.7043	SNG370/17
K	9.0	0.7050	GGG50	80-55-06	SNG500/7
K	9.0	0.7060	GGG60		SNG600/3
K	9.0	0.7070	GGG70	100-70-03	SNG700/2
K	9.0	0.8135	GTS-35	32510	B340/12
K	9.0	0.8145	GTS-45	400 10	P440/7
K	9.0	0.8155	GTS-55	50005	P510/4
K	9.0	0.8165	GTS-65	70003	P570/3
N	14.0	3.2162	GD-AlSi8Cu3	A380.1	LM24
N	14.0	3.2381	G-AlSi10Mg	A360.2	LM9
N	14.0	3.2581	G-AlSi12	A413.2	LM6
N	14.0	3.2583	G-AlSi12(Cu)	A413.1	LM20
N	14.0	3.2982	GD-AlSi12	A413.0	

AFNOR	SS	UNI	UNE	JIS
Z2CND17.11	2347	X5CrNiMo17 12	F.3543	SUS316
Z2CND17.13	2375			SUS316LN
Z2CND17.12	2353			X2CrNiMo17 12
Z2CND19.15	2367			X2CrNiMo18 16
Z6CNT18.10	2337	X6CrNiTi18 11	F.3553	SUS321
Z7CNU17-04				
Z6CNNb18.10	2338	X6CrNiNb18 11	F.3552	SUS347
		Z8CNA17-07	X2CrNiMo1712	
Z6NDT17.12	2350	X6CrNiMoTi17 12	F.3535	
Z6CNDNb17 13B		X6CrNiMoNb	17 13	
Z45CS9		X45CrSi8	F.3220	SUH1
Z10C13		X10CrA112	F.311	SUS405
Z10CAS18		X8Cr17	F.3113	SUS430
Z80CSN20.02		X80CrSiNi20	F.320B	SUH4
Z10CAS24	2322	X16Cr26		SUH446
Z15CNS20.12				SUH309
Z12CN25 20	2361	X6CrNi25 20	F.331	SUH310
Z12NCS35.16				SUH330
		XG50NiCr		SCH15
Z52CMN21.09		X53CrMnNiN		SUH35,SUH36
Ft10D	01 10-00	G10	FG10	
Ft15D	01 15-00	G14	FG15	
Ft20D	01 20-00	G20	FG20	
Ft25D	01 25-00	G25	FG25	
Ft30D	01 30-00	G30	FG30	
Ft35D	01 35-00	G35	FG35	
Ft40D	01 40-00			
	07 17-1			
FGS400-12	07 17-0 2	GS400-12		FCD40
FGS370-17	07 17-1 5	GSO42/15		
FGS500-7	07 27-0 2	GS500/7		FCD50
FGS600-3	07 32-0 3	GS600/3		FCD60
FGS700-2	07 37-0 1	GS700/2		FCD70
MN35-10	08 15			
	08 52			
MP50-5	08 54			
MP60-3	08 58			
	4250			
	4253			
	4261			
	4260			
	4247			

Formula
Formula symbols and abbreviations used

D	mm	outside diameter ∅
d	mm	inside diameter ∅
F_c	N	cutting force
F_f	N	feed force
$k_{c1.1}$	N/mm²	on the chip cross section
		b×h = 1×1 mm² cutting force applied
M_d	Nm	torque
n	min^{-1}	spindle speed
P_c	kW	spindle capacity
P_a	kW	motor output
f	mm/rev	feed per revolution
f_z	mm/rev	feed per cutting edge and revolution
k_c	N/mm²	special cutting force
v_c	m/min	cutting speed
v_f	mm/min	feed rate
z		number of effective cutting edges
π	Pi	3,14159.....
η		machine output 0,7 - 0,85 (0,8)
L	mm	overall path length (feed path)
l	mm	workpiece thickness
l_a	mm	run-on path
l_u	mm	over-run path
t_h	min	main time



$$\sin\alpha = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\alpha = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\alpha = \frac{\text{opposite}}{\text{adjacent}}$$

General Formulae

$$v_c = \frac{D \times \pi \times n}{1000}$$ cutting speed in m/min

$$n = \frac{v_c \times 1000}{D \times \pi}$$ spindle speed in min^{-1}

$$t_h = \frac{L}{f \times n}$$ main time in min

$L = l + l_a + l_u$ overall path length (feed path) in mm

$v_f = f \times n$ feed rate in mm/min

$f = f_z \times z$ feed per revolution in mm

Drilling

$$P_a = \frac{v_c \times f \times D \times k_c}{1000 \times 60 \times 4 \times \eta} \qquad P_a = \frac{P_c}{\eta}$$ drive power in kW

$$P_c = \frac{F_c \times v_c}{60000} \qquad P_c = \frac{M_d \times n}{9554}$$ spindle capacity in kW

$$F_f \approx 0{,}7 \times \frac{D}{2} \times f \times k_c$$ feed force in N

$$F_c = \frac{D}{2} \times f_z \times z \times k_c$$ cutting force in N

$$M_d = \frac{F_c \times \frac{D}{4}}{1000}$$ torque in Nm

Performation Calculation

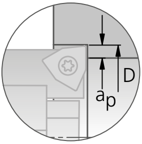
Roughing, fine boring, reaming, coutersinking

$$P_a = \frac{a_p \times f \times k_c \times n\,(D - a_p)}{2000 \times 9550 \times \eta} \qquad P_a = \frac{P_c}{\eta}$$ drive power in kW

$$P_c = \frac{f_c \times v_c \times (1 + \frac{d}{D})}{1000}$$ spindle capacity in kW

$$F_f \approx 0{,}7 \times a_p \times f \times k_c$$ feed force in N

$$M_d = \frac{f_c \times (D - d)}{4000}$$ torque in Nm



a_p = cutting width in mm
f = feed in mm/rev
k_c = special cutting force in N/mm²
D = diameter in mm
n = spindle speed in min^{-1}
η = machine output 0,7-0,85 (0,8)

Special cutting force k_c

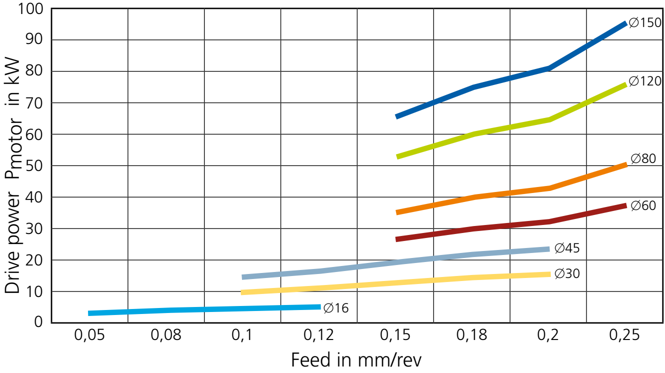
The k_c values depend on the feed rate. The table therefore shows the upper limits for these. This means the performance figure calculated may be slightly higher (~ 10 – 20%) than the actual performance required. This is necessary because of the variation in the effective level and provides a safeguard against bad results.

	Material group	Strength Rm (N/mm^2)	Hardness HB	Material *Material example material code/DIN*	Special cutting force k_c (N/mm^2)
P	1.0	≤ 500		non-alloy steels *St37-2/1.0037; 9SMn28/1.0715; St44-2/1.0044*	1740
	2.0	500-900		non-alloy / low alloy steels *St52-2/1.0050; C55/1.0525; 16MnCr5/1.7131*	2060
	2.1	< 500		lead alloys *9SMnPb28/1.0718*	1250
	3.0	> 900		non alloy / low alloy steels: heat resistant structural, heat treated, nitride and tools steels *42CrMo4/1.7225; CK60/1.1221*	2450
	4.0	> 900		high alloy steels *X6CrMo4/1.2341; X165CrMoV12/1.2601*	1820
	4.1			HSS	1860
S	5.0		250	special alloys *Inconel 718/2.4668; Nimonic 80A/2.4631*	2090
	5.1	400		titanium, titanium alloys *TiAl5Sn2/3.7114*	1370
M	6.0	≤ 600		stainless steels *X2CrNi189/1.4306; X5CrNiMo1810/1.4401*	2400
	6.1	< 900		stainless steels *X8CrNb17/1.4511; X10CrNiMoTi1810/1.4571*	2530
	7.0	> 900		stainless / fireproof steels *X10CrAl7/1.4713; X8CrS-38-18/1.4862*	2580
K	8.0		180	gray cast iron *GG-25/0.6025; GG-35/0.6035*	1140
	8.1		250	alloy gray cast iron *GG-NiCr202/0.6660*	1280
	9.0	≤ 600	130	spheroidal graphite cast iron (ferritic) *GGG-40/0.7040*	1080
	9.1		230	spheroidal graphite cast iron (ferritic/perlitic) *GGG-50/0.7050; GGG-55/0.7055; GTW-55/0.8055*	1135
	10.0	> 600	250	spheroidal graphite cast iron (perlitic), malleable iron *GGG-60/0.7060; GTS-65/0.8165*	1050
	10.1		200	alloyed spheroidal graphite cast iron *GGG-NiCr20-2/0.7661*	1180
	10.2		300	vermicular cast iron *GGV Ti<0,2; GGV Ti>0,2*	1050
N	12.0		90	copper alloy, brass, lead-alloy bronze, lead bronze (good cut) *CuZn36Pb3/2.1182; G-CuPb15Sn/2.1182*	780
	12.1		100	copper alloy, brass, bronze (average cut) *CuZn40Al1/2.0550; E-Cu57/2.0060*	780
	13.0		60	wrought aluminium alloys *AlMg1/3.3315; AlMnCu/3.0517*	650
	13.1		75	cast aluminium alloy (Si-content <10%), magnesium alloy *G-AlMg5/3.3561; G-AlSi9Mg/3.2373*	780
	14.0		100	cast aluminium alloy (Si-content >10%) *G-AlSi10Mg/3.2381*	830
H	15.0	1400		hardened steels (< 45 HRC)	2880
	16.0	1800		hardened steels (> 45 HRC)	3300

Performation Calculation

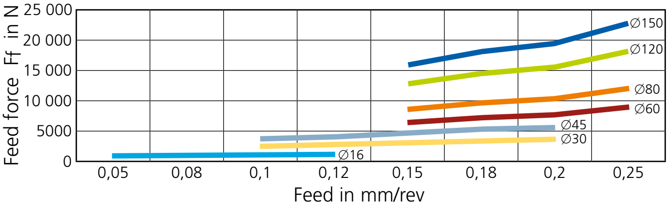
Drive power kW

Cutting speed v_C: 200 m/min
Material: 42CrMo4V, ~ 1100 N/mm²
Specific cutting force k_C1.1: ~ 2450 N/mm²



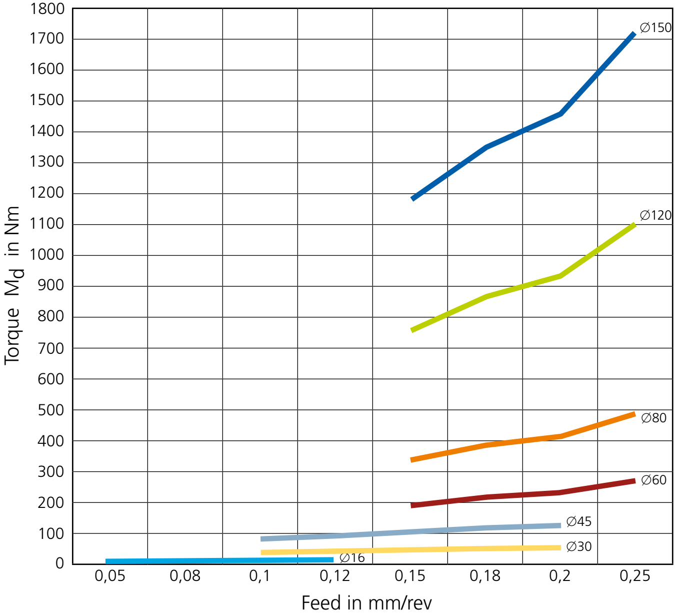
Feed force F_f

Cutting speed v_C: 200 m/min
Material: 42CrMo4V, ~ 1100 N/mm²
Specific cutting force k_C1.1: ~ 2450 N/mm²



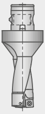
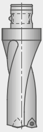
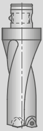
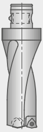
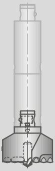
Torque M_d

Cutting speed v_c: 200 m/min
Material: 42CrMo4V, ~ 1100 N/mm²
Specific cutting force k_c1.1: ~ 2450 N/mm²



Index Drilling

	KOMET KUB® Drillmax	JEL® NCD Drillmax 90 JEL® PKD Drillmax 90 JEL® PKD Drillmax	JEL® Drillcut 24 JEL® Drillmax 22 JEL® Dreammax	KOMET KUB K2®	
Machining options	▸ 30	▸ 36	▸ 38 / 40	▸ 42	
Insert selection					
Guideline values: cutting speed v_c feed f	▸ 32 – 35	▸ 37	▸ 39 / 41	▸ 43	
Guideline values: higher cutting speed v_c insert coating					
Chip formation					
Technical notes	▸ 88 – 89			▸ 90 – 91	
Problem Possible causes – Solutions					
Dimensional variation					
Starting / roughing sizes				▸ 112	

	KOMET KUB Quatron® 	KOMET® KUB Pentron® 	KOMET KUB Trigon® 	KOMET KUB® drill 	KOMET KUB® drill adjustable 	KOMET® KUB Centron® Powerline 	KOMET® KUB Centron® 	KOMET KUB® V464 	KOMET® KUB Duon® 
	▶ 44	▶ 50	▶ 60	▶ 66	▶ 68	▶ 70	▶ 76	▶ 76	▶ 82
	▶ 45	▶ 51	▶ 61	▶ 61	▶ 61	▶ 71	▶ 77	▶ 77	▶ 83
	▶ 46 – 47	▶ 52 – 59	▶ 62 – 63	▶ 67	▶ 69	▶ 72 – 75	▶ 78	▶ 79	▶ 84
	▶ 48 – 49		▶ 64 – 65	▶ 64 – 65	▶ 64 – 65		▶ 64 – 65	▶ 64 – 65	
	▶ 81		▶ 80-81	▶ 80-81					
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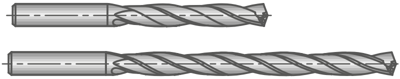
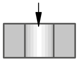
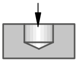
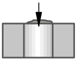
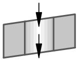
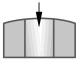
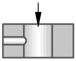
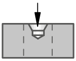
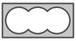
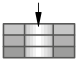
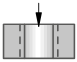
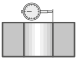
	▶ 106 – 107		▶ 106 – 107	▶ 106 – 107	▶ 106 – 107		▶ 108 – 109		▶ 110 – 111
		▶ 112		▶ 112	▶ 112		▶ 112		
	▶ 113	▶ 113		▶ 113	▶ 113		▶ 113		▶ 113

KOMET KUB® Drillmax, KUB® Drillmax XL

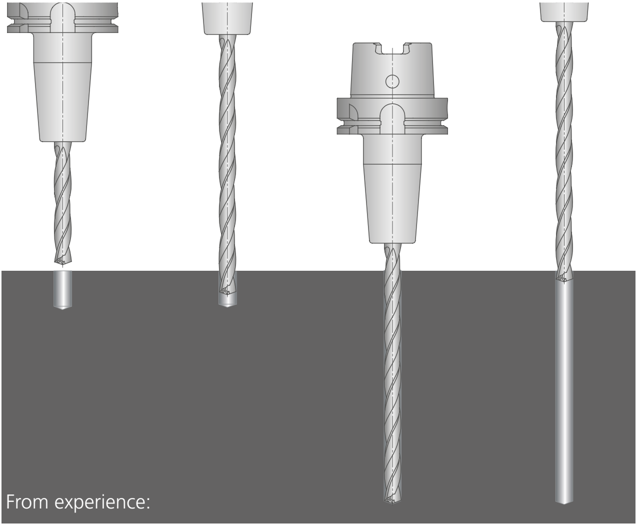
Machining options



	Machining	5×D 7-8×D	12×D	20×D 30×D
	solid drilling	●	●	
	blind hole	●	●	
	forge /casting skin, interface	◐	◐	
	angled start and drilling out, interrupted cut	○	○	
	convex	○	○	
	cross bore	○	◐	
	centering bore, seam	○	✕	
	chamber	✕	✕	
	stack plate drilling	◐	✕	
	rough boring	○	✕	
	adjustable	✕	✕	

Warning! A pilot hole must always be drilled. Direct spot drilling is not possible, even on a machined spot-drill surface. Angled surfaces or unmachined spot-drill surfaces must also be faced or spot faced for the pilot drilling tool.

● very good ◐ good ○ possible: see technical notes ▸ 88 ✕ not possible



1. Pilot hole

Drilling depth 2 – 3 × D

2. Start with deep-hole drill

Enter the pilot hole at a reduced cutting speed v_C = 20-30 m/min at the working feed rate.
Just before reaching the bottom of the pilot hole, stop feeding and increase the speed to the cycle speed without stopping.

3. Increase the deep-hole drilling

Feed rate to the cycle speed. Drill to the required hole depth without pecking. When drilling a through hole, reduce the feed rate by 50 % when the drill tip exits at through holes – risk of chipping.

4. Back out of the hole

Once the final drilling depth is reached, withdraw the tool 2-3 mm, then reduce the cutting speed to v_C = 20-30 m/min and withdraw at v_f = 3000 mm/min until the pilot hole depth.
Then back out from the hole at n = 300 rpm v_f = 3000 mm/min.

KOMET KUB ® Drillmax

Guideline values for solid drilling

Material group	Selection: L.H. fold page	Cutting speed v_c (m/min)			5×D, 7-8×D Feed f (mm/rev) ∅ 3,0–5,0			∅ 5,1–8,0			∅ 8,1–10,0		
		min	opt.	max	min	opt.	max	min	opt.	max	min	opt.	max
P	1.0	95	**115**	135	0,08	**0,14**	0,20	0,15	**0,20**	0,25	0,15	**0,23**	0,30
P	2.0	70	**85**	100	0,06	**0,12**	0,18	0,12	**0,17**	0,22	0,15	**0,20**	0,25
P	2.1	70	**85**	100	0,06	**0,12**	0,18	0,10	**0,18**	0,25	0,20	**0,28**	0,35
P	3.0	70	**75**	80	0,05	**0,10**	0,15	0,10	**0,15**	0,20	0,12	**0,19**	0,25
P	4.0	45	**60**	75	0,05	**0,09**	0,13	0,10	**0,14**	0,18	0,12	**0,18**	0,23
P	4.1												
S	5.0												
S	5.1												
M	6.0	40	**55**	70	0,06	**0,12**	0,18	0,12	**0,17**	0,22	0,15	**0,20**	0,25
M	6.1	25	**45**	65	0,05	**0,08**	0,10	0,09	**0,15**	0,20	0,11	**0,17**	0,22
M	7.0	15	**30**	40	0,05	**0,08**	0,10	0,06	**0,10**	0,14	0,08	**0,13**	0,18
K	8.0	90	**115**	140	0,10	**0,18**	0,25	0,15	**0,23**	0,30	0,20	**0,30**	0,40
K	8.1	70	**95**	120	0,10	**0,18**	0,25	0,15	**0,23**	0,30	0,20	**0,30**	0,40
K	9.0	100	**120**	140	0,08	**0,14**	0,20	0,15	**0,20**	0,25	0,15	**0,23**	0,30
K	9.1	80	**100**	120	0,06	**0,12**	0,18	0,10	**0,15**	0,20	0,14	**0,20**	0,25
K	10.0	70	**90**	110	0,06	**0,12**	0,18	0,10	**0,15**	0,20	0,14	**0,20**	0,25
K	10.1	60	**70**	80	0,06	**0,12**	0,18	0,10	**0,15**	0,20	0,14	**0,20**	0,25
K	10.2	60	**70**	80	0,06	**0,12**	0,18	0,10	**0,15**	0,20	0,14	**0,20**	0,25
N	12.0												
N	12.1												
N	13.0												
N	13.1												
N	14.0												
H	15.0												
H	16.0												

	5×D, 7-8×D								
	Feed f (mm/rev)								
	∅ 10,1–12,0			∅12,1–14,0			∅14,1–16,0		
	min	**opt.**	max	min	**opt.**	max	min	**opt.**	max
	0,20	**0,28**	0,35	0,25	**0,33**	0,40	0,30	**0,38**	0,45
	0,18	**0,24**	0,30	0,20	**0,28**	0,35	0,30	**0,44**	0,48
	0,25	**0,33**	0,40	0,30	**0,38**	0,45	0,35	**0,44**	0,52
	0,15	**0,23**	0,30	0,20	**0,28**	0,35	0,25	**0,33**	0,40
	0,15	**0,22**	0,28	0,18	**0,25**	0,32	0,20	**0,28**	0,35
	0,18	**0,24**	0,30	0,20	**0,28**	0,35	0,22	**0,31**	0,40
	0,14	**0,20**	0,25	0,16	**0,23**	0,30	0,20	**0,28**	0,35
	0,12	**0,17**	0,22	0,14	**0,20**	0,26	0,16	**0,23**	0,30
	0,25	**0,33**	0,40	0,25	**0,35**	0,45	0,30	**0,40**	0,50
	0,25	**0,33**	0,40	0,25	**0,35**	0,45	0,30	**0,40**	0,50
	0,20	**0,28**	0,35	0,25	**0,33**	0,40	0,30	**0,38**	0,45
	0,18	**0,24**	0,30	0,20	**0,28**	0,35	0,25	**0,33**	0,40
	0,18	**0,24**	0,30	0,20	**0,28**	0,35	0,25	**0,33**	0,40
	0,18	**0,24**	0,30	0,20	**0,28**	0,35	0,25	**0,33**	0,40
	0,18	**0,24**	0,30	0,20	**0,28**	0,35	0,25	**0,33**	0,40

Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB ® Drillmax XL

Guideline values for solid drilling

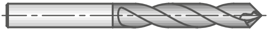
Material group	Selection: L.H. fold page	12×D											
		Cutting speed v_c (m/min)			Feed f (mm/rev)								
					∅ 3,0–6,0			∅ 6,1–10,0			∅ 10,1–12,0		
		min	opt.	max	min	opt.	max	min	opt.	max	min	opt.	max
P	1.0	60	**85**	100	0,15	**0,20**	0,25	0,20	**0,30**	0,35	0,25	**0,35**	0,40
P	2.0	60	**80**	100	0,08	**0,10**	0,15	0,15	**0,20**	0,25	0,20	**0,30**	0,40
P	2.1	60	**85**	100	0,08	**0,10**	0,15	0,15	**0,20**	0,25	0,20	**0,30**	0,40
P	3.0	60	**75**	90	0,08	**0,10**	0,15	0,15	**0,20**	0,25	0,20	**0,30**	0,40
P	4.0												
P	4.1												
S	5.0												
S	5.1	30	**35**	50	0,04	**0,05**	0,06	0,08	**0,10**	0,12	0,12	**0,15**	0,18
M	6.0												
M	6.1												
M	7.0												
K	8.0	60	**80**	100	0,10	**0,15**	0,18	0,18	**0,20**	0,25	0,25	**0,35**	0,40
K	8.1	60	**80**	100	0,10	**0,15**	0,18	0,15	**0,20**	0,25	0,25	**0,30**	0,35
K	9.0	40	**70**	90	0,10	**0,12**	0,15	0,15	**0,20**	0,25	0,20	**0,25**	0,30
K	9.1	40	**70**	90	0,08	**0,10**	0,12	0,12	**0,18**	0,20	0,15	**0,20**	0,25
K	10.0	35	**65**	80	0,06	**0,10**	0,12	0,15	**0,20**	0,25	0,15	**0,20**	0,25
K	10.1	35	**65**	80	0,06	**0,10**	0,12	0,15	**0,20**	0,25	0,15	**0,20**	0,25
K	10.2	35	**65**	80	0,06	**0,10**	0,12	0,15	**0,20**	0,25	0,15	**0,20**	0,25
N	12.0												
N	12.1												
N	13.0	80	**100**	120	0,15	0,20	0,35	0,20	**0,25**	0,40	0,20	**0,35**	0,40
N	13.1	80	**100**	120	0,20	0,35	0,45	0,25	**0,40**	0,60	0,25	**0,40**	0,60
N	14.0												
H	15.0												
H	16.0												

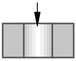
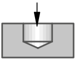
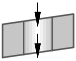
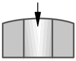
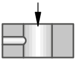
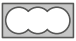
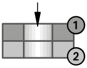
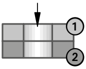
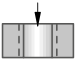
	20×D, 30×D											
	Cutting speed v_c (m/min)			Feed f (mm/rev)								
				∅3,0–4,0			∅4,1–6,0			∅6,1–10,0		
	min	**opt.**	max	min	**opt.**	max	min	**opt.**	max	min	**opt.**	max
	40	**85**	100	0,06	**0,10**	0,15	0,10	**0,20**	0,30	0,15	**0,25**	0,35
	40	**75**	100	0,06	**0,09**	0,12	0,10	**0,17**	0,25	0,15	**0,20**	0,25
	40	**85**	100	0,06	**0,10**	0,15	0,15	**0,25**	0,30	0,15	**0,25**	0,35
	35	**60**	80	0,06	**0,09**	0,12	0,10	**0,15**	0,20	0,15	**0,20**	0,25
	40	**70**	85	0,07	**0,11**	0,15	0,18	**0,24**	0,30	0,20	**0,25**	0,35
	40	**70**	85	0,07	**0,11**	0,15	0,18	**0,24**	0,30	0,20	**0,25**	0,35
	35	**65**	80	0,06	**0,10**	0,15	0,15	**0,20**	0,25	0,15	**0,25**	0,30
	35	**65**	80	0,06	**0,10**	0,15	0,15	**0,20**	0,25	0,15	**0,25**	0,30
	35	**65**	80	0,06	**0,10**	0,15	0,15	**0,20**	0,25	0,15	**0,25**	0,30
	35	**65**	80	0,06	**0,09**	0,12	0,15	**0,20**	0,25	0,15	**0,25**	0,30

Important: For more application details and safety notes see ▶ 86-87!

JEL® Drillmax

Machining options

	NCD High-performance drill Drillmax 90
	PCD High-performance drill Drillmax 90
	PCD High-performance drill Drillmax

	Machining	NCD Drillmax 90	PCD Drillmax 90	PCD Drillmax
	solid drilling	●	●	●
	blind hole	●	●	●
	angled start and drilling out, interrupted cut	●	●	◐
	convex	●	●	◐
	cross bore	●	●	●
	chamber	●	●	●
	stacks material ① CFRP – ② Al	✕	○	●
	stacks material ① Al – ② CFRP	◐	●	✕
	rough boring	●	●	●

● very good ◐ good ○ possible ✕ not possible

NCD Drillmax 90								
Cutting speed v_C (m/min) Feed f (mm/rev)	Ø 4 mm		Ø 6 mm		Ø 8 mm		Ø 10 mm	
	v_C	f	v_C	f	v_C	f	v_C	f
CFRP	100 - 200	0,04 - 0,08	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12
GFRP	100 - 200	0,04 - 0,10	100 - 300	0,06 - 0,15	100 - 300	0,06 - 0,18	100 - 300	0,06 - 0,20
CFRP/Al stacks	100 - 200	0,04 - 0,08	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12
Honeycombs	100 - 200	0,04 - 0,08	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12

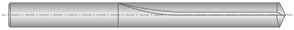
PCD Drillmax 90						
Cutting speed v_C (m/min) Feed f (mm/rev)	Ø 6 mm		Ø 8 mm		Ø 10 mm	
	v_C	f	v_C	f	v_C	f
CFRP	100 - 300	0,05 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12
GFRP	100 - 300	0,05 - 0,15	100 - 300	0,06 - 0,18	100 - 300	0,06 - 0,20
CFRP/Al stacks	100 - 300	0,05 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12
Honeycombs	100 - 300	0,05 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12

PCD Drillmax						
Cutting speed v_C (m/min) Feed f (mm/rev)	Ø 6 mm		Ø 8 mm		Ø 10 mm	
	v_C	f	v_C	f	v_C	f
CFRP	100 - 300	0,05 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12
GFRP	100 - 300	0,05 - 0,15	100 - 300	0,06 - 0,18	100 - 300	0,06 - 0,20
CFRP/Al stacks	100 - 300	0,05 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12
Honeycombs	100 - 300	0,05 - 0,12	100 - 300	0,06 - 0,12	100 - 300	0,06 - 0,12

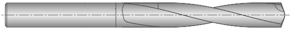
Important: For more application details and safety notes see ▸ 86-87!

JEL® Drillcut 24, Drillmax 22

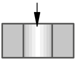
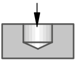
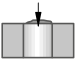
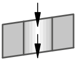
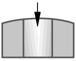
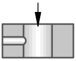
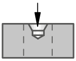
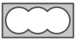
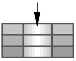
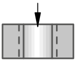
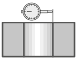
Machining options



PCD High-performance drill Drillcut 24



PCD High-performance drill Drillmax 22

	Machining	Drillcut 24	Drillmax 22
	solid drilling	●	●
	blind hole	●	●
	forge /casting skin, interface	○	○
	angled start and drilling out, interrupted cut	○	○
	convex	○	○
	cross bore	○	○
	centering bore, seam	○	○
	chamber	✕	✕
	stack plate drilling	○	○
	rough boring	✕	✕
	adjustable	✕	✕

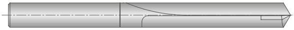
● very good ◐ good ○ possible ✕ not possible

Material group Selection: R.H. fold page		Drillcut 24 · Drillmax 22							
		∅ 5 - 6		∅ 6 - 8		∅ 8 - 10		∅ 10 - 12	
		v_c m/min	f_b mm/rev	v_c m/min	f_b mm/rev	v_c m/min	f_b mm/rev	v_c m/min	f_b mm/rev
P	1.1								
P	1.2								
P	1.3								
P	1.4								
P	1.5								
P	1.6								
H	1.7								
H	1.8								
M	2.1								
M	2.2								
M	2.3								
K	3.1								
K	3.2								
K	3.3								
K	3.4								
K	3.5								
K	3.6								
K	3.7								
S	4.1								
S	4.2								
S	4.3								
S	5.1								
S	5.2								
S	5.3								
N	6.1								
N	6.2	100-400	0,10-0,12	100-400	0,10-0,20	100-600	0,15-0,25	100-800	0,20-0,30
N	6.3								
N	6.4								
N	7.1	100-600	0,10-0,15	100-800	0,15-0,25	150-1000	0,20-0,30	150-1200	0,25-0,35
N	7.2	100-600	0,10-0,15	100-800	0,15-0,25	150-1000	0,20-0,30	150-1200	0,25-0,35
N	7.3	100-600	0,10-0,15	100-800	0,15-0,25	150-1000	0,20-0,30	150-1200	0,25-0,35
N	7.4	100-600	0,10-0,15	100-800	0,15-0,25	150-1000	0,20-0,30	150-1200	0,25-0,35
N	7.5	100-600	0,10-0,15	100-800	0,15-0,25	150-1000	0,20-0,30	150-1200	0,25-0,35
N	8.1								
N	8.2								
N	8.3	150-400	0,10-0,20	150-600	0,15-0,30	250-800	0,20-0,40	250-1000	0,25-0,50

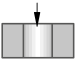
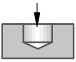
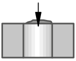
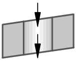
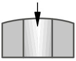
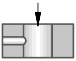
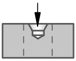
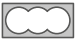
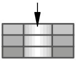
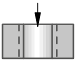
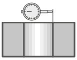
v_c = Cutting speed · f_b = Drilling feed

Important: For more application details and safety notes see ▸86-87!

JEL ® Dreammax
Machining options



Drill reamer Dreammax

	Machining	Dreammax
	solid drilling	●
	blind hole	●
	forge /casting skin, interface	○
	angled start and drilling out, interrupted cut	○
	convex	○
	cross bore	○
	centering bore, seam	○
	chamber	✕
	stack plate drilling	○
	rough boring	○
	adjustable	✕

● very good ◐ good ○ possible ✕ not possible

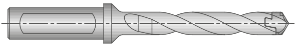
Material group (Selection: R.H. fold page)		Dreammax			
		v_c (m/min)	∅ 6 - 8 f_z (mm/tooth)	∅ 8 - 10 f_z (mm/tooth)	∅ 10 - 12 f_z (mm/tooth)
P	1.1				
	1.2				
	1.3				
	1.4				
	1.5				
	1.6				
H	1.7				
	1.8				
M	2.1				
	2.2				
	2.3				
K	3.1	30 - 60	0,03 - 0,10	0,04 - 0,10	0,07 - 0,10
	3.2	30 - 60	0,03 - 0,10	0,04 - 0,10	0,07 - 0,10
	3.3				
	3.4	30 - 60	0,03 - 0,10	0,04 - 0,10	0,07 - 0,10
	3.5				
	3.6				
	3.7				
S	4.1				
	4.2				
	4.3				
	5.1				
	5.2				
	5.3				
N	6.1				
	6.2				
	6.3				
	6.4				
	7.1				
	7.2	50 - 100	0,05 - 0,12	0,06 - 0,15	0,07 - 0,15
	7.3	50 - 100	0,05 - 0,12	0,06 - 0,15	0,07 - 0,15
	7.4				
	7.5				
	8.1				
	8.2				
	8.3				

v_c = Cutting speed · f_z = Milling feed

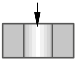
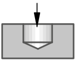
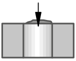
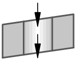
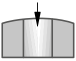
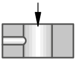
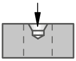
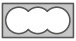
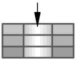
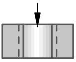
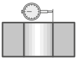
Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB K2®

Machining options

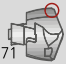


*** Please note:** Technical notes page 91, position 15.

	Machining	3×D	5×D	7×D*
	solid drilling	●	●	●
	blind hole	●	●	●
	forge /casting skin, interface	○	○	○
	angled start and drilling out, interrupted cut	○	○	○
	convex	✕	✕	✕
	cross bore	✕	✕	✕
	centering bore, seam	●	●	●
	chamber	✕	✕	✕
	stack plate drilling	●	●	●
	rough boring	✕	✕	✕
	adjustable	✕	✕	✕

● very good ◐ good ○ possible: see technical notes ▸ 90 ✕ not possible

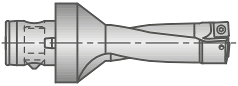
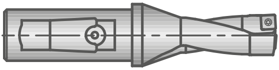
Guideline values for solid drilling

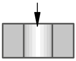
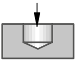
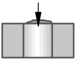
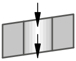
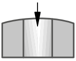
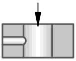
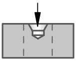
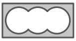
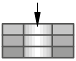
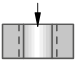
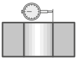
Material group Selection: L.H. fold page		v_c (m/min) Cutting speed												f (mm/rev) Feed					
		 H70 BK8425			 H70 BK2725			 H71 BK2725			 H72 BK7930			3×D / 5×D ∅10-20,5			7×D ∅10-20,5		
		min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
P	1.0	100	**120**	140				100	**120**	140				0,15	**0,18**	0,22	0,16	**0,18**	0,20
P	2.0	100	**120**	140	100	**120**	140	100	**120**	140				0,15	**0,20**	0,25	0,15	**0,18**	0,22
P	2.1	80	**100**	120	80	**100**	120	80	**100**	120				0,20	**0,25**	0,30	0,18	**0,22**	0,28
P	3.0	70	**90**	110	70	**90**	110	70	**90**	110				0,20	**0,25**	0,30	0,18	**0,22**	0,28
P	4.0	50	**70**	90	50	**70**	90	50	**70**	90				0,15	**0,20**	0,25	0,14	**0,18**	0,22
P	4.1																		
S	5.0																		
S	5.1																		
M	6.0				40	**60**	80				40	**60**	80	0,10	**0,15**	0,20	0,08	**0,13**	0,18
M	6.1										30	**50**	70	0,10	**0,12**	0,14	0,08	**0,10**	0,12
M	7.0										30	**50**	70	0,10	**0,12**	0,14	0,08	**0,10**	0,12
K	8.0	70	**90**	110				70	**90**	110				0,20	**0,30**	0,40	0,20	**0,28**	0,38
K	8.1	60	**80**	100				60	**80**	100				0,20	**0,30**	0,40	0,20	**0,28**	0,38
K	9.0	60	**80**	100				60	**80**	100				0,25	**0,35**	0,45	0,20	**0,30**	0,40
K	9.1	50	**70**	90				50	**70**	90				0,25	**0,35**	0,45	0,20	**0,30**	0,40
K	10.0	50	**70**	90				50	**70**	90				0,25	**0,35**	0,45	0,20	**0,30**	0,40
K	10.1	30	**50**	70				30	**50**	70				0,20	**0,25**	0,35	0,18	**0,22**	0,30
K	10.2	40	**60**	80				40	**60**	80				0,25	**0,35**	0,45	0,20	**0,30**	0,40
N	12.0																		
N	12.1																		
N	13.0																		
N	13.1																		
N	14.0																		
H	15.0																		
H	16.0																		

Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB Quatron ®

Machining options

	Machining	2×D	3×D
	solid drilling	●	●
	blind hole	●	●
	forge /casting skin, interface	●	●
	angled start and drilling out, interrupted cut	●	●
	convex	●	●
	cross bore	●	●
	centering bore, seam	●	●
	chamber	●	●
	stack plate drilling	●	●
	rough boring	◐	◐
	adjustable	◐	◐

● very good ◐ good ○ possible: see technical notes ▸ 92 ✕ not possible

	W83..01	W83..03	W83..13	W83..21
	 -01	 also as internal cutting -03 edge	 -13	 -21
Basic recommendation				
P	BK8425			
S	BK7935			BK7710
M				⚠ BK2730
K	BK7615			
N				BK7710
H	BK7615			
alternative for better chip control				
P		BK8430	BK8425	BK8430
S				BK7710
M		BK8430	BK7935	
K				
N				BK7710
H				
alternative for higher cutting speed ▶ 48-49				
P	BK6420	⚠ BK6730		
S				
M	BK74	⚠ BK6730		⚠ BK6130
K	BK6115			
N				
H				
alternative for greater strength				
P	BK7935			
S				
M				BK8430
K	BK6420			
N				
H				

⚠ only as external cutting edge (recommendation internal cutting edge: W83..01 in BK8425)

Guideline values for solid drilling with KUB Quatron® ▶46-47

KOMET KUB Quatron ®

Guideline values for solid drilling

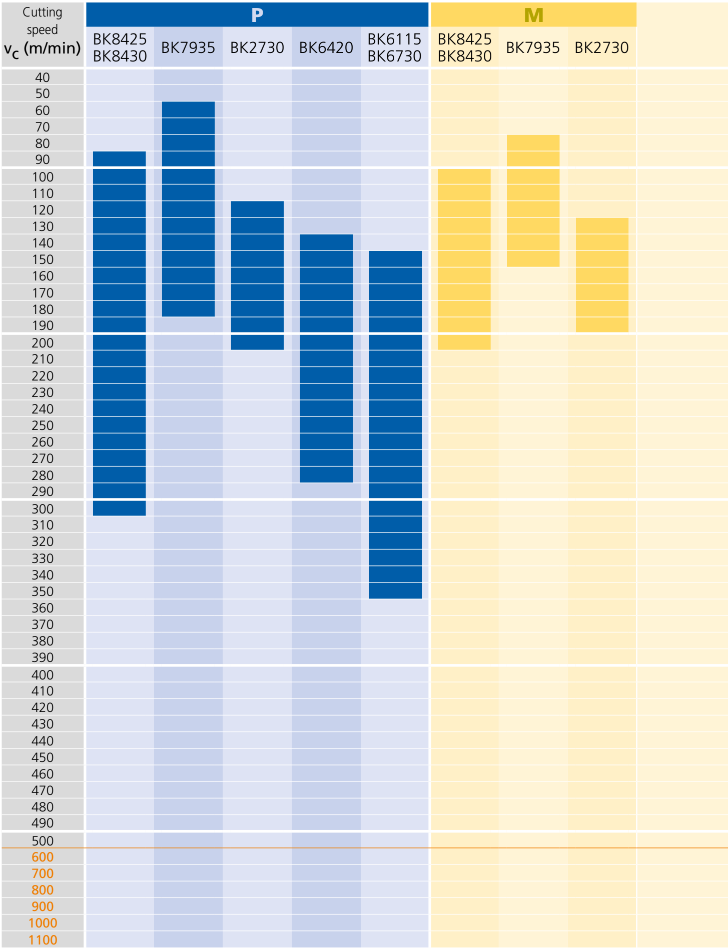
Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	2×D max. feed f (mm/rev)							
			Ø 14 – 15,9	Ø 16 – 17,5	Ø 17,6 – 21,5	Ø 21,6 – 27	Ø 28 – 33	Ø 34 – 44	Ø 45 – 54	Ø 55 – 65
P	1.0	300	0,10	0,12	0,12	0,14	0,14	0,14	0,14	0,14
P	2.0	250	0,12	0,14	0,16	0,20	0,20	0,25	0,20	0,20
P	2.1	300	0,14	0,16	0,18	0,25	0,25	0,30	0,25	0,25
P	3.0	200	0,14	0,16	0,18	0,20	0,20	0,25	0,20	0,20
P	4.0	180	0,10	0,12	0,14	0,18	0,18	0,20	0,18	0,18
P	4.1	80	0,08	0,10	0,12	0,14	0,16	0,18	0,14	0,16
S	5.0	60	0,06	0,08	0,10	0,12	0,12	0,12	0,12	0,12
S	5.1	80	0,06	0,08	0,10	0,12	0,12	0,12	0,12	0,12
M	6.0	180	0,08	0,10	0,12	0,14	0,14	0,16	0,14	0,14
M	6.1	160	0,08	0,08	0,12	0,16	0,16	0,20	0,16	0,16
M	7.0	160	0,06	0,08	0,10	0,12	0,12	0,14	0,12	0,12
K	8.0	200	0,16	0,16	0,25	0,30	0,30	0,30	0,30	0,30
K	8.1	160	0,14	0,16	0,18	0,20	0,20	0,25	0,20	0,20
K	9.0	180	0,14	0,16	0,18	0,20	0,20	0,25	0,20	0,20
K	9.1	160	0,14	0,16	0,18	0,22	0,22	0,25	0,22	0,22
K	10.0	140	0,14	0,16	0,18	0,22	0,22	0,25	0,22	0,22
K	10.1	140	0,14	0,16	0,18	0,22	0,25	0,25	0,22	0,25
K	10.2	120	0,10	0,12	0,16	0,20	0,20	0,25	0,20	0,20
N	12.0	300	0,12	0,14	0,16	0,25	0,20	0,25	0,25	0,20
N	12.1	400	0,08	0,08	0,10	0,12	0,12	0,15	0,12	0,12
N	13.0	600	0,08	0,08	0,10	0,12	0,12	0,12	0,12	0,12
N	13.1	300	0,10	0,12	0,14	0,16	0,16	0,20	0,16	0,16
N	14.0	250	0,10	0,12	0,14	0,20	0,20	0,30	0,20	0,20
H	15.0	80	0,05	0,05	0,08	0,10	0,10	0,10	0,10	0,10
H	16.0	40	0,05	0,05	0,08	0,10	0,10	0,10	0,10	0,10

	3×D							
	max. feed f (mm/rev)							
	Ø 14 – 15,9	Ø 16 – 17,5	Ø 17,6 – 21,5	Ø 21,6 – 27	Ø 28 – 33	Ø 34 – 44	Ø 45 – 54	Ø 55 – 65
	0,10	0,12	0,12	0,14	0,14	0,14	0,14	0,14
	0,12	0,14	0,16	0,20	0,20	0,25	0,20	0,20
	0,14	0,16	0,18	0,25	0,25	0,30	0,25	0,25
	0,14	0,16	0,18	0,20	0,20	0,25	0,20	0,20
	0,10	0,12	0,14	0,18	0,18	0,20	0,18	0,18
	0,08	0,10	0,12	0,14			0,14	
	0,06	0,08	0,10	0,12	0,12	0,12	0,12	0,12
	0,06	0,08	0,10	0,12	0,12	0,12	0,12	0,12
	0,08	0,10	0,12	0,14	0,14	0,16	0,14	0,14
	0,08	0,08	0,12	0,16	0,16	0,20	0,16	0,16
	0,06	0,08	0,10	0,12	0,12	0,14	0,12	0,12
	0,16	0,16	0,25	0,30	0,30	0,30	0,30	0,30
	0,14	0,16	0,18	0,20	0,20	0,25	0,20	0,20
	0,14	0,16	0,18	0,20	0,20	0,25	0,20	0,20
	0,14	0,16	0,18	0,22	0,22	0,25	0,22	0,22
	0,14	0,16	0,18	0,22	0,22	0,25	0,22	0,22
	0,14	0,16	0,18	0,22	0,25	0,25	0,22	0,25
	0,10	0,12	0,16	0,20	0,20	0,25	0,20	0,20
	0,12	0,14	0,16	0,25	0,20	0,25	0,25	0,20
	0,08	0,08	0,10	0,12	0,12	0,15	0,12	0,12
	0,08	0,08	0,10	0,12	0,12	0,12	0,12	0,12
	0,10	0,12	0,14	0,16	0,16	0,20	0,16	0,16
	0,10	0,12	0,14	0,20	0,20	0,30	0,20	0,20
	0,05	0,05	0,08	0,10	0,10	0,10	0,10	0,10
	0,05	0,05	0,08	0,10	0,10	0,10	0,10	0,10

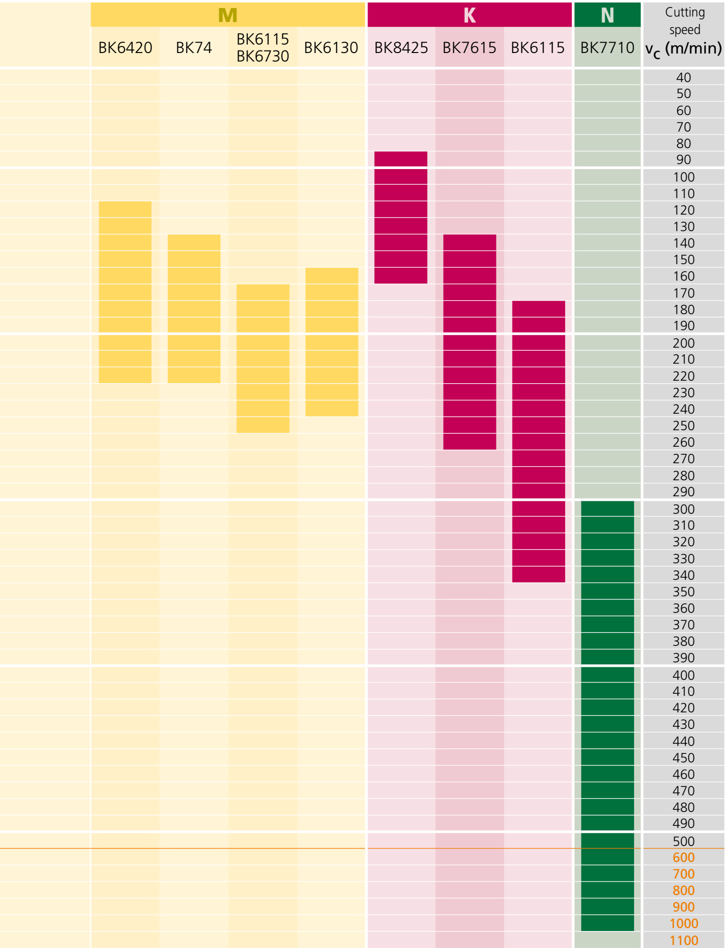
Important: For more application details and safety notes see ▶ 86-87!

KOMET KUB Quatron ®

Guideline values for solid drilling



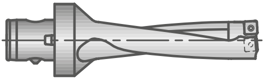
Guideline values for solid drilling

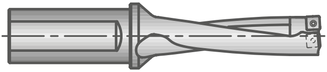


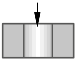
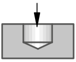
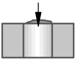
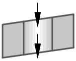
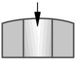
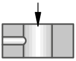
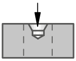
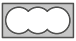
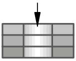
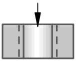
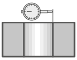
Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB Pentron®

Machining options





	Machining	4×D	5×D
	solid drilling	●	●
	blind hole	●	●
	forge /casting skin, interface	◐	◐
	angled start and drilling out, interrupted cut	◐	◐
	convex	◐	◐
	cross bore	◐	◐
	centering bore, seam	◐	◐
	chamber	○	✕
	stack plate drilling	◐	◐
	rough boring	✕	✕
	adjustable	◐	◐

● very good ◐ good ○ possible: see technical notes ▸ 98 ✕ not possible

	W80..01	W80..03
		
	Basic recommendation	
P	BK8425	BK8430
S		
M	BK2730	BK8430
K	⚠ BK6115	
N	BK7710	
H		
	alternative for better chip control	
P		
S		
M		
K		
N		
H		
	alternative for higher cutting speed	
P	BK6425	
S		
M	⚠ BK6115	
K		
N		
H		
	alternative for greater strength	
P		
S		
M		
K		
N		
H		

⚠ only as external cutting edge (recommendation internal cutting edge: BK8425)

Guideline values for solid drilling with KUB Pentron ® ▸ 52-59

KOMET KUB Pentron®

Guideline values for solid drilling

4×D

Material group (Selection: L.H. fold page)		BK8425			BK2730			BK6425			BK6115			BK7710		
		v_c (m/min) Cutting speed														
																
		min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
P	1.0	200	**260**	320	200	**250**	300	270	**320**	370	250	**300**	350			
	2.0	250	**270**	300	250	**270**	300	250	**280**	320	250	**270**	300			
	2.1	200	**260**	320	160	**220**	280	270	**320**	370	250	**300**	350			
	3.0	140	**180**	220	120	**160**	200	220	**260**	300	200	**240**	280			
	4.0	120	**160**	200	100	**140**	180	190	**220**	250	170	**200**	230			
	4.1	50	**70**	90	40	**60**	80	80	**100**	120	70	**90**	110			
S	5.0															
	5.1															
M	6.0	150	**170**	210	140	**180**	220	190	**220**	250	210	**240**	270			
	6.1	120	**150**	200	120	**160**	200	170	**200**	230	190	**220**	250			
	7.0	110	**150**	190	120	**160**	200	170	**200**	230	190	**220**	250			
K	8.0	140	**180**	220	120	**160**	200	150	**200**	250	160	**240**	320			
	8.1	120	**150**	180	100	**130**	160	100	**140**	180	100	**140**	180			
	9.0	140	**180**	220	120	**160**	200	120	**160**	200	120	**160**	200			
	9.1	120	**150**	180	110	**130**	160	100	**140**	180	100	**140**	180			
	10.0	110	**140**	170	90	**120**	150	90	**120**	150	90	**120**	150			
	10.1	110	**140**	170	90	**120**	150	90	**120**	150	90	**120**	150			
	10.2	90	**110**	130	80	**100**	120	70	**100**	130	70	**100**	130			
N	12.0	150	**200**	250	150	**200**	250							150	**250**	350
	12.1	200	**300**	400	200	**300**	400							250	**350**	450
	13.0	300	**400**	500	300	**400**	500							300	**500**	700
	13.1	180	**250**	320	180	**250**	320							210	**280**	350
	14.0	150	**200**	250	150	**200**	250							140	**220**	300
H	15.0															
	16.0															

Material group	Selection: L.H. fold page	4×D Feed f (mm/rev) Ø14,0-15,0 min.	opt.	max.	Ø15,1-16,0 min.	opt.	max.	Ø16,1-17,0 min.	opt.	max.	Ø17,1-18,0 min.	opt.	max.	Ø18,1-19,0 min.	opt.	max.	Ø19,1-20,0 min.	opt.	max.
P	1.0	0,04	**0,06**	0,08	0,04	**0,07**	0,08	0,05	**0,07**	0,10	0,06	**0,09**	0,12	0,05	**0,07**	0,10	0,05	**0,07**	0,10
P	2.0	0,04	**0,06**	0,08	0,04	**0,08**	0,09	0,10	**0,12**	0,14	0,10	**0,12**	0,14	0,10	**0,12**	0,15	0,10	**0,12**	0,15
P	2.1	0,06	**0,08**	0,12	0,08	**0,11**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16
P	3.0	0,06	**0,08**	0,12	0,08	**0,12**	0,16	0,11	**0,14**	0,16	0,11	**0,14**	0,16	0,11	**0,14**	0,16	0,11	**0,14**	0,16
P	4.0	0,06	**0,08**	0,12	0,06	**0,10**	0,12	0,10	**0,12**	0,14	0,10	**0,12**	0,15	0,09	**0,12**	0,15	0,09	**0,12**	0,15
P	4.1		–			–			–			–			–			–	
S	5.0	on request																	
S	5.1	on request																	
M	6.0	0,06	**0,08**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12
M	6.1	0,06	**0,08**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12
M	7.0	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10
K	8.0	0,08	**0,12**	0,16	0,10	**0,15**	0,18	0,10	**0,15**	0,18	0,10	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
K	8.1	0,08	**0,10**	0,14	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
K	9.0	0,08	**0,12**	0,16	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
K	9.1	0,08	**0,12**	0,16	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
K	10.0	0,08	**0,12**	0,16	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
K	10.1	0,08	**0,12**	0,14	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
K	10.2	0,08	**0,10**	0,12	0,09	**0,12**	0,15	0,09	**0,12**	0,15	0,09	**0,12**	0,15	0,09	**0,12**	0,15	0,09	**0,12**	0,15
N	12.0	0,08	**0,10**	0,12	0,08	**0,11**	0,13	0,10	**0,12**	0,14	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15
N	12.1	0,08	**0,10**	0,12	0,08	**0,10**	0,14	0,08	**0,11**	0,15	0,08	**0,11**	0,15	0,08	**0,11**	0,13	0,08	**0,11**	0,15
N	13.0	0,08	**0,10**	0,12	0,08	**0,10**	0,14	0,08	**0,11**	0,15	0,08	**0,11**	0,15	0,08	**0,11**	0,13	0,08	**0,11**	0,15
N	13.1	0,08	**0,10**	0,14	0,10	**0,12**	0,16	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15
N	14.0	0,10	**0,12**	0,15	0,10	**0,14**	0,16	0,12	**0,14**	0,17	0,13	**0,15**	0,17	0,13	**0,16**	0,18	0,13	**0,16**	0,18
H	15.0	on request																	
H	16.0	on request																	

Important: For more application details and safety notes see 86-87!

KOMET KUB Pentron ®

Guideline values for solid drilling

4×D

Material group	Selection: L.H. fold page	4×D														
		Feed f (mm/rev)														
		Ø20,1-22,0			Ø22,1-23,0			Ø23,1-24,0			Ø24,1-25,0			Ø25,1-26,0		
		min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
P	1.0	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12
P	2.0	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16
P	2.1	0,13	**0,15**	0,18	0,13	**0,15**	0,18	0,13	**0,15**	0,18	0,13	**0,15**	0,18	0,13	**0,15**	0,18
P	3.0	0,13	**0,15**	0,18	0,12	**0,16**	0,20	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22
P	4.0	0,12	**0,16**	0,20	0,13	**0,15**	0,18	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22
P	4.1		–			–			–			–			–	
S	5.0								on request							
S	5.1								on request							
M	6.0	0,10	**0,13**	0,15	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
M	6.1	0,10	**0,13**	0,15	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
M	7.0	0,09	**0,11**	0,13	0,09	**0,11**	0,13	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16
K	8.0	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,16	**0,20**	0,25	0,18	**0,22**	0,27	0,20	**0,25**	0,30
K	8.1	0,12	**0,16**	0,20	0,12	**0,16**	0,20	0,14	**0,18**	0,23	0,16	**0,20**	0,24	0,18	**0,23**	0,28
K	9.0	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,16	**0,20**	0,25	0,18	**0,22**	0,27	0,20	**0,25**	0,30
K	9.1	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,16	**0,20**	0,25	0,18	**0,22**	0,27	0,20	**0,25**	0,30
K	10.0	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,16	**0,20**	0,25	0,18	**0,22**	0,27	0,20	**0,25**	0,30
K	10.1	0,12	**0,16**	0,20	0,12	**0,16**	0,20	0,14	**0,18**	0,23	0,16	**0,20**	0,24	0,18	**0,23**	0,28
K	10.2	0,11	**0,15**	0,19	0,11	**0,15**	0,19	0,13	**0,17**	0,22	0,15	**0,19**	0,23	0,17	**0,22**	0,27
N	12.0	0,10	**0,13**	0,15	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
N	12.1	0,08	**0,11**	0,13	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
N	13.0	0,08	**0,11**	0,13	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
N	13.1	0,10	**0,13**	0,15	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
N	14.0	0,13	**0,16**	0,18	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21
H	15.0								on request							
H	16.0								on request							

4×D																	
Feed f (mm/rev)																	
∅26,1-28,0			∅28,1-30,0			∅30,1-33,0			∅33,1-37,0			∅37,1-42,0			∅42,1-46,0		
min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12
0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16
0,15	**0,18**	0,20	0,15	**0,18**	0,20	0,15	**0,18**	0,20	0,15	**0,18**	0,20	0,15	**0,18**	0,20	0,15	**0,18**	0,20
0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22
0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22
–			–			–			–			–			–		
on request																	
on request																	
0,10	**0,14**	0,18	0,10	**0,14**	0,18	0,10	**0,14**	0,18	0,10	**0,14**	0,18	0,10	**0,14**	0,18	0,10	**0,14**	0,18
0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16
0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30
0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28
0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30
0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30
0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30	0,20	**0,25**	0,30
0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28
0,17	**0,22**	0,27	0,17	**0,22**	0,27	0,17	**0,22**	0,27	0,17	**0,22**	0,27	0,17	**0,22**	0,27	0,17	**0,22**	0,27
0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21
on request																	
on request																	

Important: For more application details and safety notes see 86-87!

KOMET KUB Pentron ®

Guideline values for solid drilling 5×D

Material group	Selection: L.H. fold page	vc (m/min) Cutting speed														
		 BK8425			 BK2730			 BK6425			 BK6115			 BK7710		
		min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
P	1.0	200	**260**	320	200	**250**	300	270	**320**	370	250	**300**	350			
P	2.0	250	**270**	300	250	**270**	300	250	**280**	320	250	**270**	300			
P	2.1	200	**260**	320	160	**220**	280	270	**320**	370	250	**300**	350			
P	3.0	140	**180**	220	120	**160**	200	220	**260**	300	200	**240**	280			
P	4.0	120	**160**	200	100	**140**	180	190	**220**	250	170	**200**	230			
P	4.1	50	**70**	90	40	**60**	80	80	**100**	120	70	**90**	110			
S	5.0															
S	5.1															
M	6.0	150	**170**	210	140	**180**	220	190	**220**	250	210	**240**	270			
M	6.1	120	**150**	200	120	**160**	200	170	**200**	230	190	**220**	250			
M	7.0	110	**150**	190	120	**160**	200	170	**200**	230	190	**220**	250			
K	8.0	140	**180**	220	120	**160**	200	150	**200**	250	160	**240**	320			
K	8.1	120	**150**	180	100	**130**	160	100	**140**	180	100	**140**	180			
K	9.0	140	**180**	220	120	**160**	200	120	**160**	200	120	**160**	200			
K	9.1	120	**150**	180	110	**130**	160	100	**140**	180	100	**140**	180			
K	10.0	110	**140**	170	90	**120**	150	90	**120**	150	90	**120**	150			
K	10.1	110	**140**	170	90	**120**	150	90	**120**	150	90	**120**	150			
K	10.2	90	**110**	130	80	**100**	120	70	**100**	130	70	**100**	130			
N	12.0	150	**200**	250	150	**200**	250							150	**250**	350
N	12.1	200	**300**	400	200	**300**	400							250	**350**	450
N	13.0	300	**400**	500	300	**400**	500							300	**500**	700
N	13.1	180	**250**	320	180	**250**	320							210	**280**	350
N	14.0	150	**200**	250	150	**200**	250							140	**220**	300
H	15.0															
H	16.0															

Material group	Selection: L.H. fold page	5 × D inserting the drill at a reduced feed (-30%)																	
		Feed f (mm/rev)																	
		Ø14,0-15,0			Ø15,1-16,0			Ø16,1-17,0			Ø17,1-18,0			Ø18,1-19,0			Ø19,1-20,0		
		min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
P	1.0	0,04	**0,06**	0,08	0,06	**0,08**	0,09	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,05	**0,07**	0,10	0,05	**0,07**	0,10
P	2.0	0,04	**0,06**	0,08	0,06	**0,08**	0,10	0,08	**0,10**	0,13	0,08	**0,10**	0,13	0,08	**0,10**	0,13	0,08	**0,10**	0,13
P	2.1	0,06	**0,08**	0,12	0,08	**0,10**	0,12	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14
P	3.0	0,06	**0,08**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,08	**0,10**	0,13	0,08	**0,10**	0,13	0,08	**0,10**	0,13
P	4.0	0,06	**0,08**	0,12	0,08	**0,10**	0,12	0,09	**0,12**	0,15	0,09	**0,12**	0,15	0,09	**0,12**	0,15	0,09	**0,12**	0,15
P	4.1		–			–			–			–			–			–	
S	5.0	on request																	
S	5.1	on request																	
M	6.0	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10
M	6.1	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10
M	7.0	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10	0,06	**0,08**	0,10
K	8.0	0,08	**0,10**	0,14	0,08	**0,12**	0,15	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
K	8.1	0,08	**0,10**	0,14	0,08	**0,10**	0,13	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14
K	9.0	0,08	**0,10**	0,13	0,08	**0,12**	0,15	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
K	9.1	0,08	**0,10**	0,13	0,08	**0,12**	0,15	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
K	10.0	0,08	**0,10**	0,13	0,08	**0,12**	0,15	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
K	10.1	0,08	**0,10**	0,12	0,08	**0,10**	0,13	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14
K	10.2	0,06	**0,10**	0,12	0,06	**0,10**	0,13	0,07	**0,10**	0,14	0,07	**0,10**	0,14	0,07	**0,10**	0,14	0,07	**0,10**	0,14
N	12.0	0,08	**0,10**	0,12	0,08	**0,12**	0,14	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15
N	12.1	0,08	**0,10**	0,12	0,08	**0,10**	0,14	0,08	**0,11**	0,15	0,08	**0,11**	0,15	0,08	**0,11**	0,13	0,08	**0,11**	0,15
N	13.0	0,08	**0,10**	0,12	0,08	**0,10**	0,14	0,08	**0,11**	0,15	0,08	**0,11**	0,15	0,08	**0,11**	0,13	0,08	**0,11**	0,15
N	13.1	0,08	**0,10**	0,12	0,08	**0,12**	0,14	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15	0,10	**0,13**	0,15
N	14.0	0,10	**0,12**	0,15	0,12	**0,15**	0,17	0,13	**0,16**	0,18	0,13	**0,16**	0,18	0,13	**0,16**	0,18	0,13	**0,16**	0,18
H	15.0	on request																	
H	16.0	on request																	

Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB Pentron®

Guideline values for solid drilling

5×D

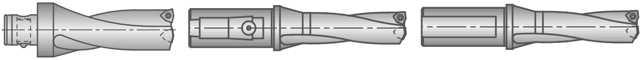
Material group	Selection: L.H. fold page	5 × D inserting the drill at a reduced feed (-30%) Feed f (mm/rev)														
		∅20,1-22,0			∅22,1-23,0			∅23,1-24,0			∅24,1-25,0			∅25,1-26,0		
		min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
P	1.0	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12	0,06	**0,09**	0,12
P	2.0	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14
P	2.1	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16	0,11	**0,13**	0,16
P	3.0	0,13	**0,15**	0,18	0,14	**0,18**	0,20	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22
P	4.0	0,12	**0,16**	0,20	0,13	**0,15**	0,18	0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,22
P	4.1		–			–			–			–			–	
S	5.0	on request														
S	5.1	on request														
M	6.0	0,09	**0,11**	0,13	0,09	**0,11**	0,13	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16
M	6.1	0,09	**0,11**	0,13	0,09	**0,11**	0,13	0,12	**0,14**	0,16	0,12	**0,14**	0,16	0,12	**0,14**	0,16
M	7.0	0,07	**0,09**	0,11	0,07	**0,09**	0,11	0,10	**0,12**	0,14	0,10	**0,12**	0,14	0,10	**0,12**	0,14
K	8.0	0,12	**0,16**	0,20	0,12	**0,16**	0,20	0,14	**0,18**	0,23	0,16	**0,20**	0,25	0,18	**0,23**	0,28
K	8.1	0,10	**0,14**	0,18	0,10	**0,14**	0,18	0,12	**0,16**	0,21	0,14	**0,18**	0,22	0,16	**0,21**	0,26
K	9.0	0,12	**0,16**	0,20	0,12	**0,16**	0,20	0,14	**0,18**	0,23	0,16	**0,20**	0,25	0,18	**0,23**	0,28
K	9.1	0,12	**0,16**	0,20	0,12	**0,16**	0,20	0,14	**0,18**	0,23	0,16	**0,20**	0,25	0,18	**0,23**	0,28
K	10.0	0,12	**0,16**	0,20	0,12	**0,16**	0,20	0,14	**0,18**	0,23	0,16	**0,20**	0,25	0,18	**0,23**	0,28
K	10.1	0,10	**0,12**	0,18	0,10	**0,14**	0,18	0,12	**0,16**	0,21	0,14	**0,18**	0,23	0,16	**0,21**	0,26
K	10.2	0,09	**0,11**	0,17	0,09	**0,13**	0,17	0,11	**0,15**	0,20	0,13	**0,17**	0,22	0,15	**0,20**	0,25
N	12.0	0,10	**0,13**	0,15	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
N	12.1	0,08	**0,11**	0,13	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
N	13.0	0,08	**0,11**	0,13	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
N	13.1	0,10	**0,13**	0,15	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
N	14.0	0,13	**0,16**	0,18	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21
H	15.0	on request														
H	16.0	on request														

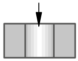
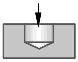
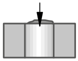
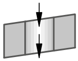
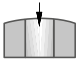
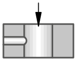
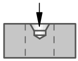
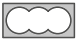
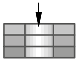
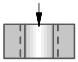
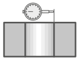
5 × D inserting the drill at a reduced feed (-30%)																	
Feed f (mm/rev)																	
∅26,1-28,0			∅28,1-30,0			∅30,1-33,0			∅33,1-37,0			∅37,1-42,0			∅42,1-46,0		
min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.	min.	**opt.**	max.
0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12	0,08	**0,10**	0,12
0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14	0,09	**0,11**	0,14
0,11	**0,15**	0,18	0,11	**0,15**	0,18	0,11	**0,15**	0,18	0,11	**0,15**	0,18	0,11	**0,15**	0,18	0,11	**0,15**	0,18
0,10	**0,15**	0,20	0,10	**0,15**	0,20	0,10	**0,15**	0,20	0,10	**0,15**	0,20	0,10	**0,15**	0,20	0,10	**0,15**	0,20
0,14	**0,18**	0,22	0,14	**0,18**	0,22	0,14	**0,18**	0,20	0,14	**0,18**	0,20	0,14	**0,18**	0,20	0,14	**0,18**	0,20
	–			–			–			–			–			–	
on request																	
on request																	
0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16	0,10	**0,14**	0,16
0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14	0,08	**0,11**	0,14
0,10	**0,12**	0,14	0,10	**0,12**	0,14	0,10	**0,12**	0,14	0,10	**0,12**	0,14	0,10	**0,12**	0,14	0,10	**0,12**	0,14
0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28
0,16	**0,20**	0,26	0,16	**0,20**	0,26	0,16	**0,20**	0,26	0,16	**0,20**	0,26	0,16	**0,20**	0,26	0,16	**0,20**	0,26
0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28
0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28
0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28	0,18	**0,23**	0,28
0,16	**0,21**	0,26	0,16	**0,21**	0,26	0,16	**0,21**	0,26	0,16	**0,21**	0,26	0,16	**0,21**	0,26	0,16	**0,21**	0,26
0,15	**0,20**	0,25	0,15	**0,20**	0,25	0,15	**0,20**	0,25	0,15	**0,20**	0,25	0,15	**0,20**	0,25	0,15	**0,20**	0,25
0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16	0,10	**0,13**	0,16
0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18	0,12	**0,15**	0,18
0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21	0,15	**0,18**	0,21
on request																	
on request																	

Important: For more application details and safety notes see ▸ 86-87!

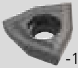
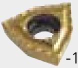
KOMET KUB Trigon®

Machining options



	Machining	2×D	3×D	4×D
	solid drilling	●	●	●
	blind hole	●	●	●
	forge /casting skin, interface	●	◐	○
	angled start and drilling out, interrupted cut	●	◐	○
	convex	●	◐	○
	cross bore	●	◐	○
	centering bore, seam	◐	◐	○
	chamber	●	◐	○
	stack plate drilling	✕	✕	✕
	rough boring	◐	○	✕
	adjustable	◐	◐	◐

● very good ◐ good ○ possible: see technical notes ▸ 92 ✕ not possible

	W29..01	W29..03	W29..11	W29..13	W29..20 for softer cut
	 -01	 -03	 -11	 -13	 -20
Basic recommendation					
P	BK8425		BK77		BK8430
S					
M	BK7930				BK2730
K	BK7615/BK62				
N			BK7710		
H					
alternative for better chip control					
P		⚠ BK8425		BK8425	
S				BK79	
M		⚠ BK8425		BK79	
K					
N					
H					
alternative for higher cutting speed ▸ 64-65					
P	BK72	⚠ BK6425			
S					
M		⚠ BK6425		BK7325	
K					
N			BK50		
H					
alternative for greater strength					
P	BK7930 / P40				
S	BK7930 / P40				
M	P40				
K	BK7930				
N			K10		
H					

⚠ only as external cutting edge (recommendation internal cutting edge: W29..01 in BK8425)

Guideline values for solid drilling with KUB Trigon® ▸ 62-63

KOMET KUB Trigon ®

Guideline values for solid drilling

Material group	Selection: L.H. fold page	Cutting speed v_c (m/min)	2×D max. feed f (mm/rev) Ø 14 – 16,9	Ø 17 – 19,9	Ø 20 – 24,9	Ø 25 – 29,9	Ø 30 – 36,9	Ø 37 – 40,9	Ø 41 – 44,0
P	1.0	300	0,08	0,10	0,10	0,12	0,12	0,12	0,12
P	2.0	250	0,06	0,08	0,12	0,14	0,14	0,14	0,16
P	2.1	300	0,08	0,10	0,12	0,14	0,16	0,16	0,20
P	3.0	200	0,06	0,08	0,10	0,14	0,16	0,16	0,16
P	4.0	180	0,06	0,08	0,10	0,12	0,12	0,12	0,14
P	4.1	80	0,04	0,06	0,08	0,10	0,10	0,12	0,12
S	5.0	60	0,04	0,06	0,08	0,10	0,10	0,10	0,10
S	5.1	80	0,06	0,08	0,10	0,12	0,10	0,12	0,12
M	6.0	180	0,06	0,08	0,10	0,14	0,14	0,14	0,14
M	6.1	160	0,06	0,06	0,08	0,12	0,12	0,12	0,14
M	7.0	160	0,06	0,06	0,08	0,12	0,12	0,12	0,12
K	8.0	200	0,10	0,12	0,14	0,20	0,20	0,20	0,25
K	8.1	160	0,08	0,08	0,10	0,14	0,14	0,16	0,18
K	9.0	180	0,08	0,10	0,14	0,20	0,20	0,20	0,25
K	9.1	160	0,08	0,10	0,14	0,20	0,20	0,20	0,25
K	10.0	140	0,10	0,12	0,16	0,25	0,16	0,18	0,18
K	10.1	140	0,08	0,10	0,14	0,20	0,20	0,20	0,25
K	10.2	120	0,08	0,10	0,14	0,16	0,16	0,16	0,20
N	12.0	300	0,05	0,08	0,12	0,16	0,16	0,18	0,20
N	12.1	400	0,05	0,08	0,08	0,10	0,10	0,10	0,12
N	13.0	600	0,05	0,08	0,08	0,10	0,10	0,12	0,12
N	13.1	300	0,10	0,12	0,14	0,18	0,18	0,20	0,20
N	14.0	250	0,10	0,12	0,14	0,20	0,20	0,20	0,25
H	15.0	80	0,05	0,05	0,08	0,10	0,10	0,12	0,12
H	16.0	40	0,05	0,08	0,08	0,10	0,10	0,10	0,10

KOMET KUB Trigon®

Guideline values for solid drilling

	3×D							4×D						
	max. feed f (mm/rev)							max. feed f (mm/rev)						
	Ø 14 – 16,9	Ø 17 – 19,9	Ø 20 – 24,9	Ø 25 – 29,9	Ø 30 – 36,9	Ø 37 – 40,9	Ø 41 – 44,0	Ø 14 – 16,9	Ø 17 – 19,9	Ø 20 – 24,9	Ø 25 – 29,9	Ø 30 – 36,9	Ø 37 – 40,9	Ø 41 – 44,0
	0,08	0,10	0,10	0,12	0,12	0,12	0,12	0,06	0,08	0,08	0,10	0,10	0,10	0,10
	0,06	0,08	0,12	0,14	0,14	0,14	0,16	0,04	0,06	0,10	0,12	0,12	0,12	0,14
	0,08	0,10	0,12	0,14	0,16	0,16	0,20	0,06	0,08	0,10	0,12	0,14	0,14	0,18
	0,06	0,08	0,10	0,14	0,16	0,16	0,16	0,04	0,06	0,08	0,12	0,14	0,14	0,14
	0,06	0,08	0,10	0,12	0,12	0,12	0,14	0,04	0,06	0,08	0,10	0,10	0,10	0,12
	0,04	0,06	0,08	0,10	0,10	0,12	0,12	0,02	0,04	0,06	0,08	0,08	0,10	0,10
	0,04	0,06	0,08	0,10	0,10	0,10	0,10	0,02	0,04	0,06	0,08	0,08	0,08	0,08
	0,06	0,08	0,10	0,12	0,10	0,12	0,12	0,04	0,06	0,08	0,10	0,08	0,10	0,10
	0,06	0,08	0,10	0,14	0,14	0,14	0,14	0,04	0,06	0,08	0,12	0,12	0,12	0,12
	0,06	0,06	0,08	0,12	0,12	0,12	0,14	0,04	0,04	0,06	0,10	0,10	0,10	0,12
	0,06	0,06	0,08	0,12	0,12	0,12	0,12	0,04	0,04	0,06	0,10	0,10	0,10	0,12
	0,10	0,12	0,14	0,20	0,20	0,20	0,25	0,08	0,10	0,12	0,18	0,18	0,18	0,23
	0,08	0,08	0,10	0,14	0,14	0,16	0,18	0,06	0,06	0,08	0,12	0,12	0,14	0,16
	0,08	0,10	0,14	0,20	0,20	0,20	0,25	0,06	0,08	0,12	0,18	0,18	0,18	0,23
	0,08	0,10	0,14	0,20	0,20	0,20	0,25	0,06	0,08	0,12	0,18	0,18	0,18	0,23
	0,10	0,12	0,16	0,25	0,16	0,18	0,18	0,08	0,10	0,14	0,23	0,23	0,23	0,23
	0,08	0,10	0,14	0,20	0,20	0,20	0,25	0,06	0,08	0,12	0,18	0,18	0,18	0,23
	0,08	0,10	0,14	0,16	0,16	0,16	0,20	0,06	0,08	0,12	0,14	0,14	0,14	0,18
	0,05	0,08	0,12	0,16	0,16	0,18	0,20	0,03	0,06	0,10	0,14	0,14	0,16	0,18
	0,05	0,08	0,08	0,10	0,10	0,10	0,12	0,03	0,06	0,06	0,08	0,08	0,08	0,10
	0,05	0,08	0,08	0,10	0,10	0,12	0,12	0,03	0,06	0,06	0,08	0,08	0,10	0,10
	0,10	0,12	0,14	0,18	0,18	0,20	0,20	0,08	0,10	0,12	0,16	0,16	0,18	0,18
	0,10	0,12	0,14	0,20	0,20	0,20	0,25	0,08	0,10	0,12	0,18	0,18	0,18	0,23
	0,05	0,05	0,08	0,10	0,10	0,12	0,12	0,03	0,03	0,06	0,08	0,08	0,10	0,10
	0,05	0,08	0,08	0,10	0,10	0,10	0,10	0,03	0,06	0,06	0,08	0,08	0,08	0,08

Important: For more application details and safety notes see ▸ 86-87!

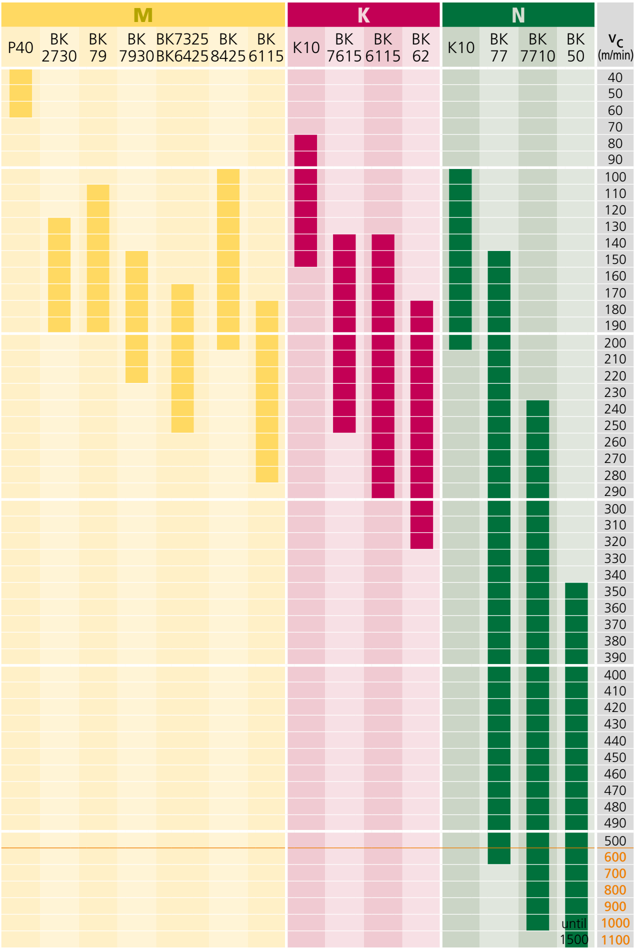
KOMET KUB Trigon®, KUB® Drill, *KUB Centron®

Guideline values for solid drilling

Cutting speed v_c (m/min)	P								
	P25M	P40	BK 79	BK 7930	BK8430 BK8425	BK 6440	BK 6425	BK6420, BK72 BK7325	BK 6115
40		■							
50	■	■	■	■					
60	■	■	■	■					
70	■	■	■	■					
80	■	■	■	■					
90	■	■	■	■	■				
100	■		■	■	■				
110			■	■	■	■			
120			■	■	■	■			
130			■	■	■	■			
140			■	■	■	■			
150			■	■	■	■	■		
160			■	■	■	■	■		
170			■		■	■	■		
180			■		■	■	■		
190					■	■	■	■	
200					■	■	■	■	■
210					■	■	■	■	■
220					■	■	■	■	■
230					■		■	■	■
240					■		■	■	■
250					■		■	■	■
260					■		■	■	■
270					■		■	■	■
280					■		■	■	■
290					■		■	■	■
300					■		■	■	■
310							■	■	■
320								■	■
330								■	■
340								■	■
350								■	■
360									■
370									■
380									■
390									
400									
410									
420									
430									
440									
450									
460									
470									
480									
490									
500									
600									
700									
800									
900									
1000									
1100									

KOMET KUB Trigon®, KUB® Drill, *KUB Centron®

Guideline values for solid drilling

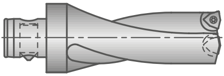


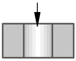
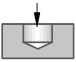
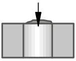
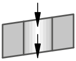
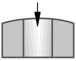
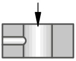
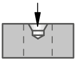
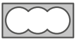
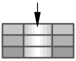
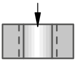
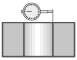
Important: For more application details and safety notes see ▶86-87!

* Please note max. v_c values of drill bit for KUB Centron® ▶78

KOMET KUB® Drill

Machining options



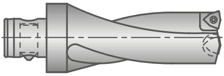
	Machining	2×D	3×D
	solid drilling	●	●
	blind hole	●	●
	forge /casting skin, interface	●	●
	angled start and drilling out, interrupted cut	●	◐
	convex	●	◐
	cross bore	◐	◐
	centering bore, seam	◐	◐
	chamber	●	◐
	stack plate drilling	✕	✕
	rough boring	◐	✕
	adjustable	◐	◐

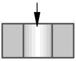
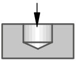
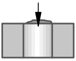
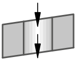
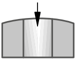
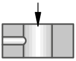
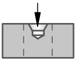
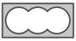
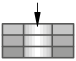
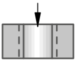
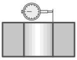
● very good ◐ good ○ possible: see technical notes ▸ 92 ✕ not possible

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	2×D max. feed f (mm/rev) Ø 45 – 54	2×D Ø 54,5 – 68	2×D Ø 68,5 – 82	3×D max. feed f (mm/rev) Ø 45 – 54	3×D Ø 54,5 – 68	3×D Ø 68,5 – 82
P	1.0	300	0,12	0,14	0,16	0,12	0,14	0,14
P	2.0	250	0,16	0,20	0,25	0,16	0,20	0,20
P	2.1	300	0,20	0,25	0,25	0,20	0,25	0,25
P	3.0	200	0,16	0,20	0,20	0,16	0,18	0,18
P	4.0	180	0,14	0,16	0,16	0,14	0,14	0,16
P	4.1							
S	5.0	60	0,10	0,12	0,14	0,10	0,12	0,14
S	5.1	80	0,12	0,14	0,16	0,12	0,14	0,14
M	6.0	180	0,14	0,16	0,16	0,14	0,14	0,16
M	6.1	160	0,14	0,16	0,16	0,14	0,16	0,16
M	7.0	160	0,12	0,16	0,18	0,12	0,16	0,16
K	8.0	200	0,25	0,30	0,30	0,25	0,25	0,30
K	8.1	160	0,18	0,30	0,30	0,18	0,20	0,25
K	9.0	180	0,25	0,30	0,30	0,25	0,25	0,30
K	9.1	160	0,25	0,30	0,30	0,25	0,25	0,30
K	10.0	140	0,25	0,30	0,30	0,25	0,25	0,30
K	10.1	140	0,25	0,30	0,30	0,25	0,25	0,30
K	10.2	120	0,20	0,25	0,30	0,20	0,20	0,20
N	12.0	300	0,20	0,25	0,25	0,20	0,20	0,25
N	12.1	400	0,12	0,16	0,16	0,12	0,12	0,14
N	13.0	600	0,12	0,12	0,14	0,12	0,12	0,14
N	13.1	300	0,20	0,25	0,25	0,20	0,25	0,25
N	14.0	250	0,25	0,30	0,30	0,25	0,30	0,30
H	15.0	80	0,12	0,14	0,14	0,12	0,14	0,14
H	16.0	40	0,10	0,10	0,10	0,10	0,10	0,10

Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB® Drill, adjustable
Machining options



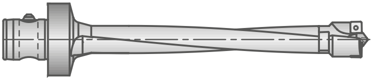
	Machining	3×D
	solid drilling	●
	blind hole	●
	forge /casting skin, interface	○
	angled start and drilling out, interrupted cut	○
	convex	○
	cross bore	○
	centering bore, seam	○
	chamber	○
	stack plate drilling	✕
	rough boring	✕
	adjustable	◐

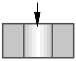
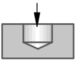
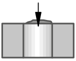
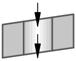
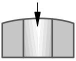
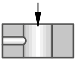
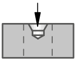
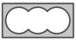
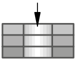
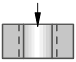
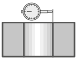
● very good ◐ good ○ possible: see technical notes ▸ 92 ✕ not possible

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	3×D max. feed f (mm/rev) Ø 38,5 – 44	Ø 44,5 – 54	Ø 54,5 – 68	Ø 68,5 – 82
P	1.0	300	0,10	0,12	0,12	0,14
P	2.0	250	0,10	0,12	0,12	0,14
P	2.1	300	0,12	0,14	0,14	0,16
P	3.0	200	0,10	0,12	0,12	0,14
P	4.0	180	0,08	0,10	0,10	0,12
P	4.1	80	0,06	0,08	0,08	0,10
S	5.0	60	0,06	0,08	0,08	0,10
S	5.1	80	0,06	0,08	0,08	0,10
M	6.0	180	0,08	0,10	0,10	0,12
M	6.1	160	0,08	0,10	0,10	0,12
M	7.0	160	0,06	0,08	0,08	0,10
K	8.0	200	0,16	0,18	0,18	0,23
K	8.1	160	0,16	0,18	0,18	0,23
K	9.0	180	0,14	0,16	0,16	0,18
K	9.1	160	0,14	0,16	0,16	0,18
K	10.0	140	0,12	0,14	0,14	0,16
K	10.1	140	0,10	0,12	0,12	0,14
K	10.2	120	0,12	0,14	0,14	0,16
N	12.0	300	0,14	0,16	0,16	0,18
N	12.1	400	0,14	0,16	0,16	0,18
N	13.0	600	0,14	0,16	0,16	0,18
N	13.1	300	0,16	0,18	0,18	0,23
N	14.0	250	0,16	0,18	0,18	0,23
H	15.0	80	0,06	0,08	0,08	0,10
H	16.0	40	0,04	0,06	0,06	0,08

Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB Centron ® Powerline
Machining options



	Machining	KUB Centron ® Powerline
	solid drilling	●
	blind hole	●
	forge /casting skin, interface	◐
	angled start and drilling out, interrupted cut	○
	convex	○
	cross bore	○
	centering bore, seam	○
	chamber	✕
	stack plate drilling	✕
	rough boring	✕
	adjustable	✕

● very good ◐ good ○ possible: see technical notes ▸ 102 ✕ not possible

	W83..01	W83..03	W83..13	W83..21
	 -01	 also as internal cutting -03 edge	 -13	 -21

Basic recommendation

	W83..01	W83..03	W83..13	W83..21
P				BK8430
S				BK2730
M				BK2730
K	BK6115			
N				BK7710
H	BK6115			

alternative for better chip control

	W83..01	W83..03	W83..13	W83..21
P		BK8430	BK8425	
S				
M		BK8430	BK7935	
K				
N				BK7710
H				

alternative for higher cutting speed ▸ 48-49

	W83..01	W83..03	W83..13	W83..21
P			BK6420	BK6130
S				
M			BK74	BK6130
K				BK6130
N				
H				

alternative for greater strength

	W83..01	W83..03	W83..13	W83..21
P	BK8425			
S				
M	BK7935			
K	BK8425			
N				
H				

Guideline values for solid drilling with KUB Centron ® Powerline ▸ 72-75

KOMET KUB Centron® Powerline

Guideline values for solid drilling

Material group	Selection: L.H. fold page	KUB Centron® Powerline 4×D – 9×D											
		⚠ Backing out of the bore with greatly reduced speed											
		Ø 20 – 24,9				Ø 25 – 29,9				Ø 30 – 32,9			
		v_c m/min	f mm/rev			v_c m/min	f mm/rev			v_c m/min	f mm/rev		
		~4×D	min.	opt.	max.	~~4×D	min.	opt.	max.	~~4×D	min.	opt.	max.
		⚠ ~ 6×D v_c = –10% · ~ 8×D v_c = –25%											
P	1.0	200	0,14	**0,16**	0,18	180	0,14	**0,17**	0,20	180	0,15	**0,18**	0,21
P	2.0	200	0,14	**0,16**	0,18	180	0,14	**0,17**	0,20	180	0,15	**0,18**	0,21
P	2.1	200	0,16	**0,18**	0,20	200	0,17	**0,20**	0,23	200	0,22	**0,25**	0,28
P	3.0	160	0,14	**0,16**	0,18	160	0,17	**0,20**	0,23	160	0,19	**0,22**	0,25
P	4.0	140	0,12	**0,14**	0,16	140	0,13	**0,16**	0,19	140	0,15	**0,18**	0,21
P	4.1												
S	5.0												
S	5.1												
M	6.0												
M	6.1												
M	7.0												
K	8.0	180	0,23	**0,25**	0,27	180	0,27	**0,30**	0,33	180	0,32	**0,35**	0,38
K	8.1	170	0,23	**0,25**	0,27	170	0,27	**0,30**	0,33	170	0,32	**0,35**	0,38
K	9.0	180	0,23	**0,25**	0,27	180	0,27	**0,30**	0,33	180	0,32	**0,35**	0,38
K	9.1	170	0,20	**0,22**	0,24	170	0,22	**0,25**	0,28	170	0,27	**0,30**	0,33
K	10.0	160	0,18	**0,20**	0,22	160	0,19	**0,22**	0,25	160	0,25	**0,28**	0,31
K	10.1	120	0,12	**0,14**	0,16	120	0,15	**0,18**	0,21	120	0,19	**0,22**	0,25
K	10.2	120	0,20	**0,22**	0,24	120	0,22	**0,25**	0,28	120	0,32	**0,35**	0,38
N	12.0	250	0,18	**0,20**	0,22	250	0,22	**0,25**	0,28	250	0,25	**0,28**	0,31
N	12.1	250	0,16	**0,18**	0,20	250	0,19	**0,22**	0,25	250	0,25	**0,28**	0,31
N	13.0	300	0,12	**0,14**	0,16	300	0,15	**0,18**	0,21	300	0,17	**0,20**	0,23
N	13.1	250	0,18	**0,20**	0,22	250	0,22	**0,25**	0,28	250	0,27	**0,30**	0,33
N	14.0	250	0,18	**0,20**	0,22	250	0,22	**0,25**	0,28	250	0,27	**0,30**	0,33
H	15.0												
H	16.0												

	KUB Centron ® Powerline 4×D – 9×D											
	Backing out of the bore with greatly reduced speed											
		Ø 33 – 36,9				Ø 37 – 39,9				Ø 40 – 44,9		
	v_c m/min	f mm/rev			v_c m/min	f mm/rev			v_c m/min	f mm/rev		
	~4×D	min.	opt.	max.	~4×D	min.	opt.	max.	~4×D	min.	opt.	max.
	~ 6×D v_c = –10% · ~ 8×D v_c = –25%											
	180	0,15	**0,18**	0,21	180	0,17	**0,20**	0,23	200	0,14	**0,16**	0,18
	180	0,15	**0,18**	0,21	180	0,17	**0,20**	0,23	200	0,14	**0,16**	0,18
	200	0,22	**0,25**	0,28	200	0,22	**0,25**	0,28	220	0,16	**0,18**	0,20
	160	0,22	**0,25**	0,28	160	0,22	**0,25**	0,28	180	0,16	**0,20**	0,22
	140	0,17	**0,20**	0,23	140	0,17	**0,20**	0,23	160	0,12	**0,16**	0,19
	180	0,32	**0,35**	0,38	180	0,32	**0,35**	0,38	180	0,23	**0,25**	0,27
	170	0,32	**0,35**	0,38	170	0,32	**0,35**	0,38	170	0,23	**0,25**	0,27
	180	0,32	**0,35**	0,38	180	0,32	**0,35**	0,38	180	0,23	**0,25**	0,27
	170	0,27	**0,30**	0,33	170	0,27	**0,30**	0,33	170	0,20	**0,22**	0,24
	160	0,25	**0,28**	0,31	160	0,25	**0,28**	0,31	160	0,18	**0,20**	0,22
	120	0,19	**0,22**	0,25	120	0,19	**0,22**	0,25	130	0,12	**0,14**	0,16
	120	0,32	**0,35**	0,38	120	0,32	**0,35**	0,38	130	0,20	**0,22**	0,24
	250	0,27	**0,30**	0,33	250	0,27	**0,30**	0,33	250	0,18	**0,20**	0,22
	250	0,25	**0,28**	0,31	250	0,25	**0,28**	0,31	250	0,16	**0,18**	0,20
	300	0,17	**0,20**	0,23	300	0,17	**0,20**	0,23	300	0,12	**0,14**	0,16
	250	0,27	**0,30**	0,33	250	0,27	**0,30**	0,33	250	0,18	**0,20**	0,22
	250	0,27	**0,30**	0,33	250	0,27	**0,30**	0,33	250	0,18	**0,20**	0,22

Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB Centron ® Powerline

Guideline values for solid drilling

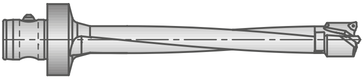
Material group / Selection: L.H. fold page		KUB Centron ® Powerline 4×D – 9×D											
		⚠ Backing out of the bore with greatly reduced speed											
		Ø 45 – 48,9				Ø 49 – 51,9				Ø 52 – 54,9			
		v_c m/min	f mm/rev			v_c m/min	f mm/rev			v_c m/min	f mm/rev		
		~4×D	min.	opt.	max.	~~4×D	min.	opt.	max.	~~4×D	min.	opt.	max.
		⚠ ~ 6×D v_c = –10% · ~ 8×D v_c = –25%											
P	1.0	180	0,14	**0,16**	0,18	200	0,14	**0,17**	0,18	180	0,14	**0,17**	0,18
P	2.0	180	0,14	**0,16**	0,18	200	0,14	**0,17**	0,18	180	0,14	**0,17**	0,18
P	2.1	200	0,17	**0,20**	0,22	220	0,20	**0,23**	0,25	200	0,20	**0,25**	0,28
P	3.0	160	0,16	**0,20**	0,22	180	0,18	**0,20**	0,24	160	0,18	**0,20**	0,24
P	4.0	140	0,12	**0,16**	0,19	160	0,12	**0,16**	0,19	140	0,17	**0,20**	0,23
P	4.1												
S	5.0												
S	5.1												
M	6.0												
M	6.1												
M	7.0												
K	8.0	170	0,23	**0,25**	0,27	180	0,27	**0,30**	0,33	170	0,27	**0,30**	0,33
K	8.1	160	0,23	**0,25**	0,27	170	0,27	**0,30**	0,33	160	0,27	**0,30**	0,33
K	9.0	170	0,23	**0,25**	0,27	180	0,27	**0,30**	0,33	170	0,27	**0,30**	0,33
K	9.1	160	0,20	**0,22**	0,24	170	0,22	**0,25**	0,28	160	0,22	**0,25**	0,28
K	10.0	150	0,18	**0,20**	0,22	160	0,19	**0,22**	0,25	150	0,19	**0,22**	0,25
K	10.1	120	0,12	**0,14**	0,16	130	0,15	**0,18**	0,21	120	0,15	**0,18**	0,21
K	10.2	120	0,20	**0,22**	0,24	130	0,22	**0,25**	0,28	120	0,22	**0,25**	0,28
N	12.0	240	0,18	**0,20**	0,22	250	0,22	**0,25**	0,28	240	0,22	**0,25**	0,28
N	12.1	240	0,16	**0,18**	0,20	250	0,19	**0,22**	0,25	240	0,19	**0,22**	0,25
N	13.0	280	0,12	**0,14**	0,16	300	0,15	**0,18**	0,21	280	0,15	**0,18**	0,21
N	13.1	240	0,18	**0,20**	0,22	250	0,22	**0,25**	0,28	240	0,22	**0,25**	0,28
N	14.0	240	0,18	**0,20**	0,22	250	0,22	**0,25**	0,28	240	0,22	**0,25**	0,28
H	15.0												
H	16.0												

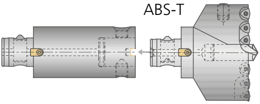
KUB Centron® Powerline 4×D – 9×D							
⚠ Backing out of the bore with greatly reduced speed							
Ø 55 – 61,9				Ø 62 – 65,9			
v_c m/min ~4×D	f mm/rev min.	opt.	max.	v_c m/min ~4×D	f mm/rev min.	opt.	max.
⚠ ~ 6×D v_c = –10% · ~ 8×D v_c = –25%							
180	0,14	**0,17**	0,18	200	0,14	**0,17**	0,18
180	0,14	**0,17**	0,18	200	0,14	**0,17**	0,18
200	0,20	**0,25**	0,28	220	0,20	**0,23**	0,25
160	0,18	**0,20**	0,24	180	0,18	**0,20**	0,24
140	0,17	**0,20**	0,23	160	0,17	**0,20**	0,23
170	0,27	**0,30**	0,33	180	0,23	**0,25**	0,27
160	0,27	**0,30**	0,33	170	0,23	**0,25**	0,27
170	0,27	**0,30**	0,33	180	0,23	**0,25**	0,27
160	0,22	**0,25**	0,28	170	0,20	**0,22**	0,24
150	0,19	**0,22**	0,25	160	0,18	**0,20**	0,22
130	0,15	**0,18**	0,21	120	0,12	**0,14**	0,16
130	0,22	**0,25**	0,28	120	0,20	**0,22**	0,24
240	0,22	**0,25**	0,28	250	0,18	**0,20**	0,22
240	0,19	**0,22**	0,25	250	0,16	**0,18**	0,20
280	0,15	**0,18**	0,21	300	0,12	**0,14**	0,16
240	0,22	**0,25**	0,28	250	0,18	**0,20**	0,22
240	0,22	**0,25**	0,28	250	0,18	**0,20**	0,22

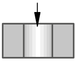
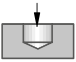
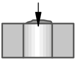
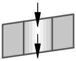
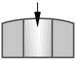
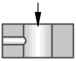
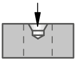
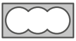
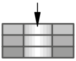
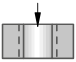
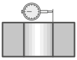
Important: For more application details and safety notes see ▸ 86-87!

KOMET KUB Centron® / KUB® V464

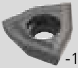
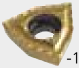
Machining options





	Machining	KUB Centron®	KUB® V464
	solid drilling	●	●
	blind hole	●	●
	forge /casting skin, interface	◐	◐
	angled start and drilling out, interrupted cut	○	○
	convex	○	○
	cross bore	○	○
	centering bore, seam	○	○
	chamber	○	○
	stack plate drilling	✕	✕
	rough boring	✕	✕
	adjustable	✕	●

● very good ◐ good ○ possible: see technical notes ▸ 104 ✕ not possible

	W29..01	W29..03	W29..11	W29..13	W29..20*
	 -01	 -03	 -11	 -13	 -20
Basic recommendation					
P	BK8425		BK77		BK8430
S					
M				BK79	BK2730
K	BK7615/BK62				
N			BK7710		
H					
alternative for better chip control					
P		BK8425		BK8425	
S					
M		BK8425		BK79	
K					
N					
H					
alternative for higher cutting speed ▶ 64-65					
P	BK72	BK6425			
S					
M		BK6425		BK7325	
K					
N			BK50		
H					
alternative for greater strength					
P	BK7930, P40				
S					
M	P40				
K	BK7930				
N			K10		
H					

Guideline values for solid drilling with KUB Centron ® ▶ 78, KUB ® V464 ▶ 79

* for softer cut

KOMET KUB Centron ®

Guideline values for solid drilling

Material group	Selection: L.H. fold page	KUB Centron ® 4×D – 9×D											
		max. feed f (mm/rev) · cutting speed v_c (m/min)											
		Ø 20 – 25			Ø 26 – 32			Ø 33 – 45			Ø 46 – 54		
			HSS	carbide		HSS	carbide		HSS	carbide		HSS	carbide
		f mm/rev	v_c m/min	v_c m/min	f mm/rev	v_c m/min	v_c m/min	f mm/rev	v_c m/min	v_c m/min	f mm/rev	v_c m/min	v_c m/min
P	1.0	0,08	160	250	0,08	170	250	0,10	200	250	0,12	180	250
P	2.0	0,10	160	200	0,12	170	200	0,12	200	200	0,14	180	200
P	2.1	0,12	160	250	0,14	170	250	0,14	200	250	0,14	180	250
P	3.0	0,12	140	180	0,14	170	180	0,14	180	180	0,14	180	180
P	4.0	0,08	120	160	0,10	160	160	0,10	160	160	0,14	160	160
P	4.1	0,07	80	80	0,07	80	80	0,07	80	80	0,08	80	80
S	5.0	–			–			–			–		
S	5.1	–			–			–			–		
M	6.0	0,07	70	180	0,10	70	180	0,10	90	180	0,10	90	180
M	6.1	0,10	70	160	0,12	70	160	0,12	90	160	0,12	90	160
M	7.0	0,08	70	120	0,10	70	120	0,10	90	120	0,10	90	120
K	8.0	0,14	100	200	0,16	110	200	0,16	120	200	0,18	120	200
K	8.1	0,12	100	160	0,14	110	160	0,14	120	160	0,15	120	160
K	9.0	0,12	100	160	0,14	110	160	0,14	120	160	0,18	120	160
K	9.1	0,12	100	140	0,14	110	140	0,14	120	140	0,18	120	140
K	10.0	0,12	100	120	0,14	110	120	0,14	120	120	0,18	120	120
K	10.1	0,10	100	100	0,12	100	100	0,12	100	100	0,15	100	100
K	10.2	0,10	80	80	0,12	80	80	0,12	80	80	0,15	80	80
N	12.0	0,14	200	200	0,16	200	200	0,16	200	200	0,20	200	200
N	12.1	0,08	250	250	0,08	250	250	0,10	250	250	0,12	250	250
N	13.0	0,07	350	350	0,07	350	350	0,07	350	350	0,10	350	350
N	13.1	0,10	250	250	0,12	250	250	0,14	250	250	0,18	250	250
N	14.0	0,12	200	200	0,14	200	200	0,14	200	200	0,15	200	200
H	15.0	–			–			–			–		
H	16.0	–			–			–			–		

Guideline values for solid drilling

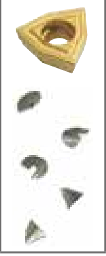
	KUB Centron® 4×D – 9×D							KUB® V464 6×D					
	max. f (mm/rev) · v_c (m/min)							max. f (mm/rev) · v_c (m/min)					
	Ø 55 – 64			Ø 65 – 71		Ø 72 – 81		Ø 80–99		Ø100–119		Ø120–159	
		HSS	carbide		HSS		HSS		HSS		HSS		HSS
	f mm/rev	v_c m/min	v_c m/min	f mm/rev	v_c m/min	f mm/rev	v_c m/min	f mm/rev	v_c m/min	f mm/rev	v_c m/min	f mm/rev	v_c m/min
	0,14	180	250	0,10	210	0,12	210	0,10	200	0,12	200	0,12	200
	0,16	180	200	0,12	210	0,14	210	0,12	180	0,14	180	0,16	180
	0,16	180	250	0,14	210	0,16	210	0,12	200	0,14	200	0,16	200
	0,16	180	180	0,14	180	0,16	180	0,12	160	0,14	160	0,16	160
	0,14	160	160	0,10	160	0,12	160	0,12	140	0,14	140	0,16	140
	0,10	80	80	0,08	80	0,10	80	0,10	60	0,12	60	0,14	60
	–			–		–		–		–		–	
	–			–		–		–		–		–	
	0,12	90	180	0,10	100	0,12	100	0,10	100	0,12	100	0,14	160
	0,14	90	160	0,12	100	0,14	100	0,12	100	0,14	100	0,14	140
	0,12	90	120	0,10	100	0,12	100	0,12	100	0,14	100	0,14	100
	0,25	120	200	0,16	140	0,20	140	0,16	180	0,16	180	0,25	180
	0,20	120	160	0,16	140	0,20	140	0,14	140	0,16	140	0,20	140
	0,25	120	160	0,16	140	0,20	140	0,14	140	0,16	140	0,20	140
	0,25	120	140	0,14	140	0,16	140	0,14	120	0,16	120	0,20	120
	0,25	120	120	0,14	120	0,16	120	0,12	100	0,14	100	0,18	100
	0,20	100	100	0,12	100	0,14	100	0,12	80	0,14	80	0,16	80
	0,20	80	80	0,12	80	0,14	80	0,12	80	0,14	80	0,16	80
	0,25	200	200	0,16	200	0,20	200	0,16	180	0,20	180	0,25	180
	0,15	250	250	0,08	250	0,10	250	0,08	200	0,10	200	0,12	200
	0,12	350	350	0,08	350	0,10	350	0,08	300	0,10	300	0,12	300
	0,25	250	250	0,14	250	0,16	250	0,14	200	0,16	200	0,16	200
	0,20	200	200	0,12	200	0,14	200	0,12	160	0,14	160	0,14	160
	–			–		–		–		–		–	
	–			–		–		–		–		–	

Important: For more application details and safety notes see ▸ 86-87!

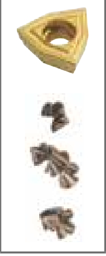
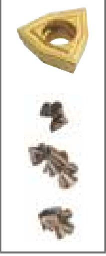
Chip Formation
for various insert geometries

Inserts suggested for KUB ® and KUB Trigon ®

Tool: KUB Trigon ® ∅ 35 mm, 3×D
Material: 42CrMo4V 1100 N/mm²
Cutting data: v_C = 200 m/min f = 0,16 mm/rev

W29 ..		W29 ..		W29 ..	
Geometry 13 internal	Geometry 13 external	Geometry 01 internal	Geometry 03 external	Geometry 01 internal	Geometry 01 external
					

Tool: KUB Trigon ® ∅ 35 mm, 3×D
Material: structural steel St37
Cutting data: v_C = 300 m/min f = 0,12 mm/rev

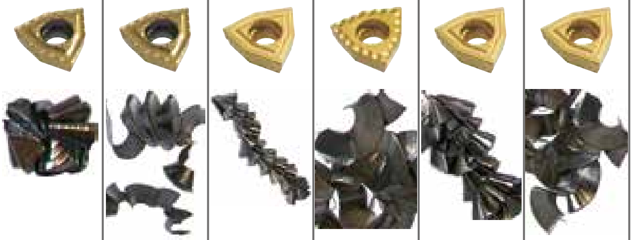
W29 ..		W29 ..		W29 ..	
Geometry 13 internal	Geometry 13 external	Geometry 01 internal	Geometry 03 external	Geometry 01 internal	Geometry 01 external
					

Chip Formation
for various insert geometries

Inserts suggested for KUB ® and KUB Trigon ®

Tool:	KUB Trigon ® ∅ 40 mm, 3×D
Material:	stainless steel 1.4571
Cutting data:	v_C = 140 m/min f = 0,1 mm/rev

W29 ..		W29 ..		W29 ..	
Geometry 13 internal	Geometry 13 external	Geometry 01 internal	Geometry 03 external	Geometry 01 internal	Geometry 01 external



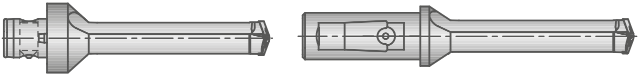
Inserts suggested for KUB Quatron ®

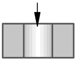
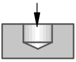
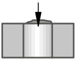
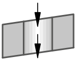
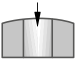
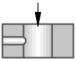
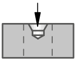
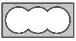
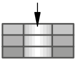
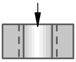
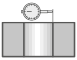
Tool:	KUB Quatron ® ∅ 35 mm, 3×D
Material:	42CrMo4V 1100 N/mm²
Cutting data:	v_C = 140 m/min f = 0,25 mm/rev

W83 ..		W83 ..		W83 ..	
Geometry 01 internal	Geometry 21 external	Geometry 13 internal	Geometry 13 external	Geometry 01 internal	Geometry 01 external

KOMET KUB Duon®

Machining options



	Machining	5×D
	solid drilling	●
	blind hole	●
	forge /casting skin, interface	◐
	angled start and drilling out, interrupted cut	○
	convex	◐
	cross bore	◐
	centering bore, seam	○
	chamber	✕
	stack plate drilling	●
	rough boring	○
	adjustable	✕

● very good ◐ good ○ possible: see technical notes ▸ 100 ✕ not possible

H60 / H62

Material group	Basic recommendation	alternative for better chip control	alternative for higher cutting speed	alternative for greater strength
P	BK8440		BK84 / BK2715*	BK8125
S				
M				
K	BK2715		BK84	BK8125
N	BK7710		BK84	BK8125
H				

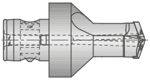
Guideline values for solid drilling with KUB Duon® ▸84

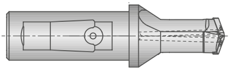
* for steels with tensile strength > 700 N/mm²

KOMET KUB Duon®
Guideline values for solid drilling

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	5×D max. feed f (mm/rev) ⌀ 17,3 – 20,7	⌀ 20,8 – 29,7	⌀ 29,8 – 36,2	⌀ 36,3 – 44,2
P	1.0					
P	2.0	140	0,15	0,20	0,22	0,25
P	2.1	160	0,15	0,20	0,22	0,25
P	3.0	120	0,15	0,20	0,25	0,30
P	4.0	100	0,15	0,18	0,20	0,25
P	4.1					
S	5.0					
S	5.1					
M	6.0					
M	6.1					
M	7.0					
K	8.0	140	0,30	0,40	0,50	0,55
K	8.1	100	0,20	0,30	0,40	0,50
K	9.0	120	0,25	0,35	0,45	0,50
K	9.1	100	0,20	0,30	0,40	0,45
K	10.0	120	0,20	0,30	0,40	0,45
K	10.1	100	0,25	0,35	0,45	0,50
K	10.2	80	0,20	0,30	0,35	0,40
N	12.0	180	0,30	0,40	0,45	0,50
N	12.1					
N	13.0	600	0,20	0,20	0,25	0,30
N	13.1	500	0,20	0,20	0,25	0,30
N	14.0	350	0,20	0,20	0,25	0,30
H	15.0					
H	16.0					

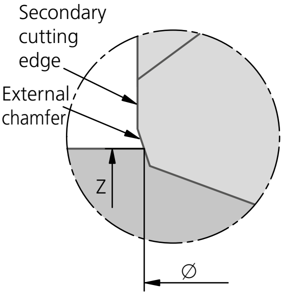
Important: For more application details and safety notes see ▸ 86-87!

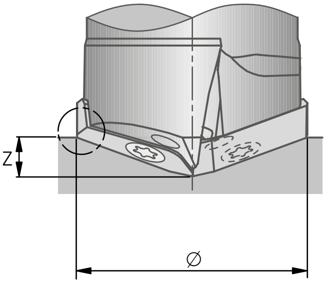




Application notes for pre-centering

- from drilling depth > 5 × D (tools to customer requirement)
- where drilling starts on surfaces which are angled or have not been pre-machined
- where there are unstable conditions because of large tool overhang





Method 1:
Determining the centre depth Z

Size	Centre depth Z
1	2,7 mm
2	3,3 mm
3	4 mm
4	4,7 mm
5	6,5 mm

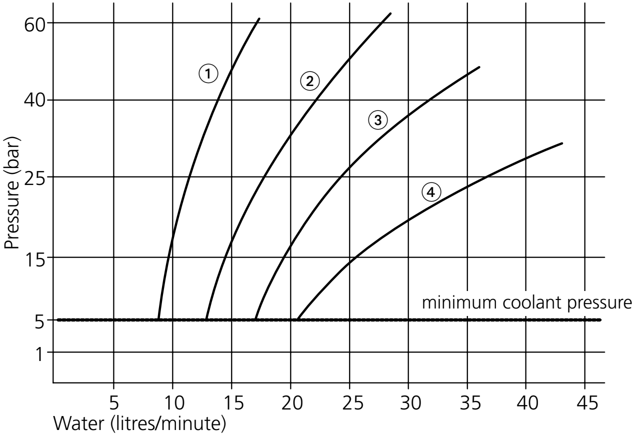
Method 2:
Determining the centre dia.

Size	Centre dia.
1	17,3 mm
2	20,8 mm
3	24,8 mm
4	29,8 mm
5	36,5 mm

Short spot drills for KUB Duon ® are fitted with standard H60… inserts.

General note:
Drill until the chamfer can be seen at the external bore diameter.

Coolant Flow / Coolant Pressure



Recommended coolant pressure
① up to 22,9 mm ∅
② up to 37,0 mm ∅
③ up to 69,9 mm ∅
④ from 70,0 mm ∅

Safety notes!

Important note: On exit of the drill a disc is ejected. With rotating components this can cause accidents. Please arrange suitable guarding.

The technical notes provided in the **application details** depend on the environmental and application conditions (such as machine, environmental temperature, lubrication/coolant used and desired machining results): these are based on proper application conditions, use and compliance with the spindle speed limits given for the tools.

To prevent damage to machine and tool, we recommend that the drive power be calculated in advance (see performance calculation on page 21-25). The drive power which is actually available will be found in the machine manufacturer's spindle speed/performance diagram.

Safety equipment should be provided to protect personnel from flying chips.

To ensure the best possible tool life, the insert should be changed promptly.

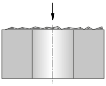
Acceptable width of flank wear marks on inserts:
W29 10... to W29 18... VB max = 0,20 mm
W29 24... to W29 34... VB max = 0,25 mm
W29 42... to W29 58... VB max = 0,30 mm

Hazard warning:

If using tungsten carbide-based hard metal products together with cobalt as a binder metal, please read our safety data sheets, which are available for you to download from our website.
http://www.kometgroup.com/navigation-top/download/service/datenblaetter.html

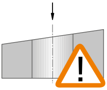
KOMET KUB® Drillmax, KUB® Drillmax XL

Technical notes



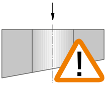
1. Starting on uneven surfaces (cast surfaces)

- depending on the quality of the surface or when spot drilling, reduce the feed



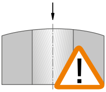
2. Starting on angled surfaces

- spot face surface before starting bore



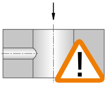
3. Angled bore exit

- reduce feed by 50 % in the exit area



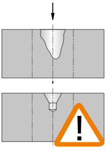
4. Starting on cambered surfaces

- drilling on centre with reduced feed is possible
- spot facing is required if the bore start point is outside the radius centre



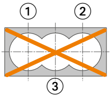
5. Drilling through a cross bore

- half feed rate at interruption

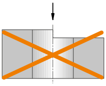


6. Starting on a groove or large centering bore

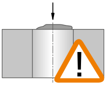
- end-face the seam or centre beforehand where applicable (diameter min. 0.1 mm greater than drill diameter)
- possible under certain conditions. Reduce feed where necessary



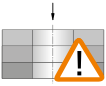
7. Drilling a chamfer
- not possible



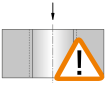
8. Starting on an edge
- not possible (start point must be flat)



9. Starting on a welded seam
- spot face surface before starting bore



10. Drilling through stacked plates
- good workpiece clamping required
- avoid large spaces between elements
- 12×D not possible

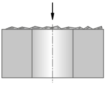


11. Roughing
- 5×D and 7-8×D possible
- 12×D, 20×D and 30×D not possible

Warning! A pilot hole must always be drilled. Direct spot drilling is not possible, even on a machined spot-drill surface.
Angled surfaces or unmachined spot-drill surfaces must also be faced or spot faced for the pilot drilling tool.

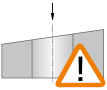
KOMET KUB K2®

Technical notes



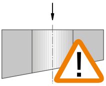
1. Starting on uneven surfaces (cast surfaces)

- depending on the quality of the surface or when spot drilling, reduce the feed



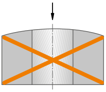
2. Starting on angled surfaces

- spot face surface before starting bore



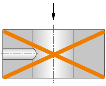
3. Angled bore exit

- reduce feed by 50 % in the exit area



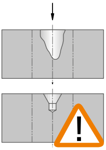
4. Starting on cambered surfaces

- not possible



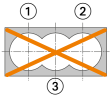
5. Drilling through a cross bore

- not possible



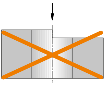
6. Starting on a groove or large centering bore

- end-face the seam or centre beforehand where applicable (diameter min. 0.1 mm greater than drill diameter)
- possible under certain conditions. Reduce feed where necessary



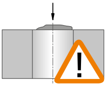
7. Drilling a chamfer

- not possible

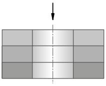


8. Starting on an edge

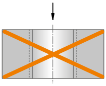
- not possible (start point must be flat)



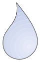
9. Starting on a welded seam
- spot face surface before starting bore



10. Drilling through stacked plates
- possible in principle
- good workpiece clamping required
- avoid large spaces between elements

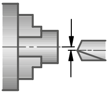


11. Roughing
- not possible

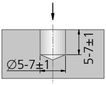


12. Coolant
- internal coolant supply min. 5 bar

13. Rotating application
- max. concentricity in rotating application 0,05 mm



14. Stationary application
- max. offset in stationary application 0,025 mm

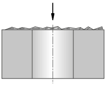


Recommended pilot hole
- basic body from 5×D: for the material group 1.0

KOMET KUB Quatron®, KUB Trigon®, KUB® Drill

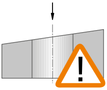
Technical notes

2×D



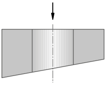
1. Starting on uneven surfaces (cast surfaces)

- subject to the surface, reduce feed as required when starting the bore



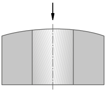
2. Starting on angled surfaces

- subject to the starting angle, the feed must be reduced when starting the bore.
  Rule of thumb: 3° ≙ 30%; 10° ≙ 40%; 25° ≙ 60% use tools max. 2×D
- use tough insertand stable corner radius



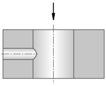
3. Angled bore exit

- from wear cut is interrupted reduce feed rate up to 50%
- use tough insertand stable corner radius



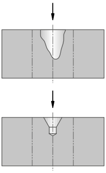
4. Starting on cambered surfaces

- no problems
- reduce feed rate if necessary



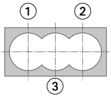
5. Drilling through a cross bore

- reduce feed rate 50% if necessary
- watch for chip jamming around tool
- use tough insertand stable corner radius



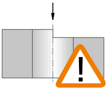
6. Starting on a groove or large centering bore

- use short tools, max. 3×D
- spot face if required
- reduce feed
- use tough insert for internal cutting edge



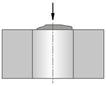
7. Drilling a chamber

- first bore Nos. 1 + 2, then bore No. 3
- check distribution is symmetrical
- avoid chip jams
- if necessary reduce to approx. 1-1,5 mm in the ∅ on circumference
- reduce feed rate 50% for interrupted cut
- use tough insertand stable corner radius



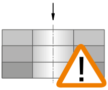
8. Starting on an edge

- reduce feed rate by 50%
- use tough insertand stable corner radius



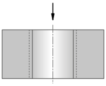
9. Starting on a welded seam

- reduce feed rate
- use max. 3×D tools



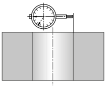
10. Drilling through stacked plates

- possible with KUB Quatron®
- not possible with KUB® / KUB Trigon®
- good workpiece clamping required
- max. gap = 1 mm



11. Roughing

- possible with KUB Quatron®
- possible with KUB Trigon® up to 3×D



12. Adjustable

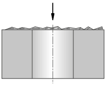
- using adjusting device (ABS-MV) and eccentric adjusting device
- for turning machines over axis

Note: please note max. offset ∅ in tables

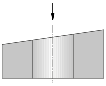
KOMET KUB Quatron®, KUB Trigon®, KUB® Drill

Technical notes

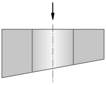
3×D



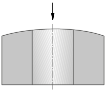
1. Starting on uneven surfaces (cast surfaces)
- subject to the surface, reduce feed as required when starting the bore



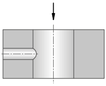
2. Starting on angled surfaces
- max. 3° angled position possible (cast angles)
- reduce feed rate when starting bore
- use stable corner radius



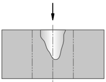
3. Angled bore exit
- from wear cut is interrupted reduce feed rate up to 50%
- use tough insertand stable corner radius

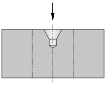


4. Starting on cambered surfaces
- no problems
- reduce feed rate if necessary

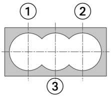


5. Drilling through a cross bore
- reduce feed rate 50% if necessary
- watch for chip jamming around tool
- use tough insertand stable corner radius



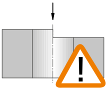


6. Starting on a groove or large centering bore
- use short tools, max. 3×D
- spot face if required
- reduce feed
- use tough insert for internal cutting edge



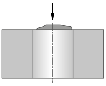
7. Drilling a chamber

- first bore Nos. 1 + 2, then bore No. 3
- check distribution is symmetrical
- avoid chip jams
- if necessary reduce to approx. 1-1,5 mm in the ∅ on circumference
- reduce feed rate 50% for interrupted cut
- use tough insertand stable corner radius



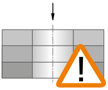
8. Starting on an edge

- not possible for 3×D tools
- because of the undefined surface for starting the bore, pre-machining is required (spot facing, face milling)
- then continue as described under Point 1



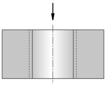
9. Starting on a welded seam

- reduce feed rate
- use max. 3×D tools



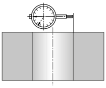
10. Drilling through stacked plates

- possible with KUB Quatron®
- not possible with KUB® / KUB Trigon®
- good workpiece clamping required



11. Roughing

- possible with KUB Quatron®
- possible with KUB Trigon® up to 3×D



12. Adjustable

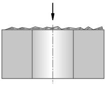
- using adjusting device (ABS-MV) and eccentric adjusting device
- for turning machines over axis

Note: please note max. offset ∅ in tables

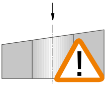
KOMET KUB Trigon®, KUB® Drill

Technical notes

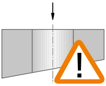
4×D



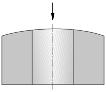
1. Starting on uneven surfaces (cast surfaces)
- subject to the surface, reduce feed as required when starting the bore



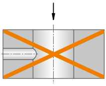
2. Starting on angled surfaces
- not possible for 4×D tools
- starting surface must be spot faced or spot milled



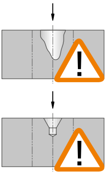
3. Angled bore exit
- Reduce feed by up to 50% for 4×D tools



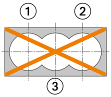
4. Starting on cambered surfaces
- starting surface must be milled evenly



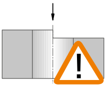
5. Drilling through a cross bore
- not possible with 4×D tools
- if necessary apply cross bore later



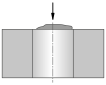
6. Starting on a groove or large centering bore
- points for starting bore must be rough machined first



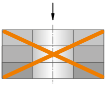
7. Drilling a chamber
- not possible



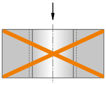
8. Starting on an edge
- not possible for 4×D tools
- because of the undefined surface for starting the bore, pre-machining is required (spot facing, face milling)
- then continue as described under Point 1



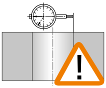
9. Starting on a welded seam
- Reduce feed by up to 50% for 4×D tools
- if necessary pre-machine point for starting bore



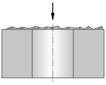
10. Drilling through stacked plates
- not possible



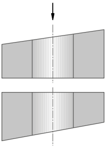
11. Roughing
- not possible



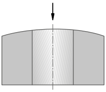
12. Adjustable
- dimensional adjustment within 1/10 range possible



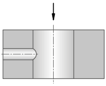
1. Starting on uneven surfaces (cast surfaces)
- when inserting and withdrawing the drill, reduce the feed rate by approx. 30-50% (depending on component stability, clamping and surface quality)



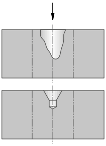
2. Starting on angled surfaces / angled bore exit
- when inserting the drill, reduce the feed rate by approx. 30-60% until full diameter is reached
- when withdrawing the drill after interruption to the cut, reduce the feed rate by approx. 30-60%
- use tough insert and stable corner radius



3. Starting on cambered surfaces
- when inserting the drill, reduce the feed rate by approx. 30-60% until full diameter is reached
- when withdrawing the drill after interruption to the cut, reduce the feed rate by approx. 30-60% (depending on component stability and clamping).

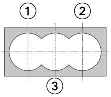


4. Drilling through a cross bore
- when inserting and withdrawing the drill, reduce the feed rate by approx. 30-50% (depending on component stability, clamping and surface quality)
- in the vicinity of the cross bore, reduce the feed rate by 50%
- watch for chip jamming around tool
- use tough insert and stable corner radius



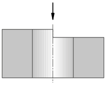
5. Starting on a groove or large centering bore
- when inserting the drill, reduce the feed rate by approx. 30-50% until centring depth is reached
- reduce feed rate
- use tough insert for internal cutting edge
- spot face if required

6. Drilling a chamber



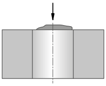
- first bore Nos. 1 + 2, then bore No. 3
- check distribution is symmetrical
- avoid chip jams
- use tough insertand stable corner radius
- Continuous drilling: when inserting the drill, reduce the feed rate by approx. 30-60% (depending on component stability and clamping)
- Interruption to cut: when drilling the cut interruption, reduce the feed rate by approx. 50-60%

7. Starting on an edge



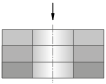
- when inserting and withdrawing the drill, reduce the feed rate by approx. 30-50% (depending on component stability, clamping and surface quality)
- use tough insert and stable corner radius

8. Starting on a welded seam



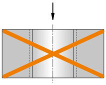
- when inserting the drill, reduce the feed rate by approx. 30-60% until full diameter is reached
- when withdrawing the drill after interruption to the cut, reduce the feed rate by approx. 30-60% (depending on component stability and clamping).

9. Drilling through stacked plates



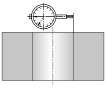
- good workpiece clamping required
- max. gap = 1 mm

10. Roughing

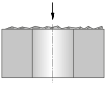


- not possible

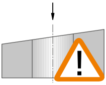
11. Adjustable



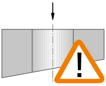
- when inserting and withdrawing the drill reduce the feed rate by approx. 30-50% until full bore diameter is reached (depending on component stability and clamping).
- use tough insert and stable corner radius



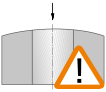
1. Starting on uneven surfaces (cast surfaces)
- Possible in principle
- Reduce feed rate when starting bore



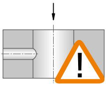
2. Starting on angled surfaces
- Spot face surface before starting bore
- Avoid chips jams



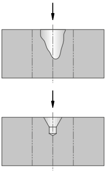
3. Angled bore exit
- Possible under certain conditions
- Reduce feed rate if necessary



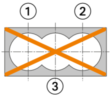
4. Starting on cambered surfaces
- Centered boring can be started with reduced feed rate
- Spot facing is required if the point for starting the bore is outside the radius centre



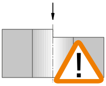
5. Drilling through a cross bore
- Halve feed rate at interruption
- Cross bore max. 1/3 of bore diameter
- Off-centre cross bore not possible



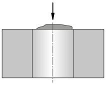
6. Starting on a groove or large centering bore
- Possible under certain conditions
- Reduce feed rate if necessary
- Face beforehand where centre is particularly large



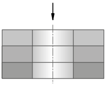
7. Drilling a chamber
• not possible



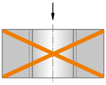
8. Starting on an edge
• Start point must be flat



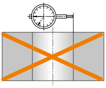
9. Starting on a welded seam
• Reduce feed rate when starting bore
• Face beforehand if necessary



10. Drilling through stacked plates
• Possible in principle
• Avoid large spaces between elements



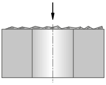
11. Roughing
• not possible



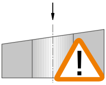
12. Adjustable
• not possible
• dimensional adjustment of diameter by means of inserts

KOMET KUB Centron® Powerline

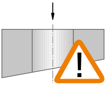
Technical notes



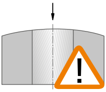
1. Starting on uneven surfaces (cast surfaces)
- possible in principle
- reduce feed rate when starting bore



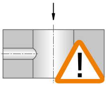
2. Starting on angled surfaces
- surface for starting bore must be spot faced beforehand
- avoid chip jams on drill shank



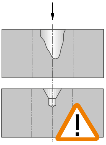
3. Angled bore exit
- possible under certain conditions
- reduce feed rate if necessary
- drilling angle max. 3°



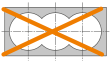
4. Starting on cambered surfaces
- centered boring can be started with reduced feed rate
- spot facing is required if the point for starting the bore is outside the radius centre



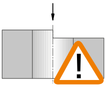
5. Drilling through a cross bore
- halve feed rate at interruption
- cross bore max. 1/3 of bore diameter
- off-centre cross bore not possible



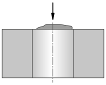
6. Starting on a groove or large centering bore
- surface for starting bore must be spot faced beforehand
- reduce feed rate if necessary



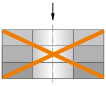
7. Drilling a chamber
- not possible



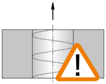
8. Starting on an edge
- not possible
- surface for starting bore must be spot faced beforehand
- avoid chip jams on drill shank



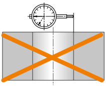
9. Starting on a welded seam
- reduce feed rate when starting bore
- face beforehand if necessary



10. Drilling through stacked plates
- not possible



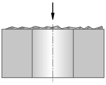
11. Backing out of the bore
- tool 9×D swings up at bore exit
- back out of the bore with greatly reduced speed to avoid any development of chatter marks



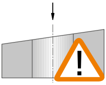
12. adjustable
- not adjustable, fixed diameter
- intermediate dimensions on request

KOMET KUB Centron®

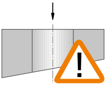
Technical notes



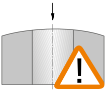
1. Starting on uneven surfaces (cast surfaces)
- Possible in principle
- Reduce feed rate when starting bore



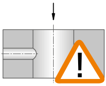
2. Starting on angled surfaces
- Surface for starting bore must be spot faced beforehand
- Avoid chip jams on drill shank



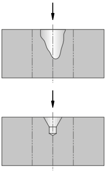
3. Angled bore exit
- Possible under certain conditions
- Reduce feed rate if necessary
- Drilling angle max. 3°



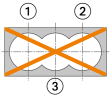
4. Starting on cambered surfaces
- Centered boring can be started with reduced feed rate
- Spot facing is required if the point for starting the bore is outside the radius centre



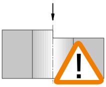
5. Drilling through a cross bore
- Halve feed rate at interruption
- Cross bore max. 1/3 of bore diameter
- Off-centre cross bore not possible



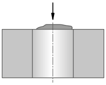
6. Starting on a groove or large centering bore
- Possible under certain conditions
- Reduce feed rate if necessary
- Face beforehand where centre is particularly large
- Central drill bit basic adjustment optimize if necessary



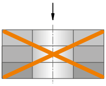
7. Drilling a chamber
- not possible



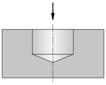
8. Starting on an edge
- Surface for starting bore must be spot faced beforehand
- Avoid chip jams on drill shank



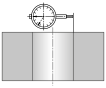
9. Starting on a welded seam
- Reduce feed rate when starting bore
- Face beforehand if necessary



10. Drilling through stacked plates
- not possible



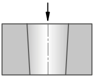
11. Blind hole
- possible
- set guide pads 0.5 mm below actual ∅



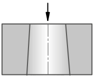
12. Adjustable
- can be adjusted from 65 mm diameter

Rotating and stationary use

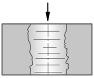
Short tool life types of wear on inserts
- cutting speed to high → select correct cutting speed
- cutting material with too little wear resistance → select grade with higher wear resistance
- tool overhang too great → if possible use shorter tool
- damaged insert seating → check tool, change if necessary
- clamping device not stable enough → improve stability



Bore narrows at bottom
- chip jam on external cutting edge → use different chip fracture geometry, increase feed if necessary
- material very soft → increase cutting speed, reduce feed. Use positive chip geometry



Bore widens at bottom
- chip jam on internal cutting edge → use different chip fracture geometry, increase feed if necessary



Bad surface finish
- bad chip removal → improve cutting parameters: increase cutting speed reduce feed

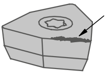
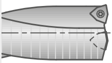
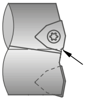


Bild up on cutting edge
- cutting speed too low → increase cutting speed
- insert too negative → use positive geometry
- coating not suitable → select correct coating



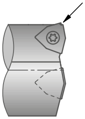
Friction marks on tool shank
- bore diameter too small → check setting
- chip removal problems → improve cutting parameters, check geometry of inserts
- cutting edge corner radius too large → use correct cutting edge radius

Stationary use



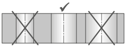
Fracture on internal cutting edge

- drill bit height of tool too high/too low → tool turret/ holder may have shifted. Readjust machine
- mix-up between renforced/non renforced insert → use correct insert
- feed rate too high → reduce feed rate
- insert grade too brittle → use tougher insert grade
- wrong insert geometry → use geometry with chamfered cutting edge



Fracture on external cutting edge

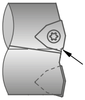
- feed rate too high → reduce feed rate
- interrupted cut → change to tougher insert grade
- cutting edge corner radius too small → use insert with larger cutting edge radius



Bore too small/ too large

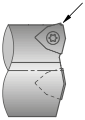
- machine not at X-0 position → move axis to correct position
- machine axis shifted → readjust machine

Rotating use



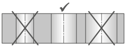
Fracture on internal cutting edge

- mix-up between renforced/non renforced insert → use correct insert
- feed rate too high → reduce feed rate
- insert grade too brittle → use tougher insert grade
- wrong insert geometry → use geometry with chamfered cutting edge



Fracture on external cutting edge

- feed rate too high → reduce feed rate
- interrupted cut → change to tougher insert grade
- cutting edge corner radius too small → use insert with larger cutting edge radius



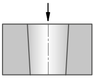
Bore too small/ too large with adjustable tool

- wrong cutting edge radius used → use correct cut-ting edge radius
- setting wrong → correct setting

Problems → possible causes → solutions

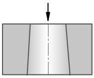
Short tool life types of wear on inserts

- cutting speed to high → select correct cutting speed
- cutting material with too little wear resistance → select grade with higher wear resistance
- tool overhang too great → if possible use shorter tool
- damaged insert seating → check tool, change if necessary
- clamping device not stable enough → improve stability



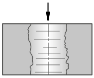
Bore narrows at bottom

- chip jam on external cutting edge → use different chip fracture geometry, increase feed if necessary
- material very soft → increase cutting speed, reduce feed. Use positive chip geometry
- axial adjustment of central drill bit not the best > adjust setting as shown on setting sheet in operating instructions



Bore widens at bottom

- chip jam on internal cutting edge → use different chip fracture geometry, increase feed if necessary



Bad surface finish

- bad chip removal → improve cutting parameters: increase cutting speed reduce feed

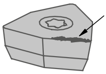
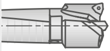


Bild up on cutting edge

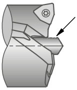
- cutting speed too low → increase cutting speed
- insert too negative → use positive geometry
- coating not suitable → select correct coating



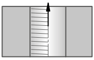
Friction marks on tool shank

- bore diameter too small → check setting
- chip removal problems → improve cutting parameters, check geometry of inserts
- cutting edge corner radius too large → use correct cutting edge radius
- chip jams on support element, fractured support element > where basic element < 6 × D use of support element can be dispensed with

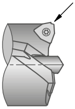
Stationary use



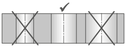
Heavy wear on one side on central drill bit
- tool not central → tool turret/holder may have shifted – readjust machine



Withdrawal groove on one side
- tool not central → tool turret/holder may have shifted – readjust machine

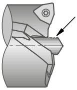


Fracture on external cutting edge
- feed rate too high → reduce feed rate
- interrupted cut → change to tougher insert grade
- cutting edge corner radius too small → use insert with larger cutting edge radius

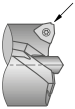


Bore too small/ too large
- machine not at X-0 position → move axis to correct position
- machine axis shifted → readjust machine

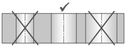
Rotating use



Heavy wear on one side on central drill bit
- insufficient guiding → check length setting on central drill bit



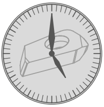
Fracture on external cutting edge
- feed rate too high → reduce feed rate
- interrupted cut → change to tougher insert grade
- cutting edge corner radius too small → use insert with larger cutting edge radius



Bore too small/ too large with adjustable tool
- wrong cutting edge radius used → use correct cutting edge radius
- setting wrong → correct setting

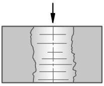
KOMET KUB Duon®

Problems → possible causes → solutions



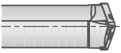
Short tool life types of wear on inserts

- cutting speed to high
  → select correct cutting speed
- cutting material with too little wear resistance
  → select grade with higher wear resistance
- tool overhang too great
  → if possible use shorter tool
- damaged insert seating
  → check tool, change if necessary
- clamping device not stable enough
  → improve stability
- run-out error
  → check tool, adaptor and spindle



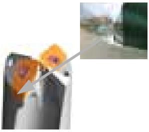
Bad surface finish

- chip jam on external cutting edge
  → improve cutting parameters: increase cutting speed reduce feed
  → check cutting parameters: reduce feed rate when starting bore



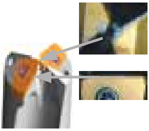
Friction marks on tool shank

- bore diameter too small
  → check setting
- chip removal problems
  → improve cutting parameters, check geometry of inserts



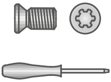
Wear

- cutting material not sufficiently wear resistant
  → better wear resistant material
- cutting speed too high
  → reduce cutting speed
- run-out error
  → check tool, adaptor and spindle



Wear, micro fractures

- cutting material too hard
  → use tougher cutting material with higher tensile strength
- feed rate not reduced when starting bore
  → reduce feed rate when starting bore and drilling out
- run-out error
  → check tool, adaptor and spindle

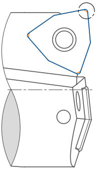


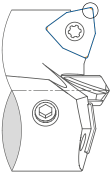
Securing the inserts

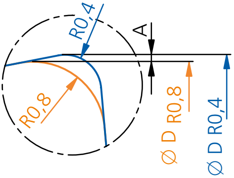
- wrong screwdriver used
  → only use TorxPlus ® screws and screwdriver
- starting torque too low
  → Check starting torques. Optimum starting torques only possible with TorxPlus ®

KOMET KUB Trigon ®, KUB Centron ®

Dimensional variation







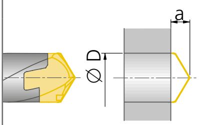
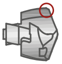
$$D_{R0,8} = D_{R0,4} - 2 \times A$$

KUB Centron ®	
∅ D	A
33,0 – 37,9	0,08
38,0 – 54,9	0,09
55,0 – 64,9	0,10

KUB Trigon ® · KUB ®	
∅ D	A
25,0 – 27,9	0,08
28,0 – 28,9	0,09
29,0 – 29,9	0,10
30,0 – 31,9	0,08
32,0 – 33,9	0,09
34,0 – 36,9	0,10
37,0 – 38,9	0,08
39,0 – 41,9	0,09
42,0 – 44,9	0,10

KOMET KUB K2 ®

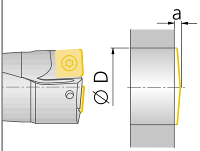
Starting/roughing sizes

KUB K2 ® 	H70 BK8425 	H70 BK2725 	H71 BK2725 	H72 BK7930 
∅ D	a			a
10,0 – 10,9	2,1			2,6
11,0 – 11,9	2,3			2,8
12,0 – 12,9	2,45			3,1
13,0 – 13,9	2,6			3,3
14,0 – 14,9	2,8			3,6
15,0 – 15,9	3,0			3,8
16,0 – 16,9	3,2			4,0
17,0 – 17,9	3,4			4,3
18,0 – 18,9	3,5			4,5
19,0 – 20,5	3,8			4,8

KOMET KUB Quatron ®, KUB Pentron ®, KUB Trigon ®, KUB Duon ®

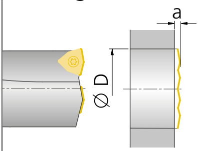
Starting/roughing sizes

KUB Quatron ® / KUB Pentron ®



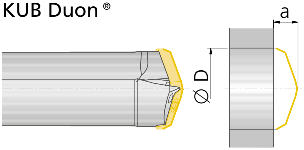
∅ D	a
14,0 – 17,5	1,5
18,0 – 21,0	1,9
22,0 – 26,5	2,4
27,0 – 33,0	2,8
34,0 – 44,0	3,0
45,0 – 52,0	3,3
53,0 – 65,0	3,7

KUB Trigon ®



∅ D	a
14,0 – 19,5	1,3
20,0 – 24,0	1,5
24,5 – 36,0	1,7
37,0 – 44,0	2,0
45,0 – 54,0	2,4
55,0 – 68,0	2,7
69,0 – 82,0	3,5

KUB Duon ®



∅ D	a
17,3	4,0
17,5	4,1
18,0	4,1
18,5	4,2
19,0	4,3
19,5	4,4
20,0	4,5
20,5	4,5
21,0	4,8
21,5	4,9
22,0	5,0

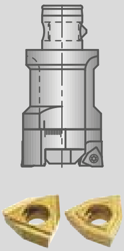
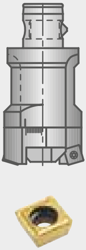
∅ D	a
22,5	5,1
23,0	5,1
23,5	5,2
24,0	5,3
24,5	5,4
25,0	5,7
25,5	5,7
26,0	5,8
26,5	5,9
27,0	6,0
27,5	6,1

∅ D	a
28,0	6,1
28,5	6,2
29,0	6,3
29,5	6,4
30,0	6,7
31,5	6,7
31,0	6,8
31,5	6,9
32,0	7,0
32,5	7,1
33,0	7,1
33,5	7,2
34,0	7,3
34,5	7,4
35,0	7,5
35,5	7,5
36,0	7,6

∅ D	a
36,5	7,7
37,0	8,0
37,5	8,1
38,0	8,1
38,5	8,2
39,0	8,3
39,5	8,4
40,0	8,5
40,5	8,5
41,0	8,6
41,5	8,7
42,0	8,8
42,5	8,9
43,0	8,9
43,5	9,0
44,0	9,1
44,2	9,2

Important: For more application details and safety notes see ▶ 86-87!

Index Roughing

	KOMET TwinKom® G01 	KOMET TwinKom® G01 
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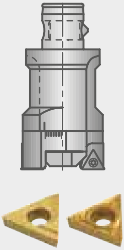
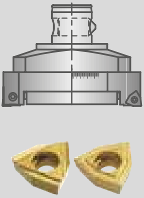
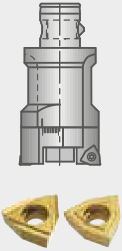
	KOMET TwinKom® G01 	KOMET TwinKom® G01 	KOMET TwinKom® G04 
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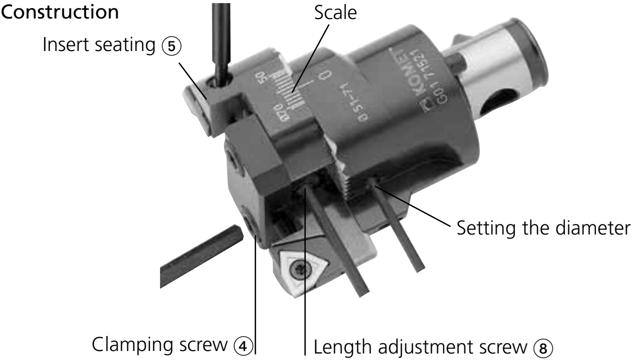
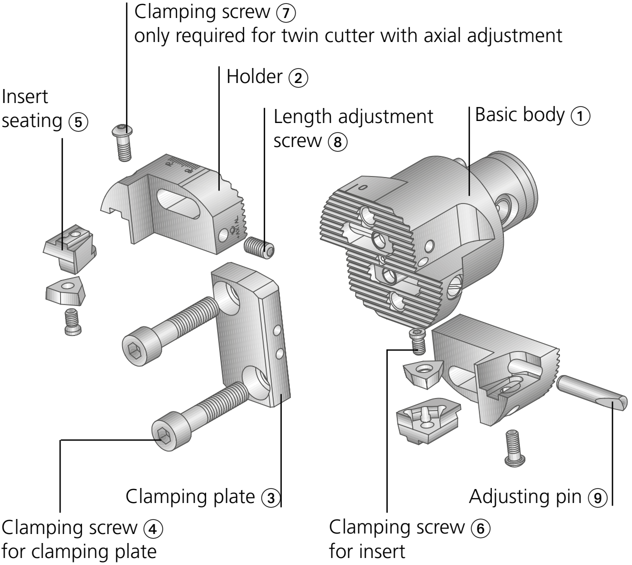
KOMET TwinKom® G01

Construction



Adaptors with the same approach angle can be combined among each other.



Setting the diameter

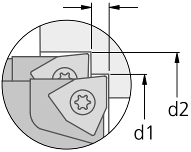
Loosen the clamping screw ④ on one side only. Set the diameter and tighten clamping screw ④ again. Repeat the same procedure on the second side. The scale is used purely for coarse setting the diameter. Exact diameter setting should be carried out with a setting device.

Length adjustment

Loosen insert seating ⑤ and then tighten again slightly. Set length to 0.02 mm in front of required dimension using length adjustment screw ⑧, tighten insert seating ⑤ and set to required height with length adjustment screw ⑧. Repeat the same procedure on the second side.

Combination roughing / combination finishing

With combination roughing and combination finishing, division of the whole cutting width is produced by offsetting the cutting edge axially and radially. This should allow the ensuing cutting forces to be better distributed and produce an even cutting result. With the roughing operation, this allows double the cutting width (using only a single feed rate $f=f_z$). With the finishing operation, the cutting width is divided so that some of the intermediate machining can be omitted.



Distribution of cut

For burnt-out and pre-cast bores with large allowances.

$$d = D_{finished} - \left[\left(\frac{D_{finished} - D_{blank}}{2} \right) + \text{offset} \right] \times 0{,}8$$

Example:

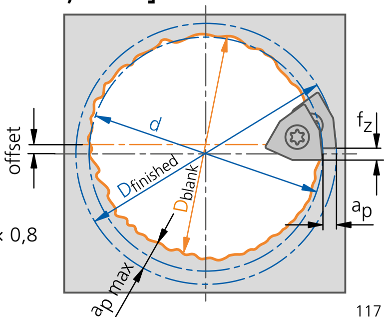
$D_{finished}$ = 100 mm

D_{blank} = 80 mm

Offset = 3 mm

$$d = 100 - \left[\left(\frac{100 - 80}{2} \right) + 3 \right] \times 0{,}8$$

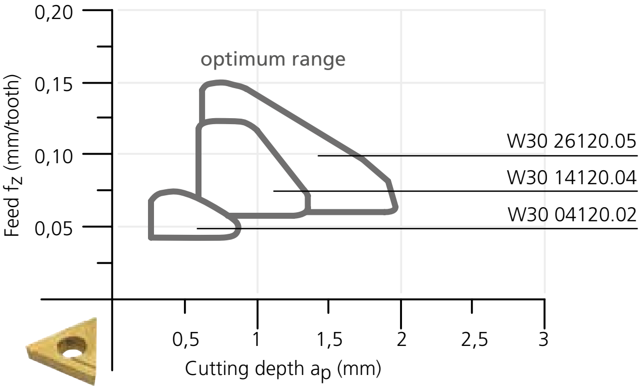
d = 89,6 mm

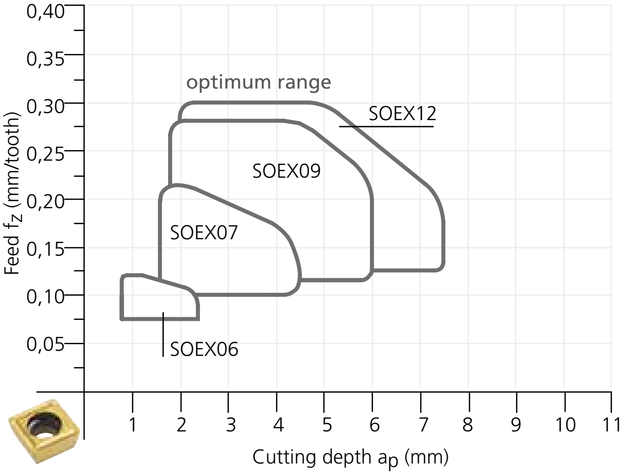


KOMET TwinKom® G01

Optimum cutting depth range

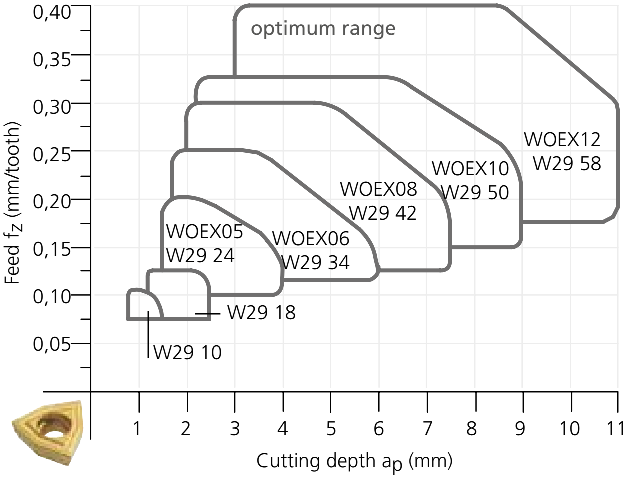
Guideline values for medium strength steels



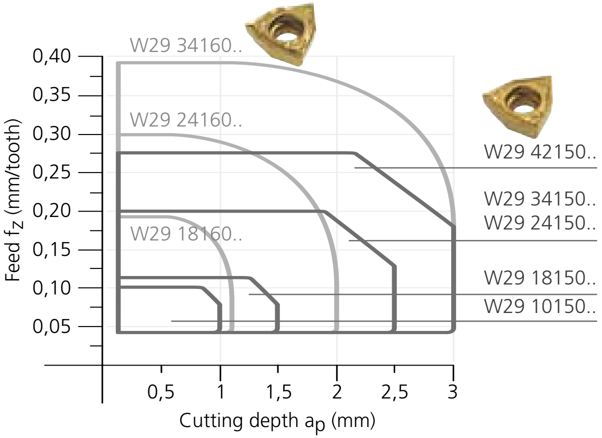


Important: For more application details and safety notes see ▸86-87!

Guideline values for medium strength steels



Guideline values for geometry 15 and 16 for medium strength steels

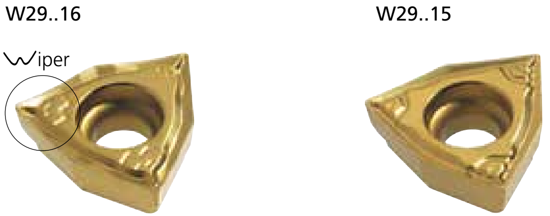


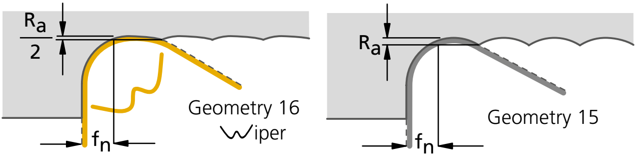
KOMET TwinKom® G01

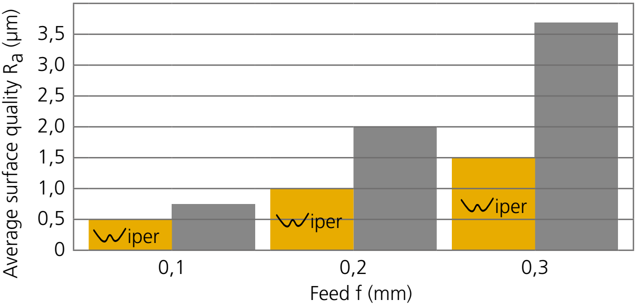
Surface quality results

Comparison of surface quality results for "Wiper" – R04 for ϰ = 90°

(in X40Cr13 / 1.4034)

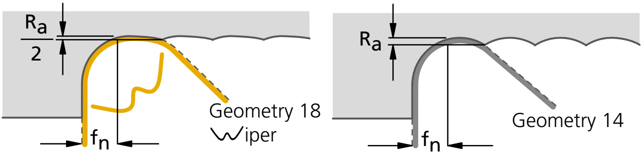


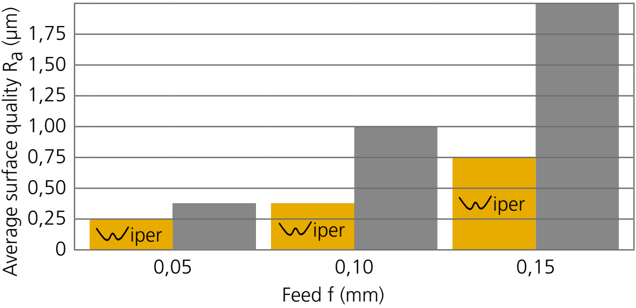




Comparison of surface quality results for "Wiper" – R04 for $\varkappa$ = 90°

(in X40Cr13 / 1.4034)

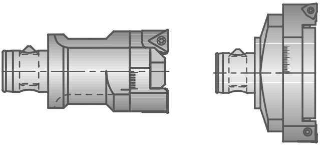


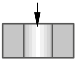
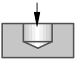
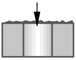
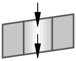
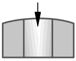
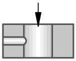
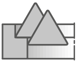
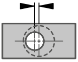
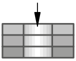
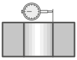


Important: For more application details and safety notes see ▸ 86-87!

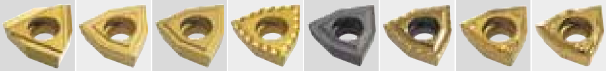
KOMET TwinKom® G01, G04

Machining options



	Machining	G01	G04
	through hole	●	●
	blind hole	●	●
	uneven	●	●
	angled start and drilling out, interrupted cut	●	●
	convex	●	●
	cross bore	●	●
	divided cut	●	✕
	large hole offset	●	●
	stack plate drilling	80°	80°
	adjustable	●	●

● very good ◐ good ○ possible: see technical notes ▸ 130 ✕ not possible



	W01	W29..01	W29..02	W29..03	W29..11	W29..13	W29..15	W29..16
Basic recommendation								
P		BK8425						
S					BK77			
M		BK7930						
K		BK7615						
N					BK77			
H								
alternative for better chip control								
P	BK8425		BK6440	BK8425		BK8425	BK8430	
S	K10							
M						BK79	BK73	
K								
N	K10							
H								
alternative for higher cutting speed ▸ 64 - 65								
P	BK6425	BK72	BK6440	BK6425		BK7325	BK73	
S								
M		BK72				BK7325	BK73	
K	CBN57/SK45	BK7615						
N	PKD55				BK50			
H								
alternative for greater strength								
P		P40						
S								
M		P40						
K		K10			K10			
N					K10			
H								
for better surface finish								
P								BK8430
S								
M								BK73
K								BK60
N								
H								

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Guideline values for roughing with W29

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	W29..00, ..01, ..02, ..03, ..11, ..13 max. feed f_z (mm/tooth)						
			W29 10 a_p= 1,5	W29 18 a_p= 2,5	W29 24 a_p= 4,5	W29 34 a_p= 6	W29 42 a_p= 7,5	W29 50 a_p= 9	W29 58 a_p= 9
P	1.0	200	0,10	0,12	0,15	0,20	0,25	0,30	0,30
P	2.0	200	0,10	0,12	0,15	0,20	0,25	0,30	0,30
P	2.1	180	0,10	0,12	0,15	0,20	0,25	0,30	0,30
P	3.0	140	0,10	0,12	0,15	0,20	0,25	0,30	0,30
P	4.0	120	0,06	0,10	0,12	0,15	0,20	0,25	0,25
P	4.1								
S	5.0	50	0,06	0,08	0,10	0,12	0,15	0,18	0,20
S	5.1	50	0,06	0,08	0,10	0,12	0,15	0,18	0,20
M	6.0	120	0,07	0,09	0,12	0,12	0,15	0,20	0,20
M	6.1	120	0,07	0,09	0,12	0,12	0,15	0,20	0,20
M	7.0	90	0,05	0,07	0,10	0,10	0,12	0,15	0,15
K	8.0	180	0,12	0,15	0,25	0,25	0,30	0,35	0,35
K	8.1	140	0,12	0,15	0,25	0,25	0,30	0,35	0,35
K	9.0	140	0,12	0,15	0,25	0,25	0,30	0,35	0,35
K	9.1	120	0,10	0,12	0,15	0,20	0,25	0,30	0,35
K	10.0	100	0,10	0,12	0,15	0,20	0,25	0,30	0,35
K	10.1	100	0,10	0,12	0,15	0,20	0,25	0,30	0,35
K	10.2	90	0,12	0,15	0,25	0,30	0,30	0,35	0,35
N	12.0	250	0,12	0,15	0,25	0,25	0,30	0,35	0,35
N	12.1	250	0,12	0,15	0,25	0,25	0,30	0,35	0,35
N	13.0	250	0,12	0,15	0,25	0,25	0,30	0,35	0,35
N	13.1	250	0,12	0,15	0,25	0,25	0,30	0,35	0,35
N	14.0	200	0,12	0,15	0,25	0,25	0,30	0,35	0,35
H	15.0								
H	16.0								

Guideline values for roughing with W29

	W29..15, W29..16				
	max. feed f_z (mm/tooth)				
	W29 10 a_p= 1	W29 18 a_p= 1,5	W29 24 a_p= 2	W29 34 a_p= 2	W29 42 a_p= 2,5
	0,06	0,10	0,18	0,18	0,25
	0,06	0,10	0,18	0,18	0,25
	0,06	0,10	0,18	0,18	0,25
	0,06	0,10	0,18	0,18	0,25
	0,06	0,10	0,18	0,18	0,25
	0,06	0,09	0,15	0,15	0,20
	0,06	0,09	0,15	0,15	0,20
	0,06	0,09	0,15	0,15	0,20

Important: For more application details and safety notes see ▸ 86-87!

KOMET TwinKom ®

Insert selection W83

	W83..01	W83..13	W83..21
	 -01	 -13	 -21
Basic recommendation			
P	BK8425		
S			BK7710
M	BK7935		
K	BK7615		
N			BK7710
H			
alternative for better chip control			
P		BK8425	BK8430
S			
M		BK7935	BK2730
K			
N			
H			
alternative for higher cutting speed ▶ 48 - 49			
P	BK6420 / BK6115		BK6130
S			
M	BK74		
K	BK6115		BK6130
N			
H			
alternative for greater strength			
P			BK8430
S			
M			BK8430
K			
N			
H			

Guideline values for roughing with W83

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	W83..01, W83..13, W83..21 max. feed f_z (mm/tooth)				
			W83 13... a_p= 1,5	W83 18... a_p= 2,5	W83 23... a_p= 4,5	W83 32... a_p= 4,5	W83 44... a_p= 7,5
P	1.0	200	0,12	0,14	0,20	0,25	0,35
P	2.0	200	0,12	0,14	0,20	0,25	0,35
P	2.1	180	0,12	0,14	0,20	0,25	0,35
P	3.0	140	0,12	0,14	0,20	0,25	0,35
P	4.0	120	0,10	0,12	0,18	0,25	0,3
P	4.1						
S	5.0	50	0,08	0,10	0,15	0,20	0,25
S	5.1	50	0,08	0,10	0,15	0,20	0,25
M	6.0	120	0,10	0,12	0,18	0,25	0,30
M	6.1	120	0,10	0,12	0,18	0,25	0,30
M	7.0	90	0,10	0,12	0,18	0,25	0,30
K	8.0	180	0,15	0,20	0,25	0,35	0,50
K	8.1	140	0,15	0,20	0,25	0,35	0,50
K	9.0	140	0,15	0,20	0,25	0,35	0,50
K	9.1	120	0,15	0,20	0,25	0,35	0,50
K	10.0	100	0,12	0,15	0,20	0,25	0,40
K	10.1	100	0,12	0,15	0,20	0,25	0,40
K	10.2	90	0,15	0,20	0,25	0,30	0,40
N	12.0	250	0,15	0,20	0,25	0,35	0,50
N	12.1	250	0,15	0,20	0,25	0,35	0,50
N	13.0	250	0,15	0,20	0,25	0,35	0,50
N	13.1	250	0,15	0,20	0,25	0,35	0,50
N	14.0	200	0,15	0,20	0,25	0,35	0,50
H	15.0						
H	16.0						

Important: For more application details and safety notes see ▸ 86-87!

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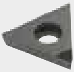
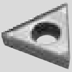
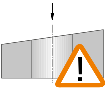
Insert selection W30, W57

	W30	W30 PKD/CBN	W57..12	W57..14
				
Basic recommendation				
P				BK8430
S			K10	
M				BK8430
K	BK7615			
N			K10	
H		CBN40 >52HRC		
alternative for better chip control				
P	CK32 / BK6425			
S				
M	CK32 / BK6425			
K				
N				
H				
alternative for higher cutting speed ▸ 144 - 146				
P				CK3210 / BK60
S			BK7710	
M				CK3210 / BK60
K		CBN57		
N		PKD55	BK7710	
H				
alternative for greater strength				
P	BK6425			
S				
M	BK6425			
K				
N				
H				

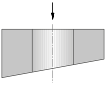
Guideline values for roughing with W30, W57

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	W30, W57 max. feed f_z (mm/tooth) W30 04... W57 04... a_p= 0,15	W30 14... W57 14... a_p= 0,4	W30 26... W57 26... a_p= 0,6
P	1.0	200	0,07	0,10	0,15
P	2.0	200	0,06	0,12	0,20
P	2.1	180	0,07	0,12	0,25
P	3.0	140	0,06	0,10	0,20
P	4.0	120	0,05	0,10	0,15
P	4.1				
S	5.0	50	0,04	0,08	0,10
S	5.1	50	0,04	0,08	0,10
M	6.0	120	0,05	0,10	0,15
M	6.1	120	0,05	0,10	0,15
M	7.0	90	0,04	0,08	0,15
K	8.0	180	0,10	0,15	0,30
K	8.1	140	0,10	0,15	0,30
K	9.0	140	0,08	0,15	0,25
K	9.1	120	0,08	0,15	0,25
K	10.0	100	0,08	0,15	0,25
K	10.1	100	0,07	0,12	0,25
K	10.2	90	0,10	0,15	0,25
N	12.0	250	0,04	0,08	0,20
N	12.1	250	0,08	0,15	0,20
N	13.0	250	0,06	0,10	0,15
N	13.1	250	0,08	0,12	0,20
N	14.0	200	0,08	0,12	0,20
H	15.0				
H	16.0				

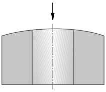
Important: For more application details and safety notes see ▸ 86-87!



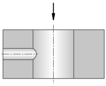
1. Starting on angled surfaces
- subject to the starting angle, the feed must be reduced when starting the bore.
  Rule of thumb: 3° = 30%; 10° = 40%; 25° = 60%
- use tough insert
- use stable corner radius



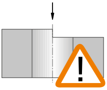
2. Angled bore exit
- from wear cut is interrupted reduce feed rate up to 50%
- use tough insert
- use stable corner radius



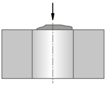
3. Starting on cambered surfaces
- no problems
- reduce feed rate if necessary



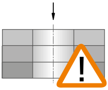
4. Roughing through a cross bore
- reduce feed rate 50% if necessary
- watch for chip jamming around tool
- use tough insert
- use stable corner radius



5. Starting on an edge
- reduce feed rate by 50%
- use tough insert
- use stable corner radius

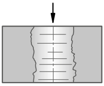


6. Starting on a welded seam
- reduce feed rate
- use max. 3×D tools

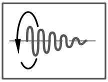


7. Roughing through stacked plates
- use holder with 80° approach angle
- good workpiece clamping required
- max. gap = 1 mm

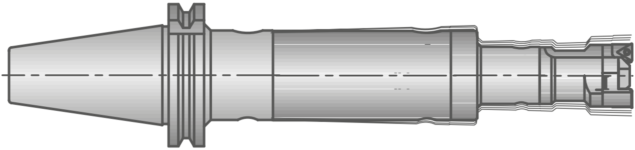
Long chips
- not optimum geometry
→ see table on page 93
→ select correct cutting depth
→ select correct cutting values



Bad surface finish
- feed rate too high → improve cutting parameters: increase cutting speed, reduce feed
- long chips → see table on page 93



Vibrations
- feed rate too high
- cutting speed too high
- geometry too obtuse
- check axial / radial setting
- check tool assembly
- if required, use a damping element adaptor



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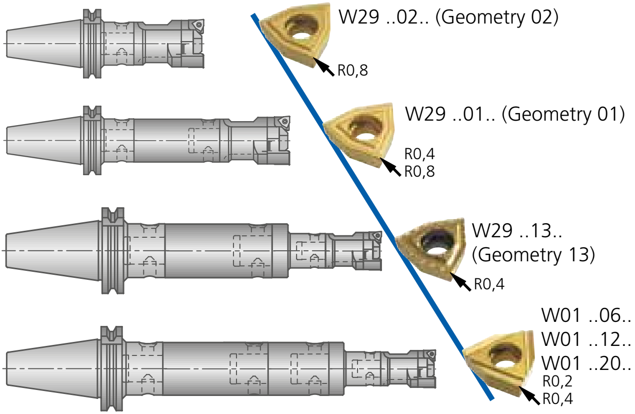
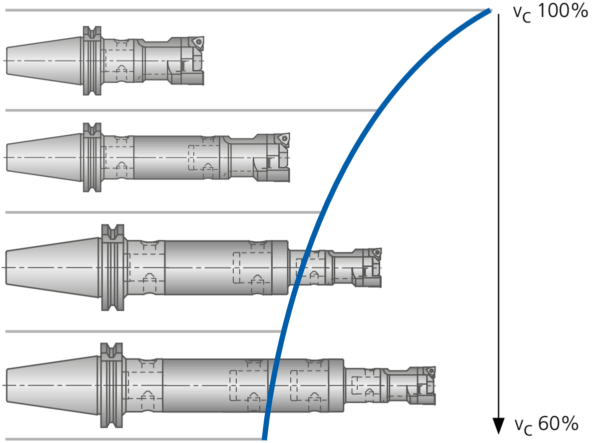
Overhang

Selecting geometry for overhang

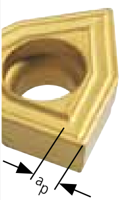
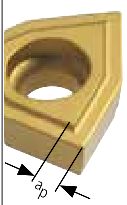
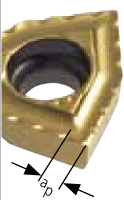
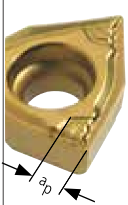
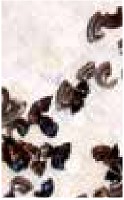
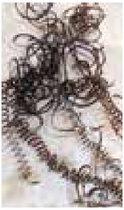


Cutting speed in relation to overhang

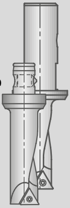


Chip formation from various insert geometries

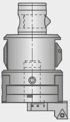
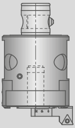
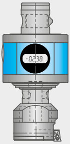
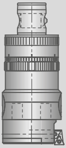
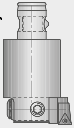
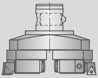
Tool:	TwinKom® twin cutter G01 Ø 40 mm
Material:	42CrMo4V 1100 N/mm²
Cutting data:	v_c = 140 m/min f = 0,35 mm/rev

W29..				
Geometry 01	Geometry 02	Geometry 03	Geometry 13	Geometry 15 / 16
				
Optimum cutting depth ▸119				Optimum cutting depth ▸119 - 120
a_p = 2,5 mm	a_p = 2,5 mm	a_p = 2,5 mm	a_p = 2,5 mm	a_p = 2,5 mm
				
a_p = 0,35 mm	a_p = 0,35 mm	a_p = 0,35 mm	a_p = 0,35 mm	a_p = 0,35 mm
				

Index Fine Boring

	KOMET® Boring bar H15 	KOMET UniTurn® 	KOMET® Boring bar 	KOMET® Boring bar low-vibration 
Machining options	▶ 136	▶ 136	▶ 138	▶ 138
Insert selection			▶ 141–143	▶ 141–143
Guideline values: cutting speed v_c feed f	▶ 137	▶ 137	▶ 140	▶ 140
Guideline values: higher cutting speed v_c insert coating			▶ 144 – 146	▶ 144 – 146
Chip formation			▶ 147	▶ 147

KOMET MicroKom *BluFlex*®
Precision Boring System with Bluetooth® Technology

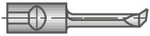
	KOMET MicroKom® *hi.flex* 	KOMET MicroKom *BluFlex*® 	KOMET MicroKom® M040 	KOMET MicroKom® M03Speed 	KOMET® Micro-adjustable head 	KOMET TwinKom® 
	▶ 138	▶ 138	▶ 139	▶ 139	▶ 139	▶ 139
	▶ 141–143	▶ 141–143	▶ 141–143	▶ 141–143	▶ 141–143	▶ 141–143
	▶ 140	▶ 140	▶ 140	▶ 140	▶ 140	▶ 140
	▶ 144 – 146	▶ 144 – 146	▶ 144 – 146	▶ 144 – 146	▶ 144 – 146	▶ 144 – 146
	▶ 147	▶ 147	▶ 147	▶ 147	▶ 147	▶ 147

Modern wireless networking is one of the benefits with which the new MicroKom *BluFlex*® fine adjustment head is equipped. Bluetooth® technology is developed for wirelessly networking devices over short distances. This technology has become standard for small mobile devices.
The introduction of Bluetooth® technology in the MicroKom *BluFlex*® tool system means that the display has been disconnected from the tool head, thereby making it easier and more convenient to read off the data. When adjusting the tool system, the user can move the display to suit the conditions on site, so that it is in his field of view. A specially designed adjustment key with integral Bluetooth® interface is part of the system.
With integral part balancing, the MicroKom *BluFlex*® can reach a rotational speed of up to 20,000 rpm.

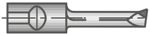
Bluetooth® technology is a Bluetooth SIG, Inc. brand name

KOMET UniTurn®, Boring Bar H15
Machining options

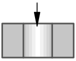
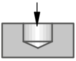
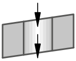
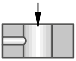
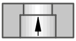
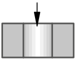
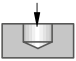
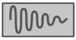
① Boring bar H15



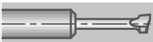
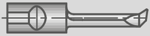
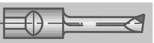
② UniTurn® Boring tool, Copying tool



③ UniTurn® Boring tool with CBN

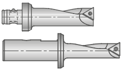
	Machining	①	②	③
	through hole	●	●	●
	blind hole	●	●	●
	angled start and drilling out, interrupted cut	◐	◐	◐
	cross bore	◐	◐	◐
	reverse machining	✕	✕	✕
	HRC > 54 through hole	✕	✕	●
	HRC > 54 blind hole	✕	✕	●
	vibration dampening	●	●	●

● very good ◐ good ○ possible ✕ not possible

Material group	Selection: L.H. fold page	Cutting speed v_c (m/min)	 ① Boring bar H15 max. feed f (mm/rev)	 ② UniTurn® Boring tool, Copying tool max. feed f (mm/rev)	 ③ UniTurn® Boring tool with CBN max. feed f (mm/rev)
P	1.0	40-180	0,015 - 0,025	0,02 - 0,04	
P	2.0	40-180	0,015 - 0,025	0,02 - 0,04	
P	2.1	60-200	0,015 - 0,025	0,03 - 0,06	
P	3.0	40-160	0,015 - 0,025	0,02 - 0,04	
P	4.0	40-140	0,015 - 0,025	0,02 - 0,04	
P	4.1				
S	5.0	20-40	0,010 - 0,020	0,010 - 0,020	
S	5.1	15-30	0,010 - 0,020	0,010 - 0,020	
M	6.0	40-140	0,015 - 0,025	0,015 - 0,030	
M	6.1	40-140	0,010 - 0,020	0,015 - 0,025	
M	7.0	40-140	0,010 - 0,020	0,015 - 0,025	
K	8.0	40-160	0,010 - 0,030	0,03 - 0,06	
K	8.1	40-140	0,010 - 0,030	0,03 - 0,06	
K	9.0	40-130	0,010 - 0,025	0,03 - 0,05	
K	9.1	40-130	0,015 - 0,030	0,02 - 0,05	
K	10.0	40-120	0,015 - 0,030	0,02 - 0,05	
K	10.1	40-120	0,015 - 0,030	0,02 - 0,05	
K	10.2	40-90	0,015 - 0,030	0,02 - 0,05	
N	12.0	60-210	0,015 - 0,030	0,02 - 0,06	
N	12.1	60-210	0,010 - 0,025	0,02 - 0,04	
N	13.0	70-220	0,010 - 0,025	0,02 - 0,04	
N	13.1	70-220	0,015 - 0,030	0,03 - 0,06	
N	14.0	70-220	0,015 - 0,030	0,03 - 0,07	
H	15.0	60-80			0,01-0,02 a_p max 0,07
H	16.0	50-70			0,01-0,02 a_p max 0,07

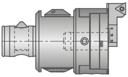
Important: For more application details and safety notes see ▸ 86-87!

KOMET ® Boring Bar
Machining options

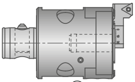


④ Boring bar

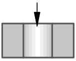
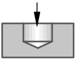
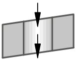
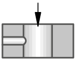
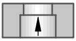
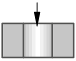
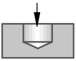
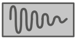
⑤ Boring bar low-vibration



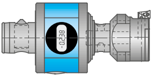
⑥ MicroKom ® *hi.flex*



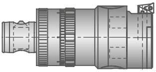
⑦ MicroKom *BluFlex* ®

	Machining	④	⑤	⑥	⑦
	through hole	●	●	●	●
	blind hole	●	●	●	●
	angled start and drilling out, interrupted cut	◐	◐	◐	◐
	cross bore	◐	◐	◐	◐
	reverse machining	✕	✕	✕	✕
	HRC > 54 through hole	●	○	◐	◐
	HRC > 54 blind hole	●	○	◐	◐
	vibration dampening	✕	●	✕	✕

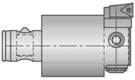
● very good ◐ good ○ possible ✕ not possible



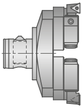
⑧
MicroKom® M040



⑨
MicroKom® M03Speed



⑩
Micro-adjustable head
with insert cartridge

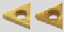
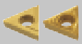
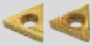


⑪
TwinKom® G01

	⑧	⑨	⑩	⑪
	●	●	●	●
	●	●	●	●
	◐	◐	◐	◐
	◐	◐	◐	◐
	●	●	×	×
	◐	●	●	●
	◐	●	●	●
	×	●	●	×

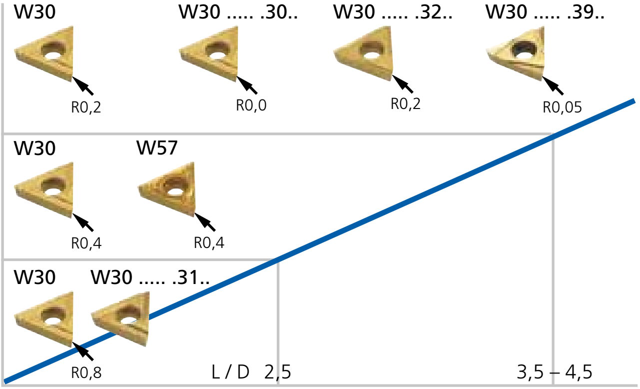
KOMET® W00, W30, W57

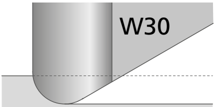
Guideline values for fine boring

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	W00	W30, W57		
			W00 04...  max. feed f (mm/rev)	W30 04... W57 04...  max. feed f (mm/rev)	W30 14... W57 14...  max. feed f (mm/rev)	W30 26... W57 26...  max. feed f (mm/rev)
P	1.0	300	0,04	0,07	0,10	0,15
P	2.0	250	0,04	0,06	0,12	0,20
P	2.1	300	0,04	0,07	0,12	0,25
P	3.0	200	0,03	0,06	0,10	0,20
P	4.0	180	0,03	0,05	0,10	0,15
P	4.1	80	0,02	0,04	0,08	0,12
S	5.0	60	0,01	0,04	0,08	0,10
S	5.1	80	0,01	0,04	0,08	0,10
M	6.0	180	0,01	0,05	0,10	0,15
M	6.1	160	0,01	0,05	0,10	0,15
M	7.0	160	0,01	0,04	0,08	0,15
K	8.0	200	0,05	0,10	0,15	0,30
K	8.1	160	0,05	0,10	0,15	0,30
K	9.0	180	0,04	0,08	0,15	0,25
K	9.1	160	0,04	0,08	0,15	0,25
K	10.0	140	0,04	0,08	0,15	0,25
K	10.1	140	0,03	0,07	0,12	0,25
K	10.2	120	0,03	0,10	0,15	0,25
N	12.0	300	0,02	0,04	0,08	0,20
N	12.1	400	0,05	0,08	0,15	0,20
N	13.0	500	0,02	0,06	0,10	0,15
N	13.1	350	0,05	0,08	0,12	0,20
N	14.0	300	0,05	0,08	0,12	0,20
H	15.0	120		0,05	0,08	0,10
H	16.0	90		0,05	0,08	0,10

Important: For more application details and safety notes see ▸ 86-87!

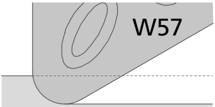
Subject to length: diameter ratio L/D





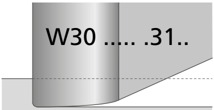
- universal insert

surface structure produced



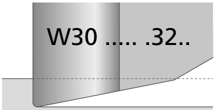
- for good chip control
- for R.H. and L.H. cutting direction

surface structure produced



- very good surface quality at high feed rates
- subject to stable conditions (max. 2×D)
- for interrupted cut

surface structure produced



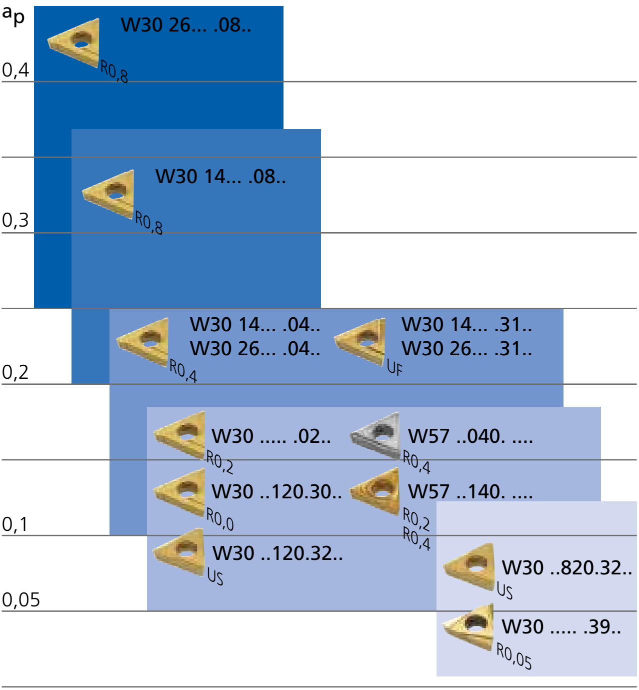
- for large cut outs
- for good chip control

surface structure produced

KOMET® W30, W57

Insert geometry selection

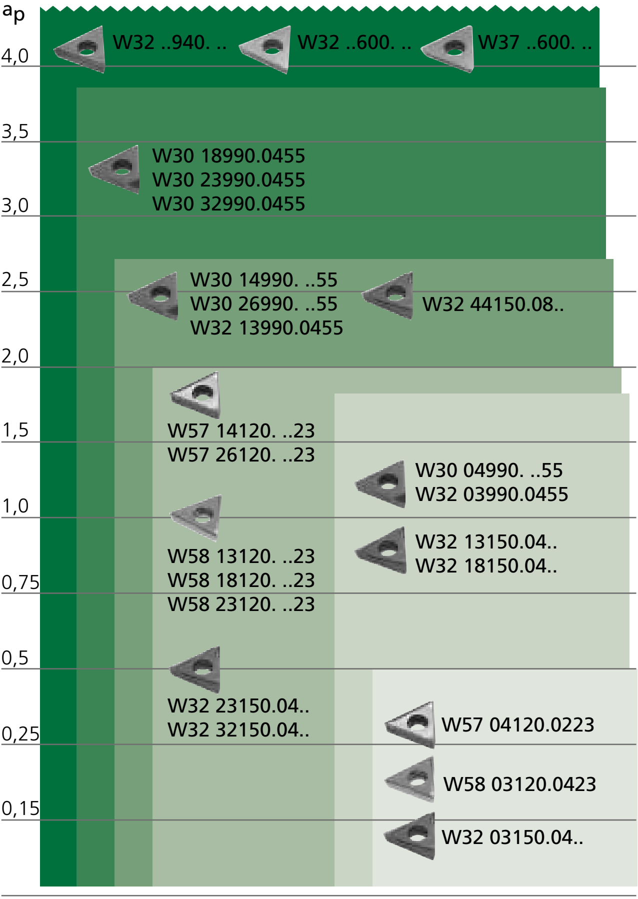
Subject to cutting depth a_p in the radius – machining steel



KOMET® W30, W32, W37, W57, W58

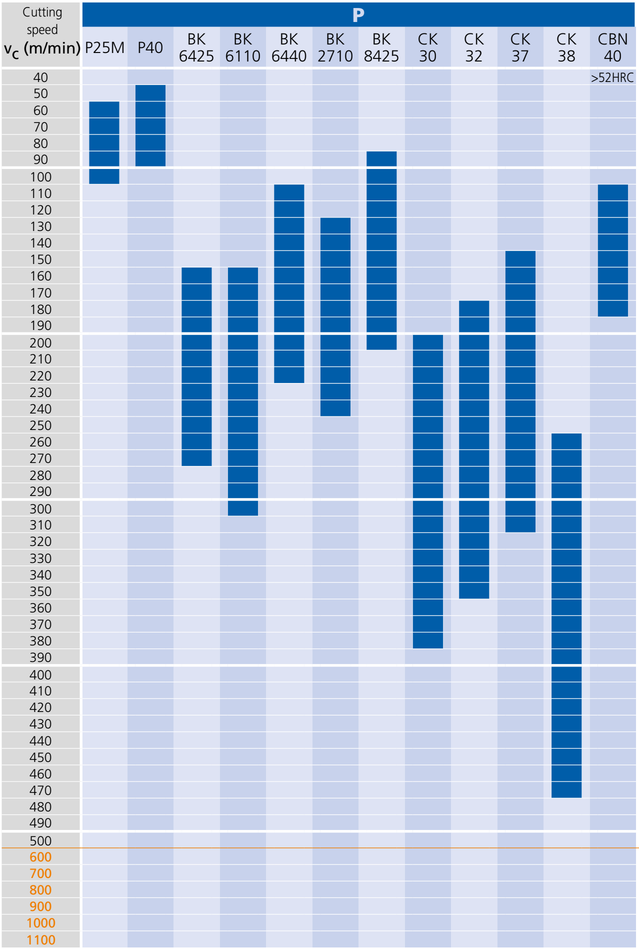
Insert geometry selection

Subject to cutting depth a_p in the radius – machining aluminium

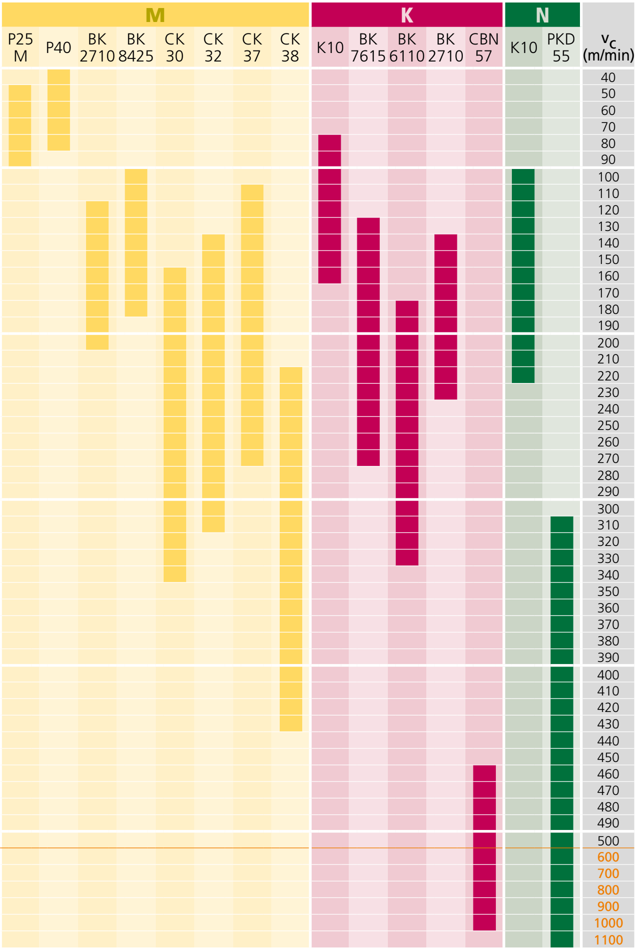


KOMET® W30

Guideline values for fine boring



Guideline values for fine boring



Important: For more application details and safety notes see ▶ 86-87!

KOMET® W57

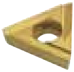
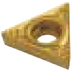
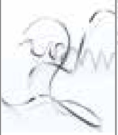
Guideline values for fine boring

Cutting speed v_c (m/min)	P				M			K	N	
	BK 8430	BK 60	CK 3230	CK 3210	BK 8430	CK 3230	CK 3210	BK 60	K10	BK 7710
40										
50										
60										
70					■					
80					■					
90	■				■					
100	■				■					
110	■				■					
120	■				■	■				
130	■				■	■				
140	■				■	■				
150	■				■	■	■			
160	■	■	■		■	■	■		■	
170	■	■	■		■	■	■		■	
180	■	■	■		■	■	■	■	■	
190	■	■	■			■	■	■	■	
200	■	■	■			■	■	■	■	
210	■	■	■	■		■	■	■	■	
220	■	■	■	■		■	■	■	■	
230	■	■	■	■		■	■	■	■	
240	■	■	■	■		■	■	■	■	
250		■	■	■		■	■	■	■	■
260		■	■	■		■	■		■	■
270		■	■	■		■	■		■	■
280			■	■		■	■		■	■
290			■	■		■	■		■	■
300			■	■			■		■	■
310			■	■			■		■	■
320			■	■			■		■	■
330			■	■					■	■
340			■	■					■	■
350			■	■					■	■
360			■	■						■
370			■	■						■
380			■	■						■
390			■	■						■
400				■						■
410				■						■
420				■						■
430				■						■
440				■						■
450				■						■
460										■
470										■
480										■
490										■
500										■
600										■
700										■
800										■
900										■
1000										■
1100										

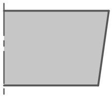
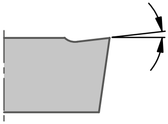
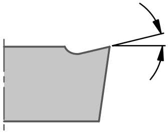
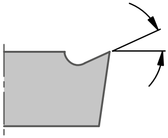
Important: For more application details and safety notes see ▸ 86-87!

Chip formation from various insert geometries

Tool: Micro-adjustable head MicroKom ® M03Speed

	W30 14...	W30 14... (UF)	W30 14... (US)	W57 14140.04..
				
Material: 42CrMo4V 1100 N/mm² Cutting data: v_C = 240 m/min f = 0,08 mm/rev a_p = 0,12 mm				
Material: St37 350 N/mm² Cutting data: v_C = 300 m/min f = 0,08 mm/rev a_p = 0,12 mm				
Material: X10CrNiMoTi18 750 N/mm² Cutting data: v_C = 160 m/min f = 0,08 mm/rev a_p = 0,12 mm				

Selecting the top rake

Recommendations for using inserts with ground chip grooves (W00, W01, W04, W30, W32, W34, W37, W60)	rounded E	sharp-edged F	chamfered F
	P	P	P
	M	M	M
	K	K	K
	N	**N** PKD55 PKD5520	N
	S	S	S
	H	H	H
 6°	**P**	P	P
	M	M	M
	K	K	K
	N	N	N
	S	S	S
	H	H	H
 12°	**P**	P	P
	M	M	M
	K	K	K
	N	**N**	N
	S	**S**	S
	H	**H**	H
 20°	P	P	P
	M	M	M
	K	K	K
	N	**N**	N
	S	**S**	S
	H	H	H

W	N	M	G	0 8	0 4	0 8	F	L	–	0 1
①	②	③	④	⑤	⑥	⑦	⑧	⑨		⑩

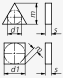
① Form

Code	
R	
S	90°
L	90°
A	85°
T	60°
C	80° / 100°
E	75°
D	55°
V	35°
W	80°

② Clearance angle

Code	
N	0°
B	5°
C	7°
O	according to manufacturer specification (with KOMET 8°)
P	11°
E	20°

③ Tolerance



Code	*m*	*s*	*d*
A	±0,005	±0,025	±0,025
E	±0,025	±0,025	±0,025
G	±0,025	±0,13	±0,025
H	±0,013	±0,025	±0,013
K	±0,013	±0,025	±0,05...±0,15
M	±0,08...±0,18 1)	±0,13	±0,05...±0,13 1)
U	±0,13...±0,38 1)	±0,13	±0,08...±0,25 1)

Tolerance in mm

∅ *d1* IC	at *m* Class M	at *m* Class U	at *d1* Class M	at *d1* Class U
6,35	±0,08	±0,13	d±0,05	±0,08
9,52	±0,08	±0,13	d±0,05	±0,08
12,70	±0,13	±0,20	±0,08	±0,13
15,87	±0,15	±0,27	±0,10	±0,18
19,05	±0,15	±0,27	±0,10	±0,18
25,40	±0,18	±0,38	±0,13	±0,25

④ Type

Code	
A	no chipformer, with hole
M	chipformer on one side, with hole
G	chipformer both sides, with hole
R	chipformer on one side, no hole
W	no chipformer, countersunk hole 40-60°
B	no chipformer, countersunk hole 70-90°
T	chipformer on one side, countersunk hole 40-60°
H	chipformer on one side, countersunk hole 70-90°
P	neg/pos. one or two sides, with hole
U	chipformer both sides, with countersunk hole
X	special design, drawing required

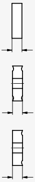
⑤ Cutting edge length *l*

Code

d1 mm	A	C	D	L	R	S	T	V	W
3,97							06		02
4,80		04							03
5,56		05				05	09		
6,35	10	06	07			06	11	11	04
7,94		08				07	13	13	
8,00	12				08	08	14		05
9,52		09	11	12		09	16	16	
10,00					10				06
10,90	16								
12,00					12				08
12,70		12	15			12	22	22	
15,00									10
15,88						15	27		
16,00					16				
17,60									12
19,05		19				19	33		13
20,00					20				
25,00					25				
25,40						25			

(at code)

⑥ Thickness *s*



Code	
T0	1,20 mm
01	1,59 mm
T1	1,80 mm
02	2,38 mm
T2	2,97 mm
03	3,18 mm
T3	3,97 mm
04	4,76 mm
05	5,30 mm
06	6,35 mm
07	7,94 mm

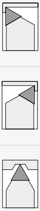
⑦ Corner radius *R*

Code	
00	0,0 mm
01	0,1 mm
02	0,2 mm
03	0,3 mm
04	0,4 mm
05	0,5 mm
06	0,6 mm
08	0,8 mm
12	1,2 mm
16	1,6 mm
20	2,0 mm
24	2,4 mm
ZZ	Face cutting edge

⑧ Cutting edge design

Code	
F	sharp
E	rounded
T	chamfered (negative)
S	chamfered + rounded

⑨ Cutting direction of insert



Code	
R	R.H.
L	L.H.
N	R.H. and L.H.

⑩ Chipfomer

Code	
-01	medium
-05	Cast iron
-11	Aluminium
-13	
-14	finishing
-15	semi-finishing
-21	
-32	
-33	

KOMET® Numerical Coding
for inserts C.. / W..

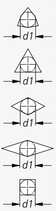
①	②		③		④		⑤		⑥		⑦			
C	8	5	1	8	0	1	0	.	0	4	7	5	2	5
W	6	0	3	2	0	6	0	.	0	8	6	0		
W	2	9	2	4	0	1	0	.	0	4	8	4	2	5

① Main group for standard inserts
Code

② Secondary group number insert geometry

	Code	Form	Version	peripheral	Chip groove	Clearance angle,other
84°	00	Unisix®	standard	ground	ground	
	01	Unisix®	strengthened	ground	ground	
	04	Unisix®	6 edged	ground	ground	0°
	05	Unisix®	6 edged	ground	ground	0°, wide flute
	24	Unisix® 95°	strengthened	sintered	sintered	
	25	Unisix®	standard	sintered	sintered	
	27	Unisix® 95°	strengthened	ground	sintered	
	28	Unisix®	standard	ground	sintered	
	29	Unisix®	strengthened		sintered	
60°	30	triangular		ground	ground	8°
	32	triangular		ground	ground	11°
	34	triangular	strengthened	ground	ground	
	36	triangular	6 edged	ground	ground	0°
	37	triangular		ground	ground	20°
	57	triangular		ground	sintered	11°
	58	triangular		ground	sintered	IC tolerance ±0,025
	59	triangular	strengthened	ground	sintered	
55°	60	rhomboid		ground	ground	
35°	78	rhomboid		ground	sintered	
55°	79	rhomboid		ground	sintered	
90°	80	square		sintered	sintered	
	82	square		ground	sintered	
	83	square		sintered	sintered	

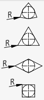
③ Inscribed circle *d1*



Code	
03	3,97 mm
04	4,0 mm
10	4,8 / 5,0 mm
12	5,5 mm
13	5,56 mm
14	5,6 mm
17	6,0 mm
18	6,2 / 6,35 mm
20	7,0 / 7,1 mm
22	7,7 mm
23	7,94 mm
24	8,0 mm
26	8,2 mm
28	8,9 mm
32	9,52 / 9,8 mm
34	10,0 mm
38	10,9 / 11,1 mm
42	12,0 mm
44	12,7 mm
46	13,2 mm
50	15,0 mm
53	15,88 mm
58	17,6 mm

⑤ Modification code
1 … 9 Code

⑥ Geometry of cutting edge



Code	
01	R 0,1 mm
02	R 0,2 mm
03	R 0,3 mm
04	R 0,4 mm
05	R 0,5 mm
06	R 0,6 mm
08	R 0,8 mm
12	R 1,2 mm
30	U8.00 R 0
31	UF
32	US
33	U8.77 15° clearance angle additional cutt. edge form for Unisix® mill. cutter inserts
34	F / KUF 90°
35	F / KUF 75°
36	F / KUF 60°
39	R 0,05 mm
40	45° corner for chamfering cartridge
75	Support chamfer 75° L.H.
90	Support chamfer 90° L.H.

④ Type of chip groove / chip surface

Code ground		Code sintered	
00	L.H. cutting, neutral	00	Double chip groove (PD), cutting edge rounded
06	L.H. cutting, 6°	01	Double chip groove (K), cutting edge chamfered and rounded
12	L.H. cutting, 12°	02	Step geometry (KS), cutting edge chamfered and rounded
15	L.H. cutting, 15°	03	Dimple geometry (KX), cutting edge rounded
18	L.H. cutting, 18°	04	Finished geometry
20	L.H. cutting, 20°	05	10° chip groove (T), cutting edge rounded
30	R.H. cutting, neutral	06	12° chip groove (C), cutting edge rounded
36	R.H. cutting, 6°	07	Finished geometry
42	R.H. cutting, 12°	10	Shank geometry, cutting edge chamfered and rounded
45	R.H. cutting, 15°	11	20° chip groove, cutting edge rounded
48	R.H. cutting, 18°	12	Al / finished geometry
50	R.H. cutting, 20°	13	Shank geometry, cutting edge rounded
60	neutral	14	Finishing-Topographie
66	3× ground, 6°	15	Semi-finishing Topographie
70	3× ground, 10°	16	Semi-finishing Topographie with "Wiper" corner
72	3× ground, 12°	17	22° Topographie / tangential insert
80	3× ground, 20°	18	Finishing-Topographie with "Wiper" corner
82	L.H. cutting, 12° sharp-edged	20	Universal topography 8° top rake
83	R.H. cutting, 12° sharp-edged	21	20° Highly positive "Technology 21"
94	neutral, bright complete, L.H. and R.H. cutting	32	peripheral ground with minimal burring
98	bright with flute on corner, L.H. and R.H. cutting	33	peripheral sintered with minimal burring
99	neutral, bright on corner, L.H. and R.H. cutting		

⑦ Material grade

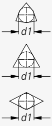
Code		Code	
03	P25M	2715	BK2715
04	P40	2730	BK2730
22	K20	6115	BK6115
60	BK60	…	

KOMET® Numerical Coding
programme ISO

W	8 5	1 8	0 0	0	.	0 8	8 4 2 5
①	②	③	④	⑤		⑥	⑦

①	Main group for standard inserts Code

②	Secondary group number insert geometry
Code	ISO basic forms
83	S... square 90°
84	T... triangular 60°
85	C... rhomboid 80°
86	D... rhomboid 55°
89	V... rhomboid 35°
90	W... hexagonal 80°
95	R... round
97	threaded



③	Inscribed circle *d1*
Code	
13	5,56 mm
18	6,35 mm
24	8,0 mm
32	9,52 mm
38	11,1 mm
44	12,7 mm
53	15,88 mm
62	19,05 mm

④	Serial number
00 ... 99	Code

⑤	Modification code
1 ... 9	Code

⑥	Serial number
01 ... 99	Code

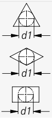
⑦	Material grade
Code	
03	P25M
04	P40
22	K20
2715	BK2715
2730	BK2730
6115	BK6115
...	

for inserts Q..

Q	2 1	4 4	0 0	0	.	0 1	2 7 3 0
Q	8 0	3 2	0 0	0	.	0 1	6 1 1 5
①	②	③	④	⑤		⑥	⑦

①	Main group for standard inserts Code

②	Secondary group number insert geometry
Code	ISO basic forms
09	S... square 90°
12	T... triangular 60°
15	C... rhomboid 80°
21	E... rhomboid 75°
36	A... rhomboid form
80	L... square 90°



③	Inscribed circle *d1*
Code	
13	5,56 mm
18	6,35 mm
24	8,0 mm
32	9,52 mm
38	11,1 mm
44	12,7 mm
53	15,88 mm

④	Serial number
00 ... 99	Code

⑤	Modification code
1 ... 9	Code

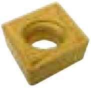
⑥	Serial number
01 ... 99	Code

⑦	Material grade
Code	
03	P25M
04	P40
22	K20
2715	BK2715
2730	BK2730
6115	BK6115
...	

KOMET® Insert

Insert geometries on example of ISO insert C85

Geometry -01:
Rough machining

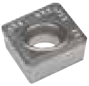


a_p = 0,5 – 4,26 mm
f = 0,1 – 0,36 mm

Geometry -14:
Finish machining for Cermet

a_p = 0,05 – 2,5 mm
f = 0,05 – 0,25 mm

Geometry -05:
Roughing/ semi-finishing
for machining cast iron

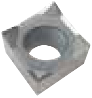


a_p = 0,5 – 4,26 mm
f = 0,11 – 0,26 mm

Geometry -14:
Finish machining
for coated carbide

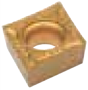
a_p = 0,14 – 1,16 mm
f = 0,02 – 0,11 mm

Geometry -12:
Semi-finishing



a_p = 0,38 – 7,1 mm
f = 0,05 – 0,5 mm

Geometry -15:
Semi-finishing



a_p = 0,25 – 3,23 mm
f = 0,03 – 0,28 mm

Figures given depend on insert size and corner radius
(see catalogue "KomPass – Bore machining")

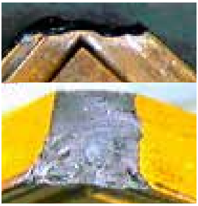
Types of wear

Wear on clearance face

normal type of wear expected
remedy:
- use hardened/wear-resistant cutting materials
- reduce cutting parameters

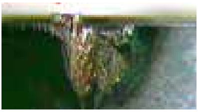
Microscopic fracturing caused by:
- coating/substrate too brittle
- vibrations on part or tool
- interrupted cut
- build-up on cutting edges

correcting by:
- tougher coating
- avoidance of vibrationsn
- avoidance of build-up on cutting edges



Stress fracture caused by:
- wrong/excessively high cutting parameters
- no allowance for tool restrictions
- interrupted cut

rectified by:
- checking of cutting data
- checking of tool restrictions



Thermal wear caused by:
- cutting speed too high
- excessive heat

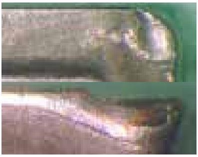
rectified by:
- reduction of cutting speed
- wear-resistant, more thermally stable coatings or substrate

Pitting caused by:
- coating/substrate not sufficiently wear-resistant
- chip geometry too negative

rectified by:
- substrate or coatings with better wear resistance
- positive chip geometries

Fracture of centre insert
caused by:
- basic substrate/coatings too brittle
- central position of internal insert too high (insert protrudes over centre)

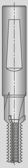
rectified by:
- tougher coatings and substrate
- check lower central position of internal insert
- use centre plate with stronger chamfering
- use internal and external insert with same geometry



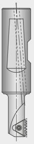
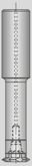
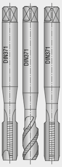
Plastic deformation of KUB Quatron® cutting edge

- cutting material too soft
- replace insert with more wear-resistant type

Index Threading

	Thread milling tool			
	 JEL® MGF XH Micro	 JEL® MGF, UMGF, MKG  JEL® GWF	 JEL® PKD MGF	 JEL® PKD GWF
Producing internal threads		▶ 156	▶ 156	▶ 156
Tap drill diameters for threads	▶ 158	▶ 158 – 162	▶ 158 – 159	▶ 158 – 159
Achievable thread lengths		▶ 163		
Guideline values cutting speed v_c milling feed f_z drilling feed f_b	▶ 164	▶ 164	▶ 168	▶ 169
CNC program explanation		▶ 174 – 175	▶ 174 – 175	▶ 174 – 175
Formulae	▶ 176 – 177	▶ 176 – 177	▶ 176 – 177	▶ 176 – 177
Setting	▶ 178 – 179	▶ 178 – 179	▶ 178 – 179	▶ 178 – 179
Problems causes → solutions		▶ 182	▶ 182	▶ 182

Index Threading

	Thread milling tool		Drill thread milling tool		Tap	Roll form tap
	JEL® XAM 	JEL® TOMILL CUT 	JEL® BGF, UBGF 	JEL® DBGF 	JEL® DOREX, TAREX, SIREX JEL® FEDUB, FEDUC 	JEL® MOREX 
	▶ 156	▶ 156	▶ 156	▶ 156	▶ 157	▶ 157
	▶ 158 – 162	▶ 158 – 162	▶ 158 – 162	▶ 158	▶ 158 – 159	▶ 158 – 159
			▶ 163			
	▶ 167	▶ 167	▶ 170 – 171	▶ 171	▶ 172	▶ 173
		▶ 174 – 175	▶ 174 – 175			
	▶ 176 – 177	▶ 176 – 177	▶ 176 – 177	▶ 176 – 177		
	▶ 178 – 179	▶ 178 – 179	▶ 178 – 179	▶ 178 – 179		
	▶ 182	▶ 182	▶ 180 – 181	▶ 180 – 181	▶ 184 – 185	▶ 183

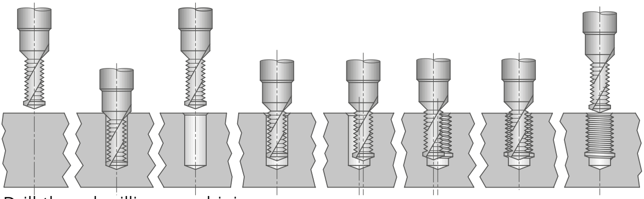
JEL ® Producing Internal Threads
Methods

Thread milling

- Chip producing method
- Thread making by helical interpolation within the pitch
- Same tool can be used for all threads with the same pitch starting from the nominal ∅
- Same tool can be used for different materials up to 45 HRC
- Lower torque than with tapping and roll form tapping
- Drill depth = thread depth if tool is not used for chamfering
- Machine spindle always running in the same direction – no reversing necessary
- High speed cutting (HSC) possible

Drill thread milling

- Chip producing method
- Complete thread is manufactured in a single pass – drilling, chamfering and thread milling
- One tool per dimension which can also be used for different materials
- Prerequisite: CNC machine or machining centre being capable to run helical interpolation

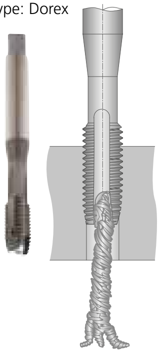


Drill thread milling: machining sequence

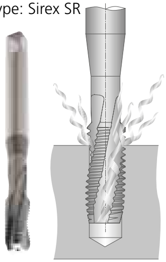
Tapping

- Chip producing method
- Thread making by rotation – pitch is on the tool
- Can be used on almost all machines
- 1 tool per dimension required

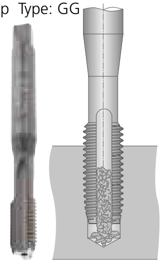
Through hole
JEL tap
Type: Dorex



Blind hole
JEL tap
Type: Sirex SR

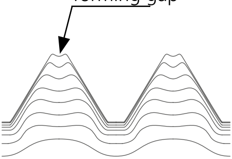


Blind and through hole
Short chipping materials
JEL tap Type: GG



Roll form tapping

- Chip less method
- Thread making by forming – pitch is on the tool
- Suitable for materials with elongation of >5% and tensile strength of <1000N/mm^2
- Tap drill Ø larger than with tapping
- Higher torque than tapping
- Generates forming gap at minor diameter



Thread forming – grain structure

JEL® M
Tap drill diameters for threads

M – Metric thread						
Size	milled and cut threads			formed threads		
	Nom. ∅	Pitch	Core ∅	Nom. ∅	Pitch	Core ∅
M 1	1,0	0,25	0,75	–	–	–
M 1,1	1,1	0,25	0,85	–	–	–
M 1,2	1,2	0,25	0,95	–	–	–
M 1,4	1,4	0,30	1,10	–	–	–
M 1,6	1,6	0,35	1,25	–	–	–
M 1,8	1,8	0,35	1,45	–	–	–
M 2	2,0	0,40	1,60	2,0	0,40	1,84
M 2,2	2,2	0,45	1,75	2,2	0,45	2,02
M 2,5	2,5	0,45	2,05	2,5	0,45	2,32
M 3	3,0	0,50	2,50	3,0	0,50	2,80
M 3,5	3,5	0,60	2,90	3,5	0,60	3,25
M 4	4,0	0,70	3,30	4,0	0,70	3,71
M 4,5	4,5	0,75	3,70	4,5	0,75	4,19
M 5	5,0	0,80	4,20	5,0	0,80	4,67
M 6	6,0	1,00	5,00	6,0	1,00	5,54
M 7	7,0	1,00	6,00	7,0	1,00	6,54
M 8	8,0	1,25	6,80	8,0	1,25	7,43
M 9	9,0	1,25	7,80	9,0	1,25	8,43
M10	10,0	1,50	8,50	10,0	1,50	9,31
M11	11,0	1,50	9,50	11,0	1,50	10,31
M12	12,0	1,75	10,20	12,0	1,75	11,20
M14	14,0	2,00	12,00	14,0	2,00	13,0
M16	16,0	2,00	14,00	16,0	2,00	15,0
M18	18,0	2,50	15,50	–	–	–
M20	20,0	2,50	17,50	–	–	–

Note for formed threads:
The core diameters listed are guidelines. The actual core diameters have to be investigated in use as these depend on the fluidity of the material and the forming speed.

MF – Metric fine thread						
Size	milled and cut threads			formed threads		
	Nom. ∅	Pitch	Core ∅	Nom. ∅	Pitch	Core ∅
M4×0,5	4	0,50	3,50	4	0,50	3,80
M5×0,5	5	0,50	4,50	5	0,50	4,80
M6×0,5	6	0,50	5,50	6	0,50	5,80
M6×0,75	6	0,75	5,30	6	0,75	5,69
M8×0,5	8	0,50	7,50	8	0,50	7,80
M8×0,75	8	0,75	7,30	8	0,75	7,69
M8×1	8	1,00	7,00	8	1,00	7,54
M10×0,75	10	0,75	9,30	10	0,75	9,69
M10×1	10	1,00	9,00	10	1,00	9,54
M12×1	12	1,00	11,00	12	1,00	11,54
M12×1,5	12	1,50	10,50	12	1,50	11,31
M14×1	14	1,00	13,00	14	1,00	13,54
M14×1,5	14	1,50	12,50	14	1,50	13,31
M15×1,5	15	1,50	13,50	15	1,50	14,31
M16×1	16	1,00	15,00	16	1,00	15,54
M16×1,5	16	1,50	14,50	16	1,50	15,31
M17×1,5	17	1,50	15,50	17	1,50	16,31
M18×1	18	1,00	17,00	18	1,00	17,54
M18x1,5	18	1,50	16,50	18	1,50	17,31
M18×2	18	2,00	16,00	18	2,00	17,00
M20×1	20	1,00	19,00	20	1,00	19,54
M20×1,5	20	1,50	18,50	20	1,50	19,31
M20×2	20	2,00	18,00	20	2,00	19,00
M22×1	22	1,00	21,00	22	1,00	21,54
M22×1,5	22	1,50	20,50	22	1,50	21,31
M22×2	22	2,00	20,00	22	2,00	21,00
M24×1	24	1,00	23,00	24	1,00	23,54
M24×1,5	24	1,50	22,50	24	1,50	23,31
M24×2	24	2,00	22,00	24	2,00	23,00
M30×1,5	30	1,50	28,50	30	1,50	29,31

JEL ® UNC, UNF

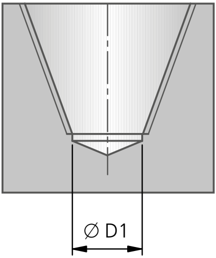
Tap drill diameters for threads

UNC – American unified coarse thread						
Size	milled and cut threads			formed threads		
	Nom. ∅	Pitch t.p.i.	Core ∅	Nom. ∅	Pitch t.p.i.	Core ∅
Nr. 10	4,820	24	3,90	4,820	24	4,33
Nr. 12	5,486	24	4,50	5,486	24	5,00
1/4	6,350	20	5,10	6,350	20	5,77
5/16	7,938	18	6,60	7,938	18	7,29
3/8	9,525	16	8,00	9,525	16	8,79
7/16	11,112	14	9,40	11,112	14	10,28
1/2	12,700	13	10,80	12,700	13	11,80
9/16	14,288	12	12,20	14,288	12	13,23
5/8	15,875	11	13,50	–	–	–

UNF – American unified fine thread						
Size	milled and cut threads			formed threads		
	Nom. ∅	Pitch t.p.i.	Core ∅	Nom. ∅	Pitch t.p.i.	Core ∅
Nr. 10	4,826	32	4,05	4,826	32	4,50
Nr. 12	5,486	28	4,60	5,486	28	5,11
1/4	6,350	28	5,45	6,350	28	5,98
5/16	7,938	24	6,90	7,938	24	7,45
3/8	9,525	24	8,45	9,525	24	9,04
7/16	11,112	20	9,85	11,112	20	10,53
1/2	12,700	20	11,45	12,700	20	12,12
9/16	14,288	18	12,90	14,288	18	13,64
5/8	15,875	18	14,45	15,875	18	15,23

Note for formed threads:
The core diameters listed are guidelines. The actual core diameters have to be investigated in use as these depend on the fluidity of the material and the forming speed.

NPT, NPTF – without using a reamer			
Size	milled and cut threads		
	Pitch t.p.i.	Core ∅ D1 **NPT**	Core ∅ D1 **NPTF**
1/16	27	6,15	6,10
1/8	27	8,50	8,45
1/4	18	11,00	10,90
3/8	18	14,50	14,30
1/2	14	17,85	17,60
3/4	14	23,20	23,00
1“	11 1/2	29,00	28,75
1 1/4“	11 1/2	37,80	37,50
1 1/2“	11 1/2	44,00	43,75
2“	11 1/2	56,00	55,75



JEL® G
Tap drill diameters for threads

G – pipe thread DIN EN ISO 228			
Size	milled and cut threads		
	Nom. ∅	Pitch t.p.i.	Core ∅
G 1/8“	9,728	28	8,82
G 1/4“	13,157	19	11,82
G 3/8“	16,662	19	15,32
G 1/2“	20,955	14	19,10
G 5/8“	22,911	14	21,10
G 3/4“	26,441	14	24,60
G 7/8“	30,201	14	28,40
G 1“	33,249	11	30,80
G 1 1/8“	37,897	11	35,50
G 1 1/4“	41,910	11	39,50
G 1 3/8“	44,323	11	41,90
G 1 1/2“	47,803	11	45,40
G 1 3/4“	53,746	11	51,40
G 2“	59,614	11	57,20

JEL ® (Drill) Thread Milling Tool

Achievable thread lengths

Material	Drill thread milling BGF 	Thread milling MKG 	Thread milling MGF 
Steel		2 × D	2 × D
Stainless steel		2 × D	2 × D
Grey cast iron	2,5 × D	2 × D	2,5 × D
Nodular grey cast iron	2 × D	2 × D	2,5 × D
Titanium alloys		1,5 × D	1,5 × D
Nickel alloys		1,5 × D	1,5 × D
Copper alloys	2,5 × D	2 × D	2,5 × D
Aluminium	2,5 × D	2 × D	2,5 × D
Plastics	2,5 × D	2 × D	2,5 × D

Advantage with drill thread milling:

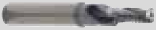
- only 1 tool for drilling, countersinking and thread milling

Advantages with thread milling:

- one and the same tool for blind bore and through hole
- one and the same tool for different diameters > nominal ∅ with the same pitch
- one and the same tool for different tolerances
- one and the same tool for different materials

JEL® MGF, UMGF, MKG, GWF

Guideline values for thread milling



		v_c (m/min)		f_z (mm/tooth)		
	Surface	uncoated	TiCN			
	Nom. Ø			≤ Ø 6	≤ Ø 12	≥ Ø 16
P	1.1		80-150	0,015-0,04	0,04-0,06	0,08-0,15
P	1.2		80-100	0,015-0,04	0,04-0,06	0,08-0,15
P	1.3		80-100	0,015-0,04	0,04-0,06	0,08-0,15
P	1.4		80-100	0,015-0,04	0,04-0,06	0,08-0,15
P	1.5		60-80	0,01-0,03	0,04-0,06	0,04-0,10
P	1.6		50-60	0,01-0,025	0,03-0,05	0,04-0,10
H	1.7		30-50	0,01-0,015	0,015-0,02	0,03-0,08
H	1.8		20-40	0,01-0,015	0,015-0,02	
M	2.1		60-80	0,015-0,03	0,03-0,05	0,08-0,15
M	2.2		60-80	0,015-0,03	0,03-0,05	0,04-0,10
M	2.3		60-80	0,01-0,025	0,02-0,04	0,04-0,10
K	3.1	50-80	80-120	0,02-0,04	0,04-0,10	0,08-0,15
K	3.2	50-80	80-120	0,02-0,03	0,04-0,08	0,08-0,12
K	3.3		80-100	0,02-0,04	0,04-0,08	0,08-0,15
K	3.4		80-120	0,02-0,04	0,04-0,10	0,08-0,15
K	3.5		80-100	0,02-0,03	0,04-0,08	0,08-0,12
K	3.6		80-100	0,02-0,04	0,04-0,10	0,08-0,15
K	3.7		80-100	0,02-0,03	0,04-0,08	0,08-0,12
S	4.1		40-100	0,015-0,03	0,03-0,08	0,08-0,15
S	4.2		40-100	0,015-0,03	0,03-0,08	0,08-0,15
S	4.3		40-80	0,015-0,02	0,03-0,06	0,08-0,12
S	5.1		50-60	0,02-0,04	0,04-0,06	0,04-0,10
S	5.2		30-40	0,02-0,04	0,04-0,06	0,04-0,10
S	5.3		10-30	0,015-0,03	0,03-0,05	0,04-0,08
N	6.1	100-300	100-400	0,04-0,07	0,07-0,12	0,10-0,20
N	6.2	100-300	100-400	0,04-0,07	0,07-0,12	0,10-0,20
N	6.3	100-300	100-400	0,04-0,07	0,07-0,12	0,10-0,20
N	6.4	60-80	60-80	0,02-0,04	0,03-0,06	0,08-0,15
N	7.1	100-400	100-400	0,03-0,07	0,07-0,12	0,10-0,20
N	7.2	100-400	100-400	0,03-0,07	0,07-0,12	0,10-0,20
N	7.3	100-400	100-400	0,03-0,07	0,07-0,12	0,10-0,20
N	7.4	100-300	100-400	0,03-0,07	0,07-0,12	0,10-0,20
N	7.5	100-200	100-250	0,03-0,07	0,07-0,12	0,10-0,20
N	8.1	80-100	100-120	0,04-0,06	0,06-0,12	0,08-0,20
N	8.2	80-100	100-120	0,04-0,06	0,06-0,12	0,08-0,15
N	8.3	50-60	60-80	0,04-0,06	0,06-0,12	0,08-0,15

v_c = Cutting speed · f_b = Drilling feed · f_z = Milling feed

Guideline values for thread milling – specially for JEL® MGF HPC

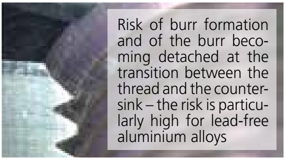
		v_c (m/min)	f_z (mm/tooth)		
	Surface	AlCrN			
	Nom. Ø		M4 – M6	M8 – M12	M14 – M20
P	1.1	80 - 100	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
P	1.2	80 - 100	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
P	1.3	80 - 100	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
P	1.4	80 - 100	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
P	1.5	80 - 100	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
P	1.6	80 - 100	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
H	1.7				
H	1.8				
M	2.1				
M	2.2				
M	2.3				
K	3.1	100 - 120	0,020 - 0,040	0,040 - 0,080	0,060 - 0,100
K	3.2	100 - 120	0,020 - 0,030	0,040 - 0,060	0,060 - 0,080
K	3.3	100 - 120	0,020 - 0,030	0,040 - 0,060	0,060 - 0,080
K	3.4	80 - 100	0,020 - 0,030	0,040 - 0,060	0,060 - 0,080
K	3.5	80 - 100	0,020 - 0,030	0,040 - 0,060	0,060 - 0,080
K	3.6	80 - 100	0,020 - 0,030	0,040 - 0,060	0,060 - 0,080
K	3.7	80 - 100	0,020 - 0,030	0,040 - 0,060	0,060 - 0,080
S	4.1	60 - 80	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
S	4.2	60 - 80	0,015 - 0,020	0,020 - 0,030	0,030 - 0,040
S	4.3	60 - 80	0,010 - 0,015	0,015 - 0,020	0,025 - 0,035
S	5.1				
S	5.2				
S	5.3				
N	6.1				
N	6.2				
N	6.3				
N	6.4				
N	7.1				
N	7.2				
N	7.3				
N	7.4				
N	7.5				
N	8.1				
N	8.2				
N	8.3				

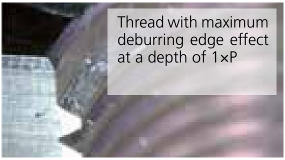
Important: For more application details and safety notes see ▸ 86-87!

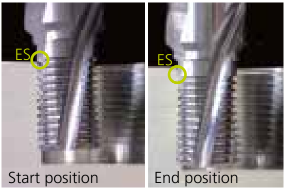
JEL® MKG

How the deburring edge works

Every thread, whether cut or formed, begins as a burr. The full thread profile is obtained as the pitch progesses when plunged into the solid material.
In screwed connections that are frequently unscrewed and then reconnected, this burr can come away and cause damage - to hydraulic components, for example.
In order to prevent this, the burr can – as with a thread mating plug gauge – be removed at the start of the thread as the thread is milled, without requiring any additional time, so that the thread starts with a full profile thread.
This is done with what is known as a deburring edge (ES), which is positioned on the tool behind the thread profile. The amount of material removed depends on the position where the edge is applied.


Risk of burr formation and of the burr becoming detached at the transition between the thread and the countersink – the risk is particularly high for lead-free aluminium alloys


Thread with maximum deburring edge effect at a depth of 1×P



Start position
End position

JEL® TPT

Software for thread milling tools

Quick and easy tool selection, and generation of CNC programmes for standard thread milling cutters and thread mills manufactured by the KOMET GROUP: 24 hours a day, across the globe, at **http://tpt.kometgroup.com**

Free service:

- Simply register, and you will instantly be provided with a password
- Program is ready to use
- You can enter the machining task
- All possible tools will be proposed, with the machining time given for each
- Tool drawings will be displayed
- CNC programs for six different control systems in six different languages, in metric or imperial
- Also available as “TPT Mobile” app, with the same features, on App Store for iPhone and iPad, and on Play Store for Androïd smartphones.

Guideline values for thread milling

						
		v_c (m/min)		f_z (mm/tooth)	v_c (m/min)	f_z (mm/tooth)
	Surface	uncoated	TiN			
	Nom. ∅					
P	1.1		80-150	0,08-0,15	80-100	0,08-0,12
	1.2		80-100	0,08-0,15	80-100	0,08-0,12
	1.3		80-100	0,08-0,15	80-100	0,08-0,12
	1.4		80-100	0,08-0,15	80-100	0,08-0,12
	1.5		60-80	0,04-0,10	60-80	0,04-0,08
	1.6		50-60	0,04-0,10	50-60	0,04-0,08
H	1.7		30-50	0,03-0,08		
	1.8					
M	2.1		60-80	0,08-0,15	60-80	0,04-0,08
	2.2		60-80	0,04-0,10	60-80	0,04-0,08
	2.3		60-80	0,04-0,10	60-80	0,04-0,08
K	3.1	50-80	80-120	0,08-0,15	80-120	0,08-0,15
	3.2	50-80	80-120	0,08-0,12	80-120	0,08-0,15
	3.3		80-100	0,08-0,15	80-100	0,08-0,15
	3.4		80-120	0,08-0,15	80-120	0,08-0,15
	3.5		80-100	0,08-0,12	80-120	0,08-0,15
	3.6		80-100	0,08-0,15	80-120	0,08-0,15
	3.7		80-100	0,08-0,12	80-120	0,08-0,15
S	4.1		40-100	0,08-0,15	40-80	0,04-0,08
	4.2		40-100	0,08-0,15	40-80	0,04-0,08
	4.3		40-80	0,08-0,12	40-80	0,04-0,08
	5.1		50-60	0,04-0,10	20-40	0,04-0,06
	5.2		30-40	0,04-0,10	20-40	0,04-0,06
	5.3		10-30	0,04-0,08	20-40	0,04-0,06
N	6.1	100-300	100-400	0,10-0,20	100-300	0,10-0,15
	6.2	100-300	100-400	0,10-0,20	100-300	0,10-0,15
	6.3	100-300	100-400	0,10-0,20	100-300	0,10-0,15
	6.4	60-80	60-80	0,08-0,15		
	7.1	100-400	100-400	0,10-0,20	100-400	0,10-0,15
	7.2	100-400	100-400	0,10-0,20	100-400	0,10-0,15
	7.3	100-400	100-400	0,10-0,20	100-400	0,10-0,15
	7.4	100-300	100-400	0,10-0,20	100-400	0,15-0,20
	7.5	100-200	100-250	0,10-0,20	100-400	0,15-0,20
	8.1	80-100	100-120	0,08-0,20	100-120	0,10-0,20
	8.2	80-100	100-120	0,08-0,15	100-120	0,10-0,15
	8.3	50-60	60-80	0,08-0,15	60-80	0,10-0,15

Important: For more application details and safety notes see ▶ 86-87!

JEL® PKD MGF

Guideline values for PCD drill slot milling tool

Surface		uncoated		
Nom. Ø			Ø 8	Ø 10 - 12
		v_c (m/min)	f_z (mm/tooth)	f_z (mm/tooth)
P	1.1			
P	1.2			
P	1.3			
P	1.4			
P	1.5			
P	1.6			
H	1.7			
H	1.8			
M	2.1			
M	2.2			
M	2.3			
K	3.1			
K	3.2			
K	3.3			
K	3.4			
K	3.5			
K	3.6			
K	3.7			
S	4.1			
S	4.2			
S	4.3			
S	5.1			
S	5.2			
S	5.3			
N	6.1			
N	6.2	300-1000	0,04-0,08	0,05-0,10
N	6.3			
N	6.4			
N	7.1	400-1500	0,04-0,08	0,04-0,10
N	7.2	400-1500	0,04-0,08	0,04-0,10
N	7.3	400-1500	0,04-0,08	0,04-0,10
N	7.4	400-1500	0,04-0,08	0,04-0,10
N	7.5	400-1500	0,04-0,08	0,04-0,10
N	8.1			
N	8.2			
N	8.3	400-1500	0,04-0,10	0,05-0,20

PCD cutting materials are suitable for maximum cutting speeds because of their hardness.

PCD tools require careful handling.

To prevent fracturing, please use non-contact measuring only. For extended or preset tools the cutting edges should be protected with a cover.

v_c = Cutting speed · f_b = Drilling feed · f_z = Milling feed

Guideline values for PCD drill slot milling tool

Surface		uncoated		
Nom. ∅			∅ 16	∅ 20
		v_c (m/min)	f_z (mm/tooth)	f_z (mm/tooth)
P	1.1			
	1.2			
	1.3			
	1.4			
	1.5			
	1.6			
H	1.7			
	1.8			
M	2.1			
	2.2			
	2.3			
K	3.1			
	3.2			
	3.3			
	3.4			
	3.5			
	3.6			
	3.7			
S	4.1			
	4.2			
	4.3			
	5.1			
	5.2			
	5.3			
N	6.1			
	6.2	300-1500	0,04-0,15	0,05-0,20
	6.3			
	6.4			
	7.1	400-2000	0,05-0,15	0,06-0,20
	7.2	400-2000	0,05-0,15	0,06-0,20
	7.3	400-2000	0,05-0,15	0,06-0,20
	7.4	400-2000	0,05-0,15	0,06-0,20
	7.5	400-2000	0,05-0,15	0,06-0,20
	8.1			
	8.2			
	8.3	500-2000	0,05-0,20	0,06-0,25

PCD cutting materials are suitable for maximum cutting speeds because of their hardness.

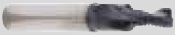
PCD tools require careful handling.

To prevent fracturing, please use non-contact measuring only. For extended or preset tools the cutting edges should be protected with a cover.

Important: For more application details and safety notes see ▸ 86-87!

JEL® BGF, UBGF

Guideline values for drill thread milling



		v_c (m/min)		f_b (mm/rev)		f_z (mm/tooth)	
Surface		uncoated	TiAlN				
Nom. Ø				≤ Ø 6	≤ Ø 12	≤ Ø 6	≤ Ø 12
P	1.1						
	1.2						
	1.3						
	1.4						
	1.5						
	1.6						
H	1.7						
	1.8						
M	2.1						
	2.2						
	2.3						
K	3.1	50-80	80-120	0,10-0,15	0,15-0,22	0,02-0,05	0,05-0,10
	3.2	50-80	80-120	0,10-0,15	0,15-0,22	0,02-0,05	0,05-0,10
	3.3		80-100	0,10-0,15	0,15-0,22	0,02-0,05	0,05-0,10
	3.4	50-80	80-120	0,10-0,15	0,15-0,22	0,02-0,05	0,05-0,10
	3.5						
	3.6						
	3.7						
S	4.1						
	4.2						
	4.3						
	5.1						
	5.2						
	5.3						
N	6.1						
	6.2	100-300		0,10-0,30	0,06-0,10	0,03-0,06	0,06-0,10
	6.3						
	6.4						
	7.1	100-400	100-400	0,10-0,25	0,25-0,30	0,03-0,06	0,06-0,10
	7.2	100-400	100-400	0,10-0,25	0,25-0,30	0,03-0,06	0,06-0,10
	7.3	100-400	100-400	0,03-0,06	0,06-0,12	0,03-0,06	0,06-0,10
	7.4	100-300	100-400	0,10-0,25	0,25-0,30	0,03-0,06	0,06-0,10
	7.5		100-300	0,10-0,25	0,25-0,30	0,03-0,06	0,06-0,10
	8.1	60-120	60-120	0,10-0,25	0,25-0,30	0,03-0,06	0,06-0,10
	8.2	60-100	60-100	0,10-0,25	0,25-0,30	0,03-0,06	0,06-0,10
	8.3	40-60	60-80	0,10-0,15	0,15-0,22	0,02-0,05	0,05-0,10

v_c = Cutting speed · f_b = Drilling feed · f_z = Milling feed

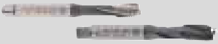
Guideline values for drill thread milling

						
		v_c (m/min)	f_b (mm/rev)	f_z (mm/tooth)	v_c (m/min)	f_z (mm/tooth)
Surface		AlCrN			TiAlN	
Nom. ∅						
P	1.1				100-150	0,03-0,10
	1.2				100-150	0,03-0,10
	1.3				100-150	0,03-0,10
	1.4				100-150	0,03-0,10
	1.5				100-150	0,03-0,10
	1.6				100-150	0,03-0,10
H	1.7					
	1.8					
M	2.1					
	2.2					
	2.3					
K	3.1	80-120	0,15-0,22	0,05-0,10	100-200	0,05-0,15
	3.2	80-120	0,15-0,22	0,05-0,10	100-200	0,05-0,15
	3.3				100-150	0,05-0,15
	3.4				100-200	0,05-0,15
	3.5				100-200	0,05-0,15
	3.6				100-200	0,05-0,15
	3.7				100-200	0,05-0,15
S	4.1					
	4.2					
	4.3					
	5.1					
	5.2					
	5.3					
N	6.1					
	6.2				100-200	0,05-0,15
	6.3				100-200	0,05-0,15
	6.4					
	7.1				100-400	0,05-0,20
	7.2				100-400	0,05-0,20
	7.3				100-400	0,05-0,20
	7.4				100-400	0,05-0,20
	7.5				100-300	0,05-0,20
	8.1				100-200	0,05-0,20
	8.2				100-200	0,05-0,20
	8.3				100-150	0,05-0,20

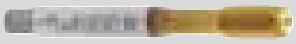
Important: For more application details and safety notes see ▸ 86-87!

JEL ® DOREX, SIREX, TAREX, FEDUB, FEDUC

Guideline values for tapping

						Coolant E=Emulsion O=Oil T=Dry L=Air
		vc (m/min)		vc (m/min)		
Cutting material		HSS		solid carbide		
Surface		uncoated	coated	uncoated	coated	
P	1.1	15-30	20-50			E / O
	1.2	15-25	20-40			E / O
	1.3	15-20	20-35			E / O
	1.4	10-15	20-30			E / O
	1.5	5-10	15-20			O / E
	1.6	2-5	10-15			O
H	1.7				2-8	O
	1.8				2-5	O
M	2.1	5-10	10-25			O
	2.2	4-8	10-20			O
	2.3	3-5	7-12			O
K	3.1	10-20	20-25	20-50		E / T
	3.2	5-10	15-20	20-50		E
	3.3					
	3.4	10-20	20-40	20-50		E
	3.5	5-10	10-15	20-50		E / O
	3.6	10-15	30-40	20-50		E / O
	3.7	5-10	10-20	20-50		E / O
S	4.1	5-15	10-15			E / O
	4.2	3-10	10-15			E / O
	4.3	1-5	5-10			O
	5.1	7-10	10-15			O
	5.2	4-8	5-10			O
	5.3	3-5	4-7			O
N	6.1	10-15	15-20			E / O
	6.2	25-30	40-50	25-60		E / T
	6.3	10-20	30-40			E / O
	6.4	2-5	5-8	5-9		E / O
	7.1	10-15	20-50			E
	7.2	15-20	20-40			E
	7.3	10-15	20-40			E
	7.4	20-30	25-50	25-80		E
	7.5	15-25	20-30	20-60		E
	8.1	15-25	20-30			E / T
	8.2	5-10	10-15	10-30		E / L
	8.3	3-5	8-12	8-25		E

v_c = Cutting speed · *HSS-E with carbide strips

					Coolant E=Emulsion O=Oil T=Dry L=Air
		v_C (m/min)	v_C (m/min)		
Cutting material		HSS	solid carbide / HML*		
Surface		coated	uncoated	coated	
P	1.1	30-50		30-80	E / O
	1.2	30-50		30-80	E / O
	1.3	30-50		30-80	E / O
	1.4	20-30		20-50	O
	1.5	10-20		15-30	O
	1.6	5-10		5-10	O
H	1.7				
	1.8				
M	2.1	20-40		20-50	O
	2.2	20-30		20-40	O
	2.3	20-30		20-40	O
K	3.1				
	3.2				
	3.3	20-40		20-60	E / O
	3.4	20-30		20-40	E / O
	3.5				
	3.6				
	3.7	20-30			O
S	4.1	20-25			
	4.2	10-15			
	4.3	15-20		10-30	O
	5.1	10-15		10-20	O
	5.2	5-10			O
	5.3	20-50	20-60	20-80	O / E
N	6.1				
	6.2	20-50	20-60	20-80	O / E
	6.3				
	6.4	20-50	20-60	20-80	O / E
	7.1	20-50	20-60	20-80	O / E
	7.2	20-50	20-60	20-80	O / E
	7.3	20-50	20-60	20-80	O / E
	7.4	20-50	20-60	20-80	O / E
	7.5				
	8.1				
	8.2				
	8.3				

Important: For more application details and safety notes see ▸ 86-87!

JEL® (Drill) Thread Milling

CNC program – step-by-step explanation

Machining task:

Thread: M10, depth = 20.560 mm (EL)
Bore: blind bore, D = 8.500 mm,
cyl. depth = 22.060 mm
Chamfer steps:
1) tapered, D=10.300 mm, W=90.0°

Material:

7.2 aluminium alloy (A5 < 14%),
AlMn 1 Mg 0,5, 3.0525

Tool:

BGF-M10 2.0D, uncoated
Milling tool radius = 3.980 mm
Eccentricity = 1.020 mm
Order No.: 80.9410.01.000022
Drawing No.: 80.9410.01.000022.01
Main time: 4.0 sec

Cutting values (external track):

v_c = 400 m/min	n = 14980 rev/min	
f_s = 0.300 mm/rev	F = 4494 mm/min	(chamfering)
f_b = 0.300 mm/rev	F = 4494 mm/min	(drilling)
f_{z1} = 0.100 mm/tooth	F1 = 2996 mm/min	(thread milling)

NC machine:

Drive: standard NC machine
Max. spindle speed: 15000 rev/min
Control: Sinumerik
Ref.: contour path, incremental

NC options:

Entry loop: 180°
Exit loop: 180°
Milling method: conventional milling
Chip removal: single, degressive

Note:

Deepest tool position = -23.370 mm
For control systems where the feed relates to the central track, the figures given in brackets must be used.

N5 G00 G53 G40 G60 G90 D0 Z+0.0000	Initialisation, absolute coordinates
N10 G80	Deselect any existing cycles
N15 T1 M06	Tool selection
N20 G54 X+0.0000 Y+0.0000 M07	Zero point shift
N25 Z+1.0000 D1 S14980 M03	Move to start pos. 1mm above workpiece
N30 G01 Z-1.3000 F1498	Start bore with reduced boring feed
N35 G01 Z-15.6580 F4494	Bore to first boring depth
N40 G00 Z+0.0000	Clear chips ("chip clearance", "blow through")
N45 G00 Z-14.6580	Move to start position for second boring depth
N50 G01 Z-23.3700	Bore to end bore depth
N55 G00 Z+0.0000	Clear chips
;(C O N V E N T I O N A L M I L L I N G)	
N60 G00 Z-20.4000	Move to start position for thread milling
N65 G01 G91 G42 G64 X+0.0000 Y+3.9800 F2996 ;(F340)	Incremental coordinates, select milling radius adjustment, No movement
N70 G02 X+0.0000 Y-8.9800 I+0.0000 J-4.4900 Z-0.2250	Entry loop with pitch adjustment (Z = 0.15×P)
N75 G02 X+0.0000 Y+0.0000 I+0.0000 J+5.0000 Z-1.5000 ;(F611)	Thread finish milling to nominal dimension (Z=P)
N80 G02 X+0.0000 Y+8.9800 I+0.0000 J+4.4900 Z-0.2250 F7490 ;(F851)	Exit loop with pitch adjustment (Z = 0.15×P)
N85 G00 G40 G60 X+0.0000 Y-3.9800	Deselect milling radius adjustment
N90 G00 G53 G40 G90 D0 Z+0.0000 M95	Exit status
N95 M30	End of program

Note: For formulae and abbreviations used, see the following pages.

The application details given depend on the environmental and application conditions (e.g. machine, ambient temperature, lubricant/coolant used and machining result required): they are based on the correct application conditions, correct use and compliance with the spindle speed limits given for the tools.

JEL® (Drill) Thread Milling
Formulae

Formula symbols and abbreviations used

n	r.p.m.	Spindle speed
z		No. of teeth
v_c	m/min	Cutting speed
f_z	mm/teeth	Milling feed
f	mm/rev	Boring feed
r_f	mm	Tool radius
e	mm	Eccentricity
g	mm	Amount of withdrawal for conventional milling
g	mm	Amount of withdrawal for climb milling
D	mm	Nominal thread diameter
R_1	mm	Nominal thread radius
R_2	mm	Radius entry loop, external path (J)
z	mm	z dimension entry and exit loop
R_3	mm	Radius entry loop, centre path (J)
R_4	mm	Radius full circle, centre path (=e)

Path feeds

$F_1 = n \times z \times f_z$ Entry loop contour path

$F_1 = n \times z \times f_z \times \dfrac{e}{r_f + R_1}$ Entry loop centre point path

$F_2 = n \times z \times f_z$ Full circle contour path

$F_2 = n \times z \times f_z \times \dfrac{2 \times e}{D}$ Full circle centre point path

$F_3 = n \times z \times f_z \times 2{,}5$ Exit loop contour path

$F_3 = F_2 \times 2{,}5$ Exit loop centre point path

Formulae

$$v_c = \frac{D \times \pi \times n}{1000}$$ Cutting speed in m/min

$$n = \frac{v_c \times 1000}{D \times \pi}$$ Spindle speed in r.p.m.

$$r_f = R1 - e$$ Tool radius in mm

$$e = R1 - r_f$$ Eccentricity in mm

$$g = 1{,}3 \times \text{ pitch } + \frac{e}{\tan(\frac{\alpha}{2})}$$ Amount of withdrawal for conventional milling in mm

$$g = \frac{e}{\tan(\frac{\alpha}{2})} \text{①}$$ Amount of withdrawal for climb milling in mm

① where α = 90° countersink angle = tan45° = 1
where countersink angle is 60° the amount of withdrawal is larger

$$R_1 = \frac{D}{2}$$ Nominal thread radius in mm

$$R_2 = \frac{r_f + R_1}{2}$$ Radius entry loop, external path (J) in mm

$$z = p \times 0{,}15$$ z dimension entry and exit loop in mm

$$R_3 = \frac{e}{2}$$ Radius entry loop, centre path (J) in mm

$$R_4 = e$$ Radius full circle, centre path (=e) in mm

JEL ® (Drill) Thread Milling

Setting: Preparations on tool

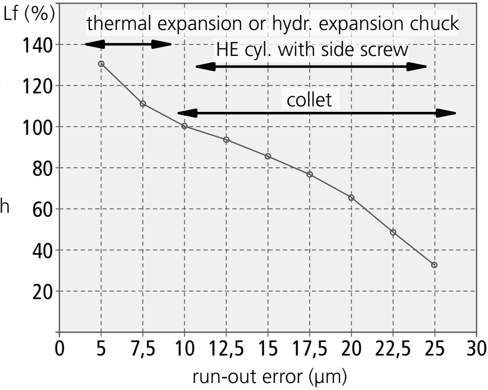
Tool clamping

- Correct alignment of clamping screw on clamping surface for Whistle-Notch adaptor
- Minimise overhang but the cutting sweep for the tool should be beyond the adaptor

Effect of concentricity on tool life using a solid carbide thread milling tool as an example

Material:
heat treated steel
Rm = 1000 N/mm²

Cutting values:
size: M10
v_C = 100 m/min
f_Z = 0,06 mm/tooth



Tool measurement

- Only measure tool length on pre-setter.
- Check concentricity at drill tip resp. thread milling section <0.02 mm
- Use tool radius shown on the CNC program

Preparations on machine

- Inkey tool length and tool radius into offset register of the control

Program test

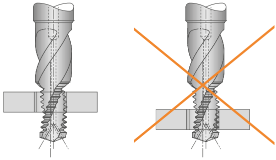
- Do a test run over the workpiece (increase tool length in tool record)
- Check machining time. If the time recorded is clearly different to that given in the program, there is an error in the feed rate calculation (contour path/centrer point path
- Optimise coolant supply. If flood coolant used, i.e. direct coolant flow onto the milling section of the tool. For through holes use flood coolant if there is no lateral flute coolant supply on the tool.

Cast aluminium
- Can be carried out without peck cycle
- For tools with internal coolant there is no need for chip clearance after boring.

Long chipping aluminium
- At least once peck cycle
- Radial division of cut may be necessary if a thread with very low burring is required

Grey cast iron
- No chip clearance
- Conventional thread milling in one path. Over 2×D two pathes may be required.

Special cases
Through hole
- For tool with internal coolant, switch to external coolant for milling
- To reduce side load, preferably work with milling section on shank side



Angled bore exit / cutting through cross holes
- Reduce bore feed rate at bore exit by 60%

Cavities (inclusions) in cast materials
- Reduce bore feed rate by 40-60%

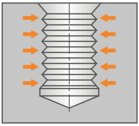
JEL® Drill Thread Milling Tool

Problems → possible causes → solutions

Chips packed or glued at the thread profile
- poor coolant

→ improve coolant (i.e. add flood coolant, lateral flute coolant supply for through holes)

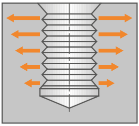
→ add coolant flutes flutes on shank



Thread go-gage doesn't fit
- thread too small

→ reduce tool radius in offset register
- chips in thread

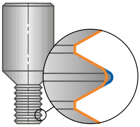
→ improve coolant



Thread is getting tapered
- poor tool clamping

→ improve tool holding (i.e. shrink fit holders)
- thread milling feed too high

→ reduce thread milling feed

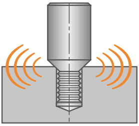


Erratic tool wear
- tool run out too high

→ use better tool holders (i.e. shrink fit holders)

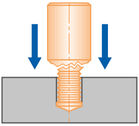
Counterbore chips are winding around the tool
- chamfer feed too low

→ increase chamfer feed



Loud drilling noise
(especially towards the final drilling depth)
- chip problem

→ reduce drill feed rate
→ use tool with coolant through
→ add peck cycle

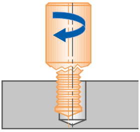


Tool breakage while drilling
(especially in long chipping material)
- chip problem

→ reduce drill feed rate
→ use tool with coolant through
→ add peck cycle (multiple pecks)

Chips glued up in the flutes
- poor coolant

→ improve coolant situation
→ use tool with coolant through
→ use coated tool



Chippage,tool breakage while thread milling
- feed rate thread milling too high

→ check that the chip grooves are free of chips after the boring operation
- vibrations

→ reduce feed rate (check whether NC feeds relate to centre point or external track)

Poor thread surface (harmonics)
- vibrations

→ check tool holder (do not use modular systems !)
→ check workpiece clamping and fixture. Where the clamping set-up is unstable introduce a distribution of the cutting force.
→ reduce cutting speed
→ increase tooth feed rate
→ introduce distribution of cutting force

JEL® Thread Milling Tool

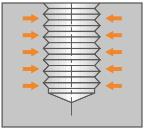
Problems → possible causes → solutions

Chips packed or glued at the thread profile

• poor coolant

→ improve coolant (i.e. add flood coolant, lateral flute coolant supply for through holes)

→ add coolant flutes flutes on shank



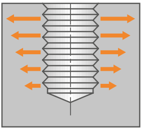
Thread go-gage doesn’t fit

• thread too small

→ reduce tool radius in offset register

• chips in thread

→ improve coolant



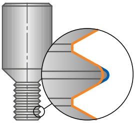
Thread is getting tapered

• poor tool clamping

→ improve tool holding (i.e. shrink fit holders)

• thread milling feed too high

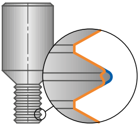
→ reduce thread milling feed



Erratic tool wear

• tool run out too high

→ use better tool holders (i.e. shrink fit holders), check material for homogeneity



Chippage, tool breakage

• feed rate thread milling too high

→ reduce thread milling feed

• vibrations

→ check tool holder (don’t use modular systems!!), change feeds and speeds

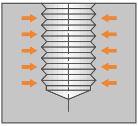
Poor thread surface

• tool overhang too long

→ check part clamping an and fixture. Use multiple cuts when part is clamped weak.

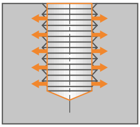
• non-suitable tool for this application

→ reduce cutting speed, increase feed/tooth, prefer conventional milling



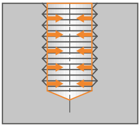
Thread too tight
- tolerance of thread forming tool does not align with thread gauge

→ use thread forming tool with right tolerance



Core diameter too large on thread
- wrong drill diameter (too large)

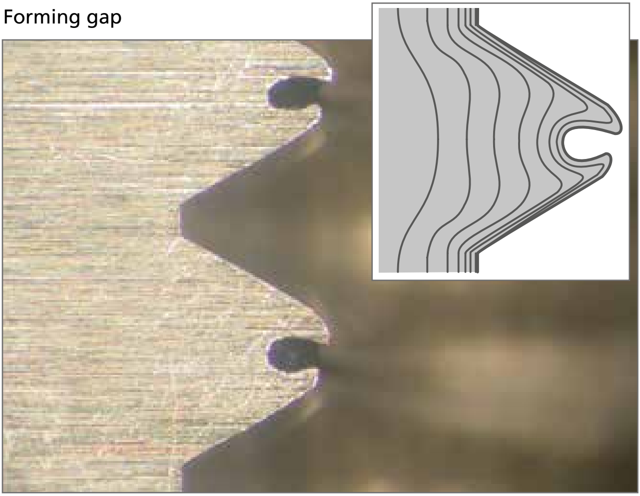
→ use smaller drill



Core diameter too small or torque too high
- drill diameter too small

→ use larger core boring tool

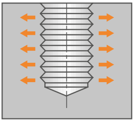
Forming gap



JEL® Tap

Problems → possible causes → solutions

Oversized thread



- wrong tools

→ select the right tools as shown in the catalogue

- cutting edge geometry not suitable for materials to be machined

→ select the right tools as shown in the catalogue

- material built-up at tap flanks

→ improve coolant system
→ use coated tap

- minor diameter too small, tool is cutting full profile

→ select correct core diameter

- chip jam

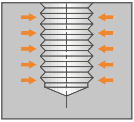
→ blind bore: increase spindle speed. Correct tool selection (spiral flute)
→ through hole: correct tool selection (spiral point)

- tolerance of tap drill to thread gauge does not agree

→ use tap drill with right tolerance

- angular or positional error in core bore

→ adjust workpiece clamping, use tapping chuck with axis parallel float



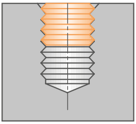
Thread too tigh

- tolerance of tap drill to thread gauge does not agree

→ use tap drill with right tolerance

- wrong tool type

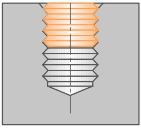
→ select the right tools as shown in the catalogue



Thread is cut wrongly axially

- cutting lead pressure on tapping chuck too great

→ select the right cutting lead pressure

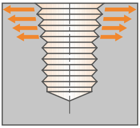


Pitch distortion

(plug gauge cannot be screwed in over full thread length on the workpiece)

- tap is not cutting true to pitch

→ select right tool
→ select right cutting lead pressure
→ with length adjustment chucks reduce feed to 95%



Thread oversize at the entry

- wrong cutting lead pressure

→ use compensation chuck(tension)
→ use lead srcrew
→ select right tool

Thread surface not clean

- wrong tool type

→ select right tool

- chip jam

→ see "thread too large – chip jam"

- core diameter too small

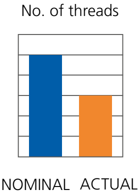
→ select right core diameter

- material built-up on thread flanks

→ use tools with surface treatment
→ improve coolant system

- cutting speed to low

→ increase cutting speed



Tool life too short

- wrong tool type

→ select right tool type

- cutting speed too high or too low

→ adjust cutting speed

- composition and supply of coolant inadequate

→ provide suitable, sufficient coolant

- premature wear due to lack of or unsuitable surface treatment

→ use coated tools, if necessary solid carbide tools

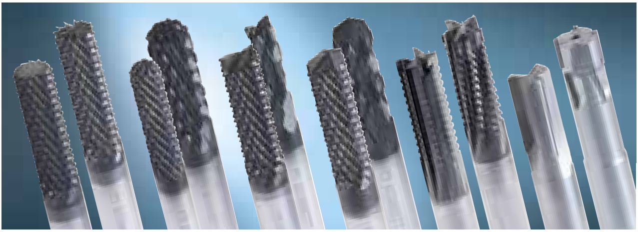
Index Milling

	JEL® End mill cutter	JEL® Roughing end mill	JEL® Spherical cutter	JEL® Torus mill cutter
Guideline values cutting speed v_C	▶ 188 – 190	▶ 188	▶ 189	▶ 190
Guideline values milling feed f_Z	▶ 192 – 194	▶ 192 – 193	▶ 195	▶ 195
Technical Notes Slot milling, rough milling, finish milling	▶ 196 – 197	▶ 196 – 197	▶ 196 – 197	

KOMET® Indexable insert milling cutter

Quatron *hi.feed:* Application examples, guideline values	▶ 204 – 207
Indexable insert milling cutter: Guideline values, calculation information	▶ 208 – 217

	JEL® Chamfer mill cutter	JEL® Radius mill cutter	JEL® End mill cutter AL	JEL® End mill cutter HF	JEL® End mill cutter AL	JEL® PCD Slot milling cutter	JEL® PCD Face milling cutter
	▶ 190	▶ 191	▶ 191	▶ 191	▶ 191	▶ 198	▶ 199
			▶ 193	▶ 193	▶ 193	▶ 198	▶ 199



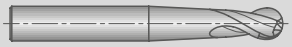
JEL® Milling cutter for machining of composite materials

NCD Composite milling cutter, HSC NCD Composite multi-totth milling cutter	▶ 202 – 203
PCD Slot milling cutter PCD Compression milling cutter	▶ 200 – 201

JEL ® Solid Carbide Milling Cutter
Guideline values for milling

		End mill cutter UNI		End mill cutter HPC		End mill cutter XH		Roughing end mill	
		 DIN 6535 HB		 DIN 6535 HB		 DIN 6535 HA		 DIN 6535 HB	
Coating		TiAlN		TiAlN		AlTiN		TiAlN	
∅		∅ 6 - 20		∅ 6 - 20		∅ 4 - 16		∅ 6 - 20	
		v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)	Kf
P	1.1	165	2	180	2			165	2
	1.2	135	2	160	2			150	2
	1.3	125	2	140	2			140	2
	1.4	125	2	140	2			140	2
	1.5	100	1	120	1			120	1
	1.6	90	1	100	1			100	1
H	1.7					80	4		
	1.8					60	4		
M	2.1	75	1	110	1				
	2.2	65	1	110	1				
	2.3	70	1	110	1				
K	3.1	150	2	150	2			160	2
	3.2	130	2	130	2			140	2
	3.3	130	2	130	2			140	2
	3.4	130	2	130	2			140	2
	3.5	110	2	110	2			120	2
	3.6	110	2	110	2			120	2
	3.7	110	2	110	2			120	2
S	4.1	60	1	60	1			65	1
	4.2	60	1	60	1			65	1
	4.3	55	1	55	1			60	1
	5.1	45	1	45	1				
	5.2	35	1	35	1				
	5.3	30	1	30	1				
N	6.1	175	3					190	3
	6.2	160	3					180	3
	6.3	175	3					190	3
	6.4	100	3					110	3
	7.1	280	3					310	3
	7.2	260	3					285	3
	7.3	260	3					285	3
	7.4	240	3					270	3
	7.5	200	3					220	3
	8.1	160	3					175	3
	8.2	175	3					190	3
	8.3	145	3					160	3

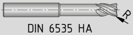
v_c = Cutting speed · Kf = Correction factor for feed f_z (page 192-195)

Spherical cutter		Spherical cutter XH		Spherical cutter XH		End mill cutter	
 DIN 6535 HB		 DIN 6535 HA		 DIN 6535 HA		 DIN 6535 HA / HB	
TiAlN		AlTiN		AlTiN		TiAlN	
∅ 3 - 20		∅ 3 - 16		∅ 6 - 16		∅ 3 - 20	
v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)	Kf
170	p4	235	p4	225	p4	165	2
160	p4	220	p4	210	p4	135	2
150	p4	205	p4	200	p4	125	2
150	p4	205	p4	200	p4	125	2
130	p4	180	p4	175	p4	100	1
95	p3	135	p3	125	p3	90	1
		145	p1	140	p1		
		125	p1	120	p1		
95	p3					75	1
85	p2					65	1
75	p3					70	1
225	p4	305	p4	300	p4	150	2
210	p4	280	p4	275	p4	130	2
210	p4	280	p4	275	p4	130	2
190	p4	260	p4	250	p4	130	2
160	p4	220	p4	210	p4	110	2
145	p4	200	p4	190	p4	110	2
145	p4	200	p4	190	p4	110	2
						60	1
						60	1
						55	1
55	p2					45	1
55	p2					35	1
45	p2					30	1
145	p5					175	3
140	p5					160	3
145	p5					175	3
80	p5					100	3
520	p5					280	3
460	p5					260	3
460	p5					260	3
270	p5					240	3
220	p5					200	3
210	p5					160	3
225	p5					175	3
190	p5					145	3

Important: For more application details and safety notes see ▸ 86-87!

JEL ® Solid Carbide Milling Cutter

Guideline values for milling

		End mill cutter XH		End mill cutter XH		Torus mill cutter		Chamfer mill cutter
		 DIN 6535 HA		 DIN 6535 HA		 DIN 6535 HA		 DIN 6535 HB
Coating		AlTiN		AlTiN		AlTiN		TiAlN
⌀		⌀ 4 - 10		⌀ 6 - 10		⌀ 6 - 12		⌀ 6 - 12
		v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)
P	1.1					225	p4	165
	1.2					210	p4	135
	1.3					200	p4	125
	1.4					200	p4	125
	1.5					175	p4	100
	1.6					125	p4	90
H	1.7	80	p4	80	p4	140	p1	
	1.8	60	p4	60	p4	120	p1	
M	2.1							75
	2.2							65
	2.3							70
K	3.1					300	p4	150
	3.2					275	p4	130
	3.3					275	p4	130
	3.4					250	p4	130
	3.5					210	p4	110
	3.6					190	p4	110
	3.7					190	p4	110
S	4.1							60
	4.2							60
	4.3							55
	5.1							45
	5.2							35
	5.3							30
N	6.1							175
	6.2							160
	6.3							175
	6.4							100
	7.1							280
	7.2							260
	7.3							260
	7.4							240
	7.5							200
	8.1							160
	8.2							175
	8.3							145

v_c = Cutting speed · Kf = Correction factor for feed f_z (page 192-195)

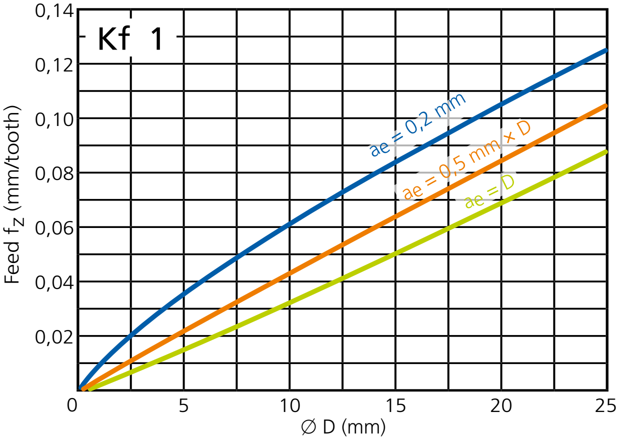
JEL ® Solid Carbide Milling Cutter
Guideline values for milling

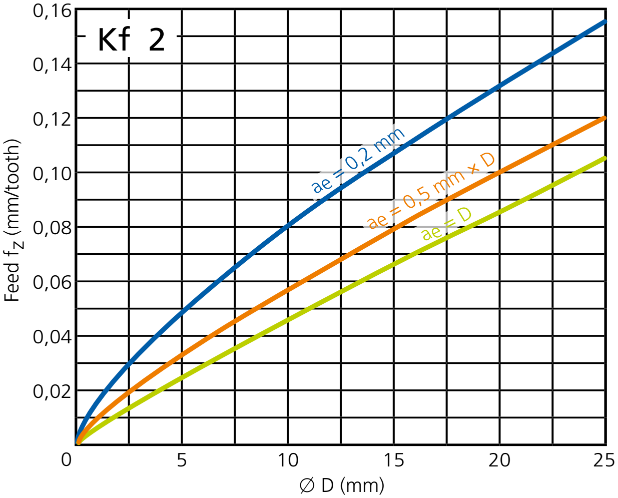
	Radius mill cutter	End mill cutter AL		End mill cutter HF		End mill cutter AL	
	 DIN 6535 HB	 DIN 6535 HB		 DIN 6535 HA		 DIN 6535 HA	
	TiAlN	AlTiN		TiB2		TiAlN	
	∅ 6 - 8	∅ 3 - 20		∅ 6 - 25		∅ 4 - 8	
	v_c (m/min)	v_c (m/min)	Kf	v_c (m/min)	Kf	v_c (m/min)	Kf
	165						
	135						
	125						
	125						
	100						
	90						
	75						
	65						
	70						
	150						
	130						
	130						
	130						
	110						
	110						
	110						
	60						
	60						
	55						
	45						
	35						
	30						
	175	150	3			150	3
	160	140	3			140	3
	175	150	3			150	3
	100	80	3			80	3
	280	500	3	300 - 600	3	500	3
	260	420	3	300 - 600	3	420	3
	260	420	3	300 - 600	3	420	3
	240	270	3	200 - 500	3	270	3
	200	220	3	100 - 300	3	220	3
	160	150	3			150	3
	175	160	3			160	3
	145	120	3			120	3

Important: For more application details and safety notes see ▸86-87!

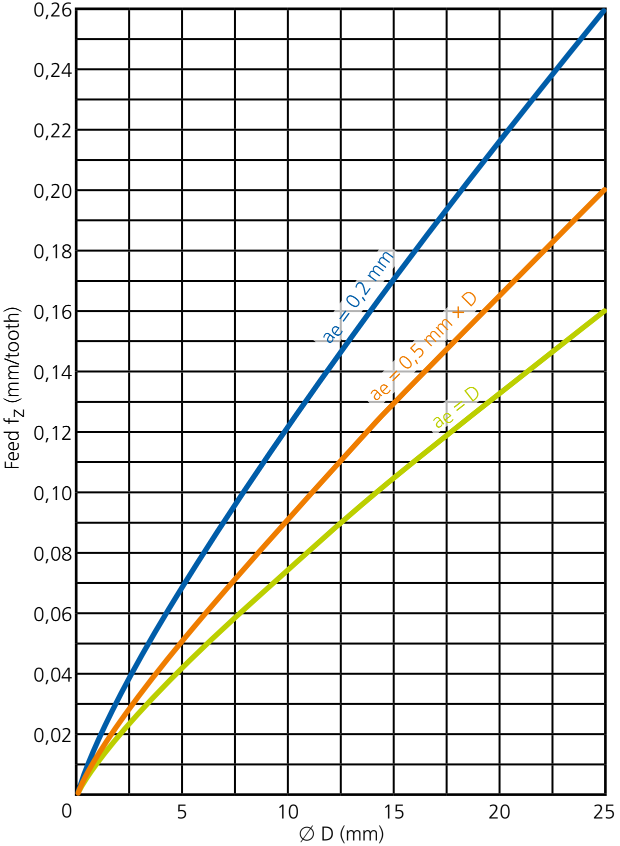
JEL® Solid Carbide Milling Cutter

Correction factor Kf for feed f_z





Kf 3

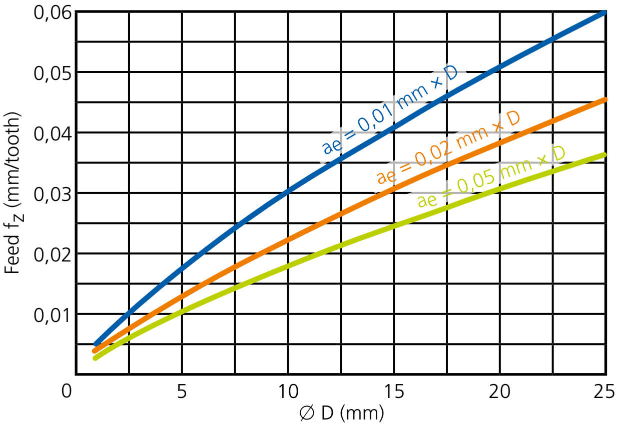


Important: For more application details and safety notes see 86-87!

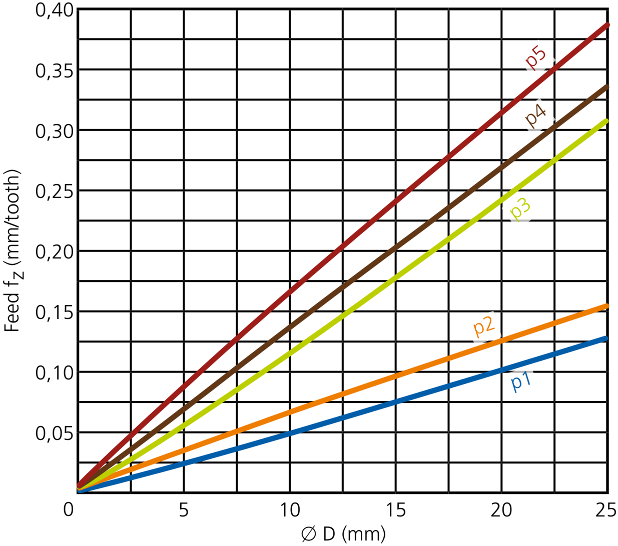
Correction factor Kf for feed f_z

Kf 4

hardened steel
a_p max. = 0,2 mm

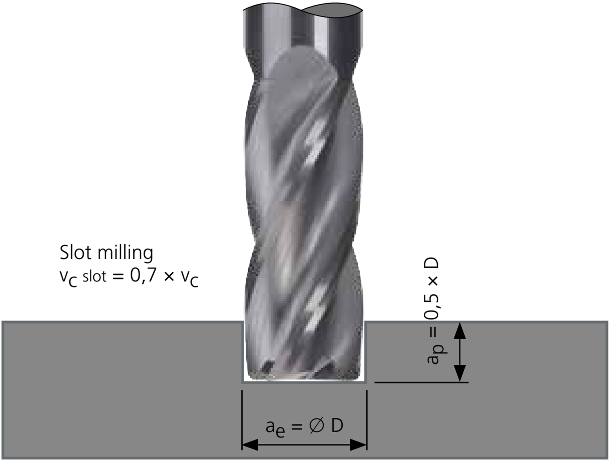


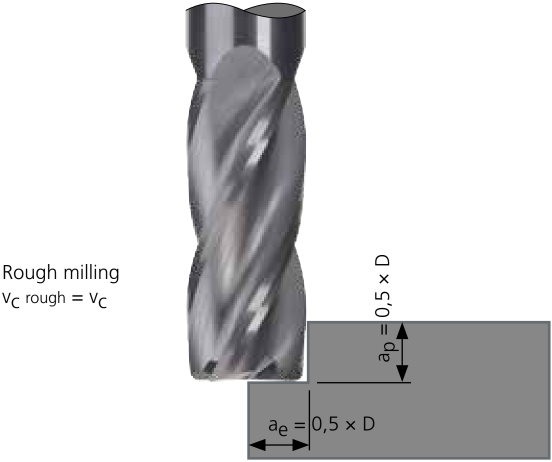
Kf p1-p5

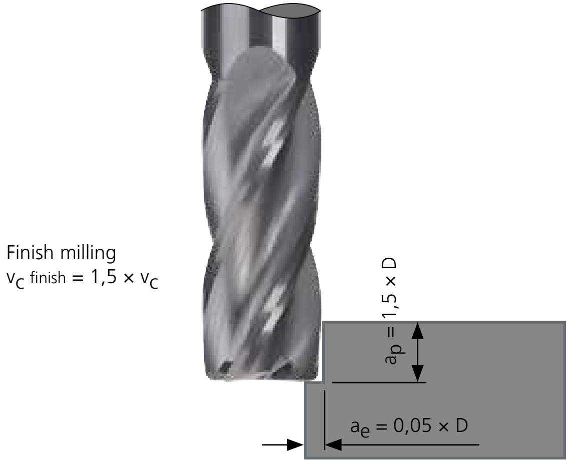


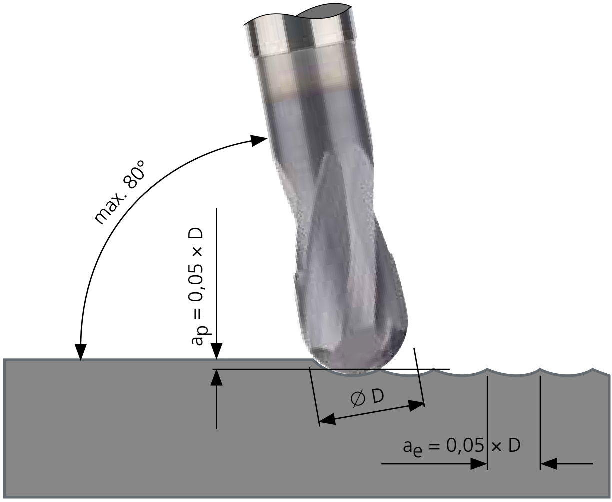
Important: For more application details and safety notes see ▸ 86-87!

JEL ® Solid Carbide Milling Cutter
Technical notes



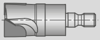



Finish milling
v_c finish = 1,5 × v_c
a_p = 1,5 × D
a_e = 0,05 × D


max. 80°
a_p = 0,05 × D
∅ D
a_e = 0,05 × D

JEL® PCD

Guideline values for PCD slot milling cutter



	Nom. Ø	Ø 6		Ø 8		Ø 10		Ø 12		Ø 16 | 20 | 25	
		v_c m/min	f_z mm/tooth	v_c m/min	f_z mm/tooth	v_c m/min	f_z mm/tooth	v_c m/min	f_z mm/tooth	v_c m/min	f_z mm/tooth
P	1.1										
P	1.2										
P	1.3										
P	1.4										
P	1.5										
P	1.6										
H	1.7										
H	1.8										
M	2.1										
M	2.2										
M	2.3										
K	3.1										
K	3.2										
K	3.3										
K	3.4										
K	3.5										
K	3.6										
K	3.7										
S	4.1										
S	4.2										
S	4.3										
S	5.1										
S	5.2										
S	5.3										
N	6.1										
N	6.2	200-600	0,04-0,08	200-800	0,04-0,10	300-800	0,04-0,12	300-1000	0,04-0,15	300-1000	0,06-0,20
N	6.3										
N	6.4										
N	7.1	200-800	0,04-0,08	200-800	0,04-0,10	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20
N	7.2	200-800	0,04-0,08	200-800	0,04-0,10	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20
N	7.3	200-800	0,04-0,08	200-800	0,04-0,10	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20
N	7.4	200-800	0,04-0,08	200-800	0,04-0,10	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20
N	7.5	200-800	0,04-0,08	200-800	0,04-0,10	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20
N	8.1										
N	8.2										
N	8.3	200-500	0,02-0,06	200-500	0,03-0,08	200-600	0,03-0,10	200-600	0,04-0,12	500-1200	0,05-0,15

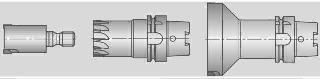
PCD cutting materials are suitable for maximum cutting speeds because of their hardness.

PCD tools require careful handling.

To prevent fracturing, please use non-contact measuring only. For extended or preset tools the cutting edges should be protected with a cover.

v_c = Cutting speed (m/min) · f_z = Milling feed (mm/tooth)

Guideline values for PCD face milling cutter



	Nom. Ø	Ø 10 vc m/min	Ø 10 fz mm/tooth	Ø 12 vc m/min	Ø 12 fz mm/tooth	Ø 16|20|25|32 vc m/min	Ø 16|20|25|32 fz mm/tooth	Ø 40 – 160 vc m/min	Ø 40 – 160 fz mm/tooth
P	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
H	1.7								
	1.8								
M	2.1								
	2.2								
	2.3								
K	3.1								
	3.2								
	3.3								
	3.4								
	3.5								
	3.6								
	3.7								
S	4.1								
	4.2								
	4.3								
	5.1								
	5.2								
	5.3								
N	6.1								
	6.2	300-800	0,04-0,12	300-1000	0,04-0,15	300-1000	0,06-0,20	1000-1500	0,04-0,15
	6.3								
	6.4								
	7.1	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20	1000-3500	0,04-0,15
	7.2	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20	1000-3500	0,04-0,15
	7.3	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20	1000-3500	0,04-0,15
	7.4	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20	1000-1500	0,04-0,15
	7.5	400-1000	0,04-0,12	400-1500	0,04-0,15	400-1500	0,06-0,20	1000-1500	0,04-0,15
	8.1								
	8.2								
	8.3	200-600	0,03-0,10	200-600	0,04-0,12	500-1200	0,05-0,15	500-1200	0,05-0,15

PCD cutting materials are suitable for maximum cutting speeds because of their hardness.

PCD tools require careful handling.

To prevent fracturing, please use non-contact measuring only. For extended or preset tools the cutting edges should be protected with a cover.

Important: For more application details and safety notes see 86-87!

JEL ® PCD
PCD Slot milling cutter

Trimming, face milling, plunge milling
38304..
straight fluted

PCD Slot milling cutter						
Cutting speed v_C (m/min) Feed f_Z (mm/tooth)	Ø 6 mm		Ø 8 mm		Ø 10 mm	
	v_C	f_Z	v_C	f_Z	v_C	f_Z
CFRP	200 - 400	0,02 - 0,06	200 - 400	0,03 - 0,08	200 - 400	0,03 - 0,10
GFRP	200 - 400	0,02 - 0,08	200 - 400	0,03 - 0,10	200 - 400	0,03 - 0,12
CFRP/Al stacks	200 - 400	0,02 - 0,06	200 - 400	0,03 - 0,08	200 - 400	0,03 - 0,10
Honeycombs	200 - 400	0,02 - 0,06	200 - 400	0,03 - 0,08	200 - 400	0,03 - 0,10

Trimming, pocket and slot milling

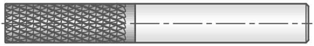
38300..
staggered cut with dual right and left helix

PCD Compression milling cutter								
Cutting speed v_C (m/min) Feed f_Z (mm/tooth)	Ø 6 mm		Ø 8 mm		Ø 10 mm		Ø 12 mm	
	v_C	f_Z	v_C	f_Z	v_C	f_Z	v_C	f_Z
CFRP	200 - 400	0,02 - 0,06	200 - 400	0,03 - 0,08	200 - 400	0,03 - 0,10	200 - 400	0,03 - 0,12
GFRP	200 - 400	0,02 - 0,08	200 - 400	0,03 - 0,10	200 - 400	0,03 - 0,12	200 - 400	0,03 - 0,15
CFRP/Al stacks	200 - 400	0,02 - 0,06	200 - 400	0,03 - 0,08	200 - 400	0,03 - 0,10	200 - 400	0,03 - 0,12
Honeycombs	200 - 400	0,02 - 0,06	200 - 400	0,03 - 0,08	200 - 400	0,03 - 0,10	200 - 400	0,03 - 0,12

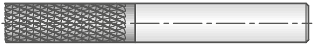
JEL ® NCD

NCD Composite milling cutter, HSC

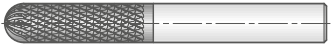
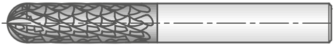
Milling and trimming
78980.. type FZ (fine-tooth)
flat head



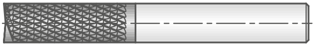
Milling and trimming
78981.. type FZ (fine-tooth)
burr style



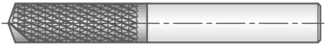
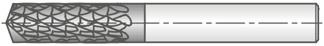
Slot milling and plunge milling
78982.. type FZ (fine-tooth)
78983.. type GZ (coarse-tooth)
ball nose

Plunge milling and trimming
78984.. type FZ (fine-tooth)
78985.. type GZ (coarse-tooth)
2 front cutters




Trimming, slot milling, plunge milling and shoulder milling
78986.. type FZ (fine-tooth)
78987.. type GZ (coarse-tooth)
2 front cutters, 135° drill centre

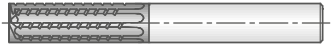
NCD Composite milling cutter										
	Ø 4 mm		Ø 6 mm		Ø 8 mm		Ø 10 mm		Ø 12 mm	
	v_C	f	v_C	f	v_C	f	v_C	f	v_C	f
CFRP	100 - 200	0,06 - 0,10	100 - 300	0,08 - 0,12	100 - 300	0,10 - 0,15	100 - 300	0,10 - 0,20	100 - 300	0,10 - 0,25
GFRP	120 - 200	0,06 - 0,12	100 - 300	0,08 - 0,15	100 - 300	0,10 - 0,20	100 - 300	0,10 - 0,25	100 - 300	0,10 - 0,30

Cutting speed v_C (m/min) · Feed f (mm/rev)

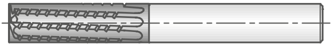
NCD Composite multi-tooth milling cutter

Trimming, circular cutting, axial grooving, pocket and slot milling

78988..
straight teeth
burr style, every second tooth exposed
fine chip breaker



78989..
helical teeth, pull cut
burr style, every second tooth exposed
fine chip breaker



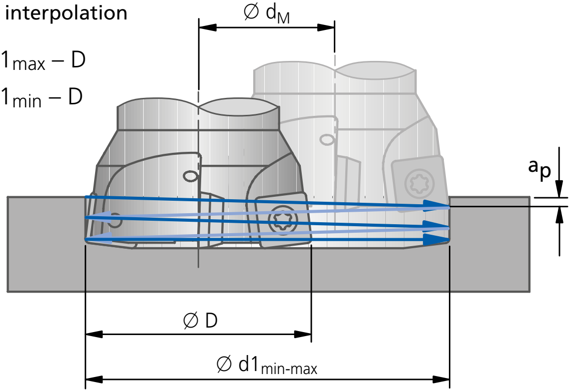
NCD Composite multi-tooth milling cutter								
Cutting speed v_C (m/min) Feed f (mm/rev)	Ø 4 mm		Ø 6 mm		Ø 8 mm		Ø 10 mm	
	v_C	f	v_C	f	v_C	f	v_C	f
CFRP	100 - 200	0,02 - 0,04	100 - 300	0,02 - 0,06	100 - 300	0,02 - 0,08	100 - 300	0,02 - 0,10
GFRP	100 - 200	0,02 - 0,06	100 - 300	0,02 - 0,08	100 - 300	0,02 - 0,10	100 - 300	0,02 - 0,12
CFRP/Al stacks	100 - 200	0,02 - 0,04	100 - 300	0,02 - 0,06	100 - 300	0,02 - 0,08	100 - 300	0,02 - 0,10
Honeycombs	100 - 200	0,02 - 0,04	100 - 300	0,02 - 0,06	100 - 300	0,02 - 0,08	100 - 300	0,02 - 0,10

KOMET® Quatron *hi.feed*
Application examples

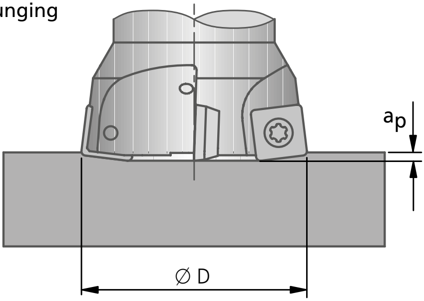
Circular interpolation

$d_M = d1_{max} - D$

$d_M = d1_{min} - D$



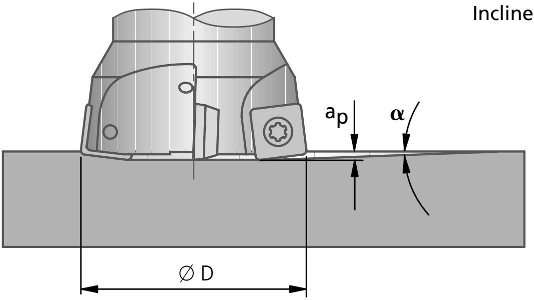
Axial plunging



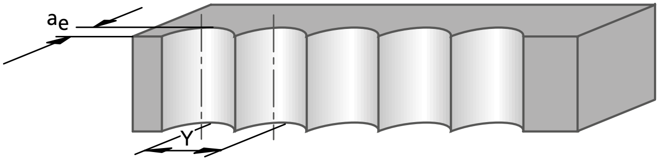
Milling cutter dia. Ø D	machining dia. min-max	Ramping angle α	a_p max	a_e max
20	30-38	2,8°	0,67	5,0
25	41-48	2,8°	0,72	5,6
32	52-62	2,5°	0,88	7,0
35	56-68	2,5°	0,88	7,0
42	69-82	2,3°	1,1	8,5
52	87-100	2,3°	1,1	8,5

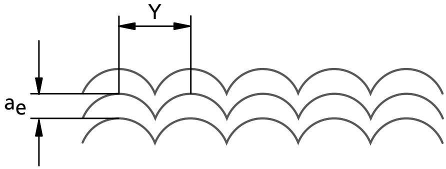
f_z initial	f_z min	f_z max	Y max
0,10	0,08	0,15	< 0,7 × D

Inclined plunging

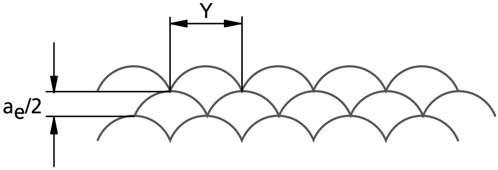


Plunge milling





Tool offset with optimum coverage



Tool offset for unstable conditions

KOMET® Quatron *hi.feed*

Guideline values for milling

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)	Feed f_z (mm/tooth)					
			∅ 20		∅ 25		∅ 32	
			normal	Plunge milling	normal	Plunge milling	normal	Plunge milling
P	1.0	300	0,5-1,2	0,05-0,11	0,5-1,2	0,05-0,11	0,5-1,6	0,06-0,13
P	2.0	250	0,5-1,2	0,05-0,11	0,5-1,2	0,05-0,11	0,5-1,6	0,06-0,13
P	2.1	300	0,5-1,2	0,05-0,11	0,5-1,2	0,05-0,11	0,5-1,6	0,06-0,13
P	3.0	200	0,5-1,2	0,05-0,11	0,5-1,2	0,05-0,11	0,5-1,6	0,06-0,13
P	4.0	180	0,5-1,2	0,05-0,11	0,5-1,2	0,05-0,11	0,5-1,6	0,06-0,13
P	4.1	80	0,5-1,2	0,05-0,11	0,5-1,2	0,05-0,11	0,5-1,6	0,06-0,13
S	5.0							
S	5.1							
M	6.0							
M	6.1							
M	7.0							
K	8.0							
K	8.1							
K	9.0							
K	9.1				on request			
K	10.0							
K	10.1							
K	10.2							
N	12.0							
N	12.1							
N	13.0							
N	13.1							
N	14.0							
H	15.0							
H	16.0							

	Feed f_z (mm/tooth)					
	∅ 35		∅ 42		∅ 52	
	normal	Plunge milling	normal	Plunge milling	normal	Plunge milling
	0,5-1,6	0,06-0,13	0,5-2,0	0,07-0,15	0,5-2,0	0,07-0,15
	0,5-1,6	0,06-0,13	0,5-2,0	0,07-0,15	0,5-2,0	0,07-0,15
	0,5-1,6	0,06-0,13	0,5-2,0	0,07-0,15	0,5-2,0	0,07-0,15
	0,5-1,6	0,06-0,13	0,5-2,0	0,07-0,15	0,5-2,0	0,07-0,15
	0,5-1,6	0,06-0,13	0,5-2,0	0,07-0,15	0,5-2,0	0,07-0,15
	0,5-1,6	0,06-0,13	0,5-2,0	0,07-0,15	0,5-2,0	0,07-0,15

on request

Important: For more application details and safety notes see ▸ 86-87!

KOMET® Indexable insert milling cutter

Guideline values for milling

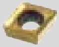
Material group Selection: L.H. fold page		Cutting speed v_c (m/min)						
		T-slot milling = v_c – 50 %						
		uncoated		CVD coated				PVD
		P25M	K10 / K20	BK6110	BK6115	BK64	BK74	BK2715
P	1.0	60-100				100-180	100-180	
P	2.0	60-100				100-180	100-180	
P	2.1	60-100				100-180	100-180	
P	3.0	40-70				60-120	60-120	
P	4.0	40-70				60-120	60-120	
P	4.1	–				–	–	
S	5.0		20-40				40-60	
S	5.1		10-30				40-60	
M	6.0					60-140	80-160	
M	6.1					60-140	80-160	
M	7.0					60-140	80-160	
K	8.0		60-150	180-350	150-330			140-250
K	8.1		60-150	150-280	120-260			110-200
K	9.0		60-150	160-320	140-300			130-230
K	9.1		60-150	150-280	120-260			110-200
K	10.0		60-150	130-250	110-230			100-180
K	10.1		60-150	130-250	110-230			100-180
K	10.2		60-100	110-210	90-200			90-150
N	12.0		200-500					
N	12.1		200-500					
N	13.0		200-500					
N	13.1		200-500					
N	14.0		200-500					
H	15.0							
H	16.0							

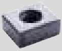
	Cutting speed v_c (m/min)							
	T-slot milling = v_c – 50 %							
	PVD coated							Cermet
	BK2725	BK2730	BK68	BK78	BK80	BK8425	BK8440	CK37
	90-160	120-180	90-160	120-180	90-160	100-180	80-160	180-350
	90-160	120-180	90-160	120-180	90-160	100-180	80-160	180-350
	90-160	120-180	90-160	120-180	90-160	100-180	80-160	180-350
	50-110	120-160	50-110	90-160	50-110	70-130	60-110	160-280
	50-110	120-160	50-110	90-160	50-110	70-130	60-110	160-280
	–	–	–	–	–	–	–	–
				80-160	100-180	80-160	70-150	200-260
				80-160	100-180	80-160	70-150	200-260
				80-160	100-180	80-160	70-150	200-260
	60-140	120-260	60-140			140-200		250-320
	60-140	120-260	60-140			140-200		250-320
	60-140	120-260	60-140			140-200		250-320
	60-140	120-260	60-140			140-200		250-320
	60-140	120-260	60-140			140-200		250-320
	60-140	120-260	60-140			140-200		250-320
	–	–	–			–		–

Important: For more application details and safety notes see ▸ 86-87!

KOMET® Indexable insert milling cutter

Guideline values for milling

Material group	Selection: L.H. fold page	Feed f_Z (mm/tooth)				
		Q09			Q12	Q15
		 Face milling cutter	 T-slot milling cutter	 Chamfer milling cutter	 Circular milling cutter	 T-slot milling cutter
P	1.0	0,08-0,40	0,04-0,12	0,05-0,20	0,05-0,12	0,04-0,12
P	2.0	0,08-0,40	0,04-0,12	0,05-0,20	0,05-0,12	0,04-0,12
P	2.1	0,08-0,40	0,04-0,12	0,05-0,20	0,05-0,12	0,04-0,12
P	3.0	0,08-0,30	0,04-0,12	0,05-0,20	0,05-0,12	0,04-0,12
P	4.0	0,05-0,25	0,04-0,12	0,05-0,20	0,05-0,12	0,04-0,12
P	4.1	–	–	–	–	–
S	5.0			0,05-0,20		
S	5.1			0,05-0,20		
M	6.0	0,05-0,20		0,05-0,20	0,05-0,10	
M	6.1	0,05-0,20		0,05-0,20	0,05-0,10	
M	7.0	0,05-0,20		0,05-0,20	0,05-0,10	
K	8.0	0,08-0,40	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
K	8.1	0,08-0,40	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
K	9.0	0,08-0,40	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
K	9.1	0,08-0,30	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
K	10.0	0,08-0,30	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
K	10.1	0,08-0,30	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
K	10.2	0,08-0,30	0,04-0,15	0,05-0,20	0,05-0,15	0,04-0,15
N	12.0	0,05-0,40	0,05-0,15	0,05-0,20	0,05-0,25	0,05-0,15
N	12.1	0,05-0,30	0,05-0,15	0,05-0,20	0,05-0,25	0,05-0,15
N	13.0	0,05-0,30	0,05-0,15	0,05-0,20	0,05-0,25	0,05-0,15
N	13.1	0,10-0,50	0,05-0,15	0,05-0,20	0,05-0,25	0,05-0,15
N	14.0	0,10-0,50	0,05-0,15	0,05-0,20	0,05-0,25	0,05-0,15
H	15.0					
H	16.0					

	Feed f_z (mm/tooth)				
	Q36				Q80
	 Corner milling cutter	 Shell end face milling cutter	 End milling cutter	 Copying end milling cutter	 Arbor face milling cutter *hi.aeQ*
	0,08-0,35	0,06-0,30	0,06-0,30	0,06-0,30	
	0,08-0,35	0,06-0,30	0,06-0,30	0,06-0,30	
	0,08-0,35	0,06-0,30	0,06-0,30	0,06-0,30	
	0,08-0,25	0,06-0,25	0,06-0,25	0,06-0,25	
	0,08-0,25	0,06-0,25	0,06-0,25	0,06-0,25	
	–	–	–	–	
	0,04-0,10	0,04-0,10	0,04-0,10		
	0,04-0,10	0,04-0,10	0,04-0,10		
	0,05-0,15	0,05-0,15	0,05-0,15	0,05-0,15	
	0,05-0,15	0,05-0,15	0,05-0,15	0,05-0,15	
	0,05-0,15	0,05-0,15	0,05-0,15	0,05-0,15	
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,30	0,10-0,30	0,10-0,30	0,10-0,30	0,25-0,35
	0,10-0,45	0,10-0,45	0,10-0,45	0,10-0,45	
	0,10-0,45	0,10-0,45	0,10-0,45	0,10-0,45	
	0,10-0,45	0,10-0,45	0,10-0,45	0,10-0,45	
	0,10-0,45	0,10-0,45	0,10-0,45	0,10-0,45	
	0,10-0,45	0,10-0,45	0,10-0,45	0,10-0,45	

Important: For more application details and safety notes see ▸ 86-87!

KOMET® Calculation information

Specific cutting force kc (N/mm²)

a_e = milling width in mm
a_p = cutting depth in mm
b = chip width in mm
D = tool diameter in mm
f_z = feed/tooth in mm
n = speed in min^{-1}
k_c = specific cutting force in N/mm²
P_e = power requirement in KW
v_c = cutting speed in m/min
v_f = feed rate in mm/min
z = tooth load
η = working angle

Cutting speed:

$$v_c = \frac{n \times p \times D}{1000} \quad \text{(m/min)}$$

Power requirement:

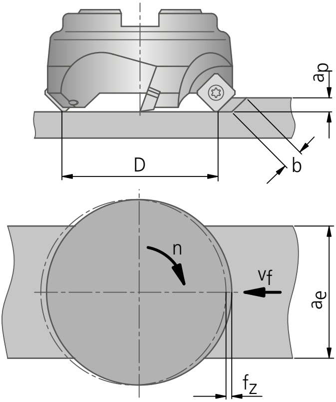
$$P_e = \frac{a_p \times a_e \times v_f \times k_c}{60 \times 10^6 \times \eta} \quad \text{(kW)}$$

Feed rate:

$$v_f = f_z \times z \times n \quad \text{(mm/min)}$$

Spindle speed:

$$n = \frac{v_c \times 1000}{p \times D} \quad (\text{min}^{-1})$$



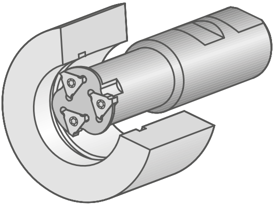
Specific cutting force kc (N/mm²)

	Workpiece material	Brinell-hardness HB	Feed f_Z (mm/tooth) 0,1	0,2	0,3	0,4
P	Carbon steel 0,2%C	150	3200	2700	2450	2300
	Carbon steel 0,45%C	190	3550	3000	2750	2550
	Carbon steel 0,83%C	250	3900	3300	3000	2800
	Alloy steel	up to 200	3550	3000	2750	2550
		200 - 250	3900	3300	3000	2800
		275 - 325	4300	3600	3300	2100
		325 - 375	4600	3900	3600	3300
		375 - 425	4850	4100	3750	3500
		425 - 475	5000	4300	3900	3700
M	Stainless steel, ferritic	135 - 175	3100	3600	2350	2200
		175 - 225	4150	3500	3200	3000
	Stainless steel, martensitic	275 - 325	4700	4000	3650	3400
		375 - 425	5300	4500	4100	3850
	Stainless steel, austenitic	135 - 425	4150	3500	3200	3000
K	Cast steel, carbon	up to 150	2850	2400	2200	2050
		150 - 200	3150	2650	2400	2250
	Cast steel, alloy	200 - 250	3400	2900	2650	2450
		250 - 300	3700	3200	2900	2700
	Malleable iron, ferritic	110 - 145		2000		
	Malleable iron, perlitic	200 - 250		2000		
	Grey cast iron, low tensile strengh	180		1400		
	Grey cast iron, high tensile strengh, alloy	250		1800		
	Spheroidal graphite cast iron, ferritic	160		1500		
	Spheroidal graphite cast iron, perlitic	250		2250		
	Chill cast iron	400		3500		

KOMET ® Calculations for circular milling

R = workpiece radius in mm
r = milling cutter radius in mm
a_r = radial cutting depth in mm
φ = approach angle in °
h_m = average chip thickness in mm
n = spindle speed in min^{-1}
z = number of teeth (effectively cutting)

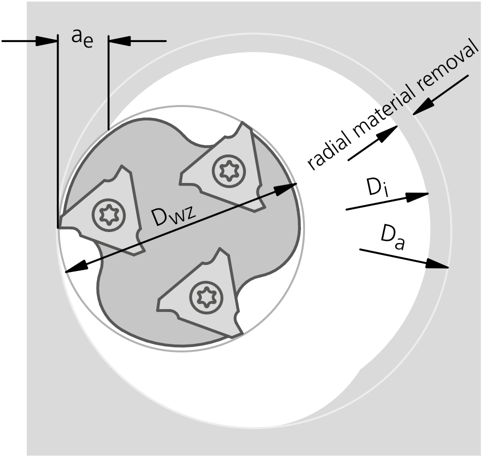
Circular milling, internal



$$a_e = \frac{D_a^2 - D_i^2}{4\,(D_a - D_{WZ})}$$

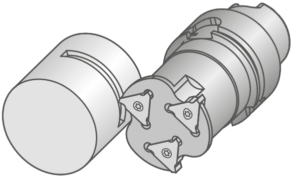
$$v_f = \frac{(D_a - D_{WZ}) \times n \times z_{eff} \times f_z}{D_a}$$

a_e > radial material removal



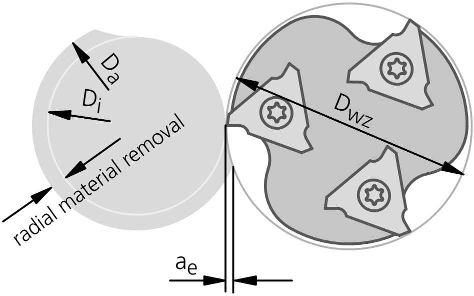
The average chip thickness is determined by considering workpiece and tool geometry data.
The total cutting time must allow for the entry and exit times. Axial "chambering" is also possible with these interpolating milling cutters.

Circular milling, external



$$a_e = \frac{D_a^2 - D_i^2}{4\,(D_i - D_{WZ})}$$

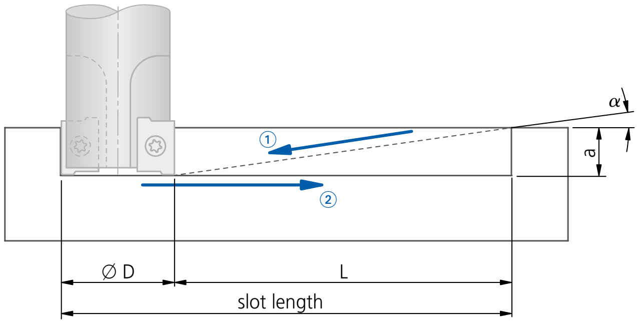
$$v_f = \frac{(D_i - D_{WZ}) \times n \times z_{eff} \times f_z}{D_i}$$



a_e < radial material removal

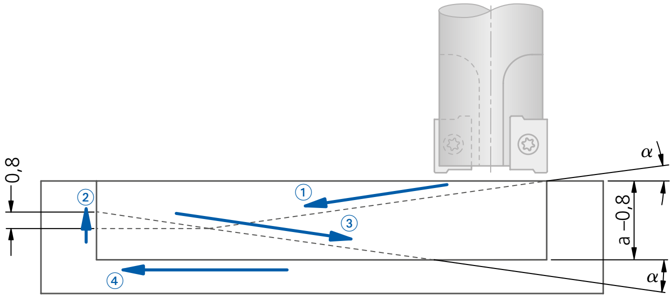
Single angled entry

It it is not possible to obtain the required slot depth by a single entry, this is achieved by entering more than once.



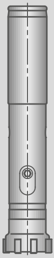
Multiple entry

It should be noted that there must be an allowance of 0,8 mm when the milling cutter is reversed. If this allowance is not made, the tool may be damaged or destroyed.



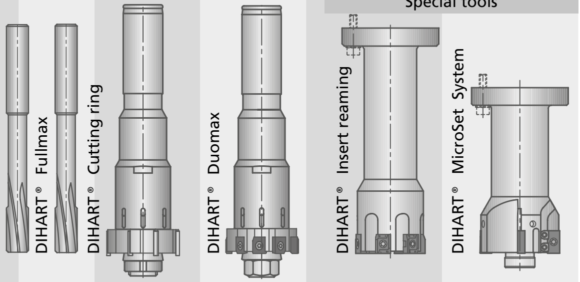
Milling dia.			Max. angle of entry α in relation to diameter d1
Ø D	L	a_p	α
		max	max
9,5	91,5	8	5°
10,0	91,5	8	5°
12,0	14,4	9	32°
14,0	12,8	9	35°
16,0	33,6	9	15°
20,0	128,7	9	4°
25,0	128,7	9	4°
32,0	343,0	9	1,4°
40,0 (F51 50181)	186,0	15	3°

Index Reaming



	DIHART REAMAX® TS	DIHART REAMAX®	DIHART Monomax®
Tool selection	▸ 220	▸ 220	▸ 220
Assembly instructions	▸ 222	▸ 224	▸ 225
Guideline values cutting speed v_c	▸ 238	▸ 238	▸ 238
Guideline values feed f_z	▸ 240	▸ 240	▸ 240

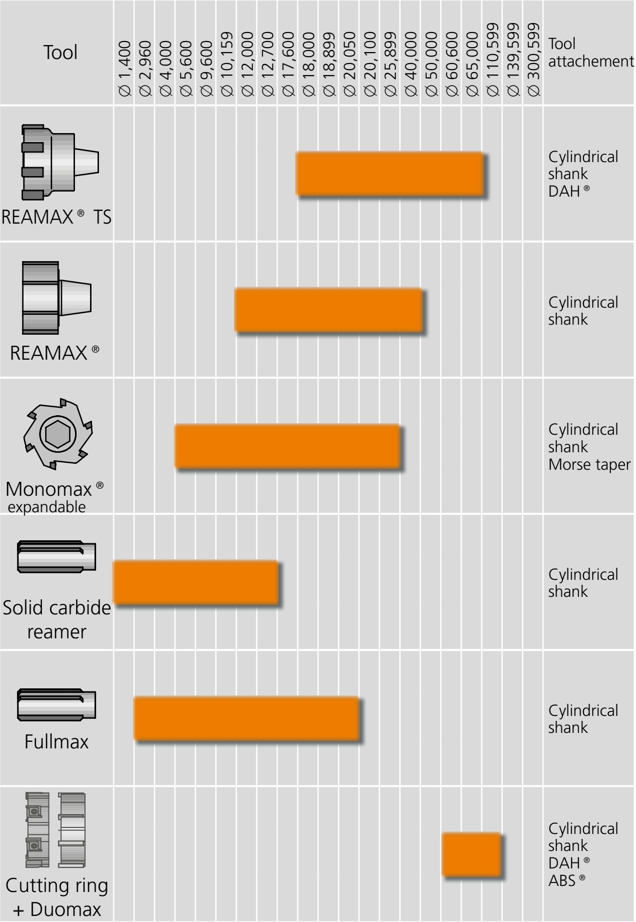
Assembly instructions DIHART DAH® compensating holder	▸ 234 - 235
Cutting geometry ASG, cutting materials and coatings	▸ 242 - 245
Types of tool wear	▸ 246 - 247
Problem – possible causes – solutions	▸ 248 - 249
Measuring	▸ 250 - 251

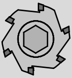
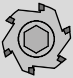
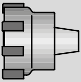
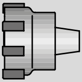
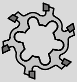
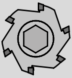
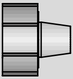
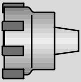
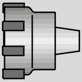
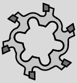
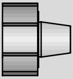
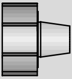
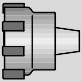
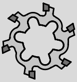


					Special tools	
	DIHART® Solid carbide reamer	DIHART® Fullmax	DIHART® Cutting ring	DIHART® Duomax	DIHART® Insert reaming	DIHART® MicroSet System
	▶ 220	▶ 220	▶ 220	▶ 220		
			▶ 226	▶ 228	▶ 231	▶ 232
	▶ 238	▶ 236	▶ 238	▶ 238		
	▶ 240	▶ 236	▶ 240	▶ 240		

DIHART® Tool Selection

Overview standard reamers

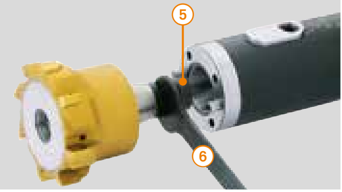


	∅ 1,40 – 5,59 mm	∅ 5,60 – 11,99 mm	∅ 12,00 – 17,99 mm	∅ 18 – 40 mm	∅ 40 – 65 mm	∅ 65 – 110 mm
IT 5 – IT 6	 Solid carbide reamer	 Monomax ®	 Monomax ®	 REAMAX ® TS	 REAMAX ® TS	 Cutting ring + Duomax
IT 7	 Solid carbide reamer	 Monomax ®	 REAMAX ®	 REAMAX ® TS	 REAMAX ® TS	 Cutting ring + Duomax
≥ IT 8	 Solid carbide reamer	 Solid carbide reamer	 REAMAX ®	 REAMAX ®	 REAMAX ® TS	 Cutting ring + Duomax

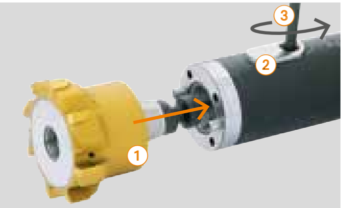
IT-Tolerance class see page 6.

DIHART REAMAX ® TS

Assembly instructions



Clean taper/face contact thoroughly (grease free).
Screw pull stud ⑤ into reaming head and tighten with open-end wrench ⑥.

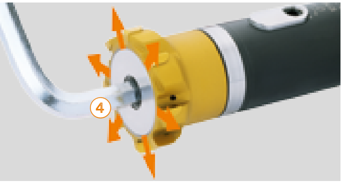


Open clamping jaws ② with key ③.
Insert reaming head ①.

Dia. range	Starting torque M
18,000 – 19,999	1,5 Nm
20,000 – 21,999	2,5 Nm
22,000 – 26,999	4 Nm
27,000 – 34,999	5 Nm
35,000 – 41,999	6 Nm
42,000 – 51,999	10 Nm
52,000 – 65,000	13 Nm

Close clamping jaws ② with key ③, noting recommended torque. When inserting the reaming head ① this is drawn into its final position by closing the clamping jaws ②.

When removing the reaming head ① this is pressed out of its position by the clamping jaws ② which allows it to be easily removed from the holder: open the clamping jaws ② with the key ③, emove the reaming head ①.



Adjusting to compensate for wear

The smallest bore tolerances of up to IT4 can be achieved by readjusting with the hexagonal key ④.

Adjusting:

- Set the µm dial by adjusting the bezel position.
- Determine the highest setting on the dial by turning the tool.
- Turn the adjustment screw clockwise using an Allen key (1), correcting the concentricity.
  Over tension by approx. 5 µm.
- Engage the opposite adjustment screws (2) and drive back the tool by the specified overtension value.
- Engage the two other adjustment screws.
- Align all 4 adjustment screws until concentricity is < 2 µm.

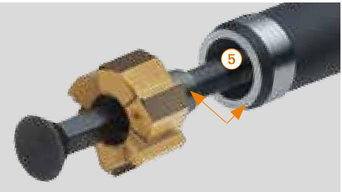
Please note:

- Only unscrew the adjustment screws by a max of ½ to 1 rotation.
- Never use the holder without the reamer head clamped and then only when the adjustment screws are tightened.

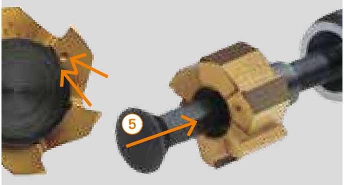
Important: For more application details and safety notes see ▸ 86-87!

DIHART REAMAX®

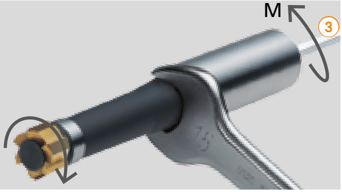
Assembly instructions



Clean taper/face contact thoroughly (grease free).
Apply light grease on tie bar thread ⑤.

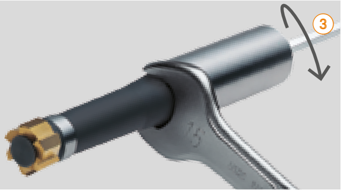


Locate tie bar ⑤ on insert and holder.
Important note: for nominal size 3, 4 and 5, fit with marking on tie bar and insert aligned.

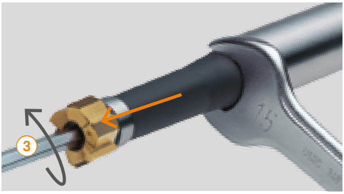


Draw in tie bar with the clamping nut. Before tightening, turn insert and tie bar clockwise until it stops. Tighten the clamping nut as far as possible using the torque key to the specified starting torque M.

Dia. range	Starting torque M
12,000 – 15,999	4-5 Nm
16,000 – 21,999	6-7 Nm
22,000 – 25,999	10-12 Nm
26,000 – 32,000	18-20 Nm
32,001 – 40,000	26-28 Nm

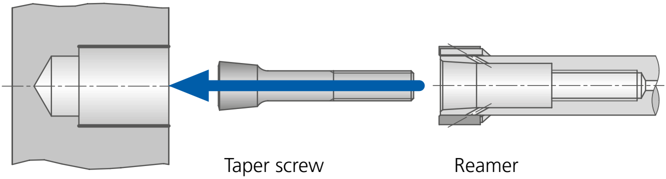


Removing the replaceable insert:
Loosen the clamping screw.
Pull tie bar from holder and insert.



Locate operating key ③ in insert and loosen insert by turning.

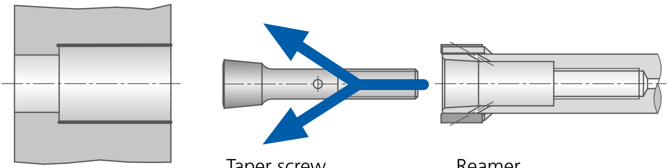
Central coolant outlet



Taper screw
15A.**11**.200xx

Reamer

Lateral coolant outlet

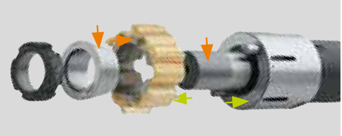


Taper screw
15A.**10**.200xx

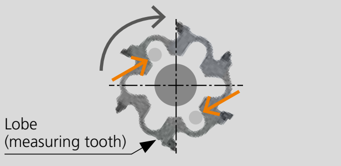
Reamer

DIHART® Cutting Ring

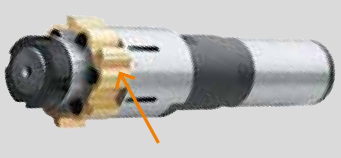
Assembly instructions on holder for through hole machining



Arrow markings:
- light grease
- face surfaces on holder and cutting ring are grease-free



The position for the drive pins is marked with a lobe or in red. Before tightening and adjusting turn the cutting ring against the direction of machining until hitting the drive pins.



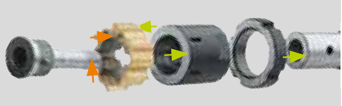
Please observe the marking on holder and cutting ring, check alignment of the coolant bores.

Adjust the diameter to the middle of the tolerance (counter-clockwise thread).

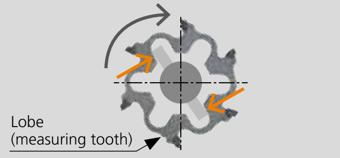
The diameter can only be measured at the marked cutting edges due to unequal angular position!

Measure the diameter
If the diameter was set too large, the conical ring must be loosened and the cutting ring readjusted.

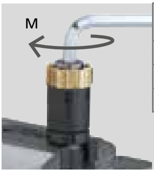
Assembly instructions on holder for blind hole machining



Arrow markings:
- light grease
- face surfaces on holder and cutting ring are grease-free

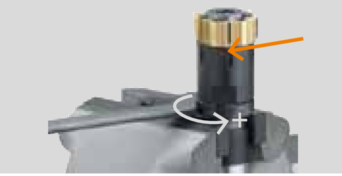


The position for the drive pins is marked with a lobe or in red. Before tightening and adjusting turn the cutting ring against the direction of machining until hitting the drive pin.

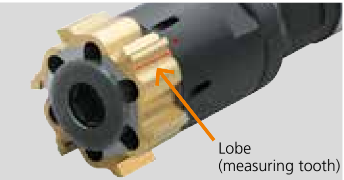


Dia. range	Starting torque M
60	90 – 110 Nm
61 – 79	120 – 140 Nm
80 – 100	180 – 220 Nm

Screw the nut onto the holder with the smooth face against the bush. Mount the cutting ring with the conical screw. After fastening the conical screw check that there is space between bush and ring. Fasten conical screw according to index table.



Please observe the marking on holder and cutting ring, check alignment of the coolant bores. Adjust the diameter to the middle of the tolerance.

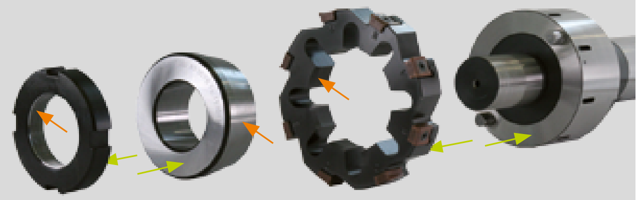


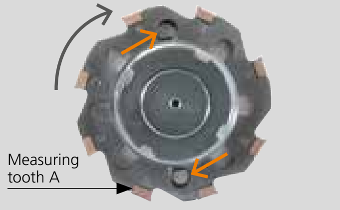
The diameter can only be measured at the marked cutting edges due to unequal angular position!

Measure the diameter
If the diameter was set too large, the nut must be loosened and the cutting ring readjusted.

DIHART® Duomax

Assembly instructions on holder for through hole machining



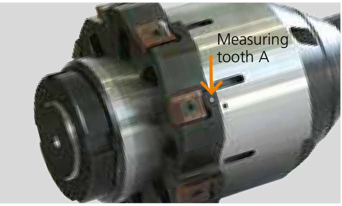


Arrow markings:
- light grease
- face surfaces on holder and Duomax are grease-free

Positioning of the drive pins to the right of letter A (the measuring tooth is located at letter A and is also marked on the holder with a spot).
Before tightening and adjusting turn the Duomax against the direction of machining until hitting the drive pins.

Please observe the marking on holder and Duomax, check alignment of the coolant bores.

Adjust the diameter to the middle of the tolerance (counter-clockwise thread).

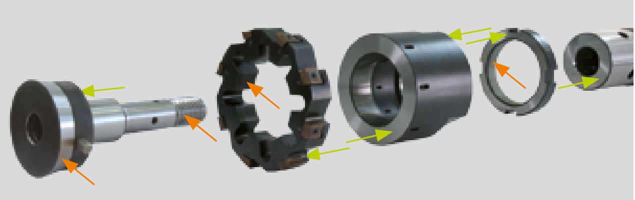


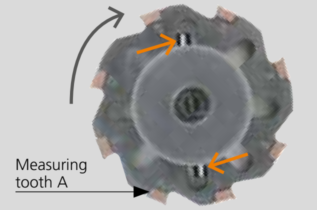
The diameter can only be measured at the marked cutting edges (measuring tooth A) due to unequal angular position!

If the diameter was set too large, the conical ring must be loosened and the Duomax readjusted.

⚠ Measure the diameter see page 202

Assembly instructions on holder for blind hole machining





Arrow markings:
- light grease
- face surfaces on holder and Duomax are grease-free

Positioning of the drive pins to the right of letter A (the measuring tooth is located at letter A and is also marked on the holder with a spot). Before tightening and adjusting turn the Duomax against the direction of machining until hitting the drive pins.

Dia. range	Starting torque M
61 – 79	120 – 140 Nm
80 – 100	180 – 220 Nm

Screw the nut onto the holder with the smooth face against the bush. Mount the Duomax with the conical screw. After fastening the conical screw check that there is space between bush and Duomax. Fasten conical screw according to index table.

Please observe the marking on holder and Duomax, check alignment of the coolant bores. Adjust the diameter to the middle of the tolerance.

The diameter can only be measured at the marked cutting edges (measuring tooth A) due to unequal angular position!

If the diameter was set too large, the nut must be loosened and the Duomax readjusted.

⚠ Measure the diameter see page 202

DIHART® Duomax

Assembly instructions inserts

Cleaning:

Make sure that the insert seats ③ and inserts are absolutely clean/grease-free. If necessary, remove tiny dust particles with compressed air!

Montage:

- All inserts and insert seats are marked with letters ①. This ensures correct assignment to the insert seat.
- The number markings ② ensure that all inserts are positioned correctly.
- Tighten the screw ④ (order no. N00 57710) to 2.5 Nm.
  Torque wrench
  order no. L05 00940

Measuring the diameter:

The measuring tooth is located at letter A and is also marked on the holder with a spot ⑤.

Caution!

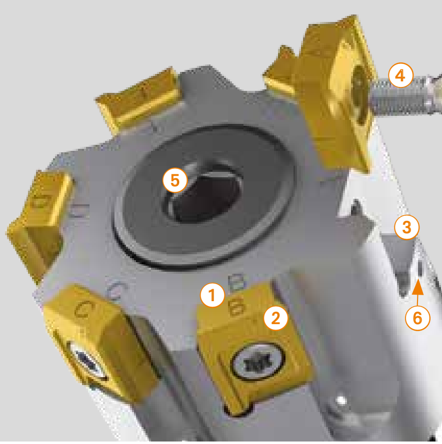
- Uneven angle division !
- There are 2 cutters 180° opposite = measuring tooth A.
- Measure the diameter at the front of the cutter (due to tapering, see illustration).
- Avoid damaging the cutters
- When turning the insert, the diameter must be readjusted.
- Delivery status:
  Duomax with mounted inserts.

Cleaning:

Make sure that the insert seats ③ and indexable inserts are absolutely clean/ grease-free. If necessary, remove tiny dust particles with compressed air!

Assembly:

- All indexable inserts and insert seats are marked with letters ①. This ensures correct assignment to the insert seat.
- The number markings ② ensure that all indexable inserts are positioned correctly.
- Tighten the screw ④ (order no. N00 57710) to 2.5 Nm.
  Torque wrench
  order no. L05 00940

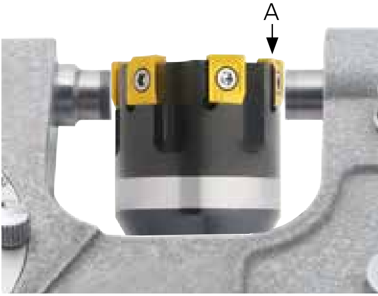


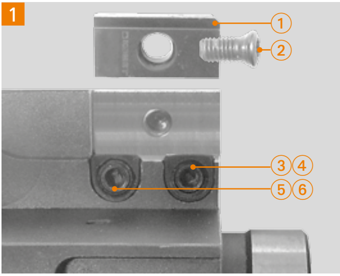
Measuring the diameter:

The measuring tooth is located at letter A and is also marked on the holder with a spot ⑥. If the diameter is too large, loosen the conical screw ⑤ and turn it to the right to set the correct diameter. The conical screw ⑤ does not have to be removed completely !

Caution!

- Uneven angle division !
- There are 2 cutters 180° opposite = measuring tooth A.
- Measure the diameter at the front of the cutter (due to tapering, see illustration).
- Avoid damaging the cutters.
- When turning the indexable insert on an adjustable carrier, the diameter must be readjusted.

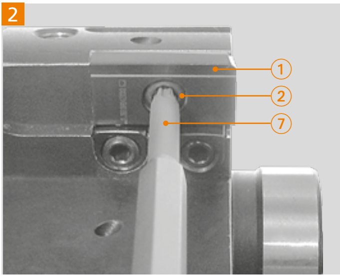




Assembly parts (Fig. 1)
1 indexable insert
2 clamping screw

Setting machining dia.
3 adjusting wedge
4 differential screw

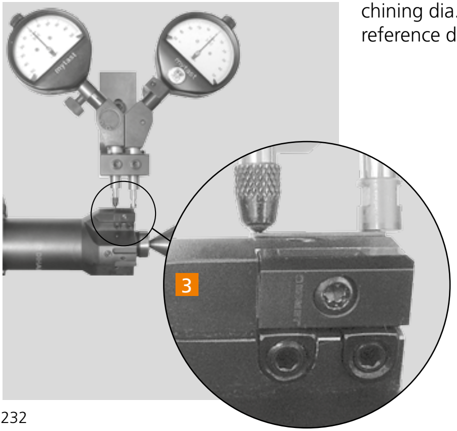
Setting conicity
5 adjusting wedge
6 differential screw

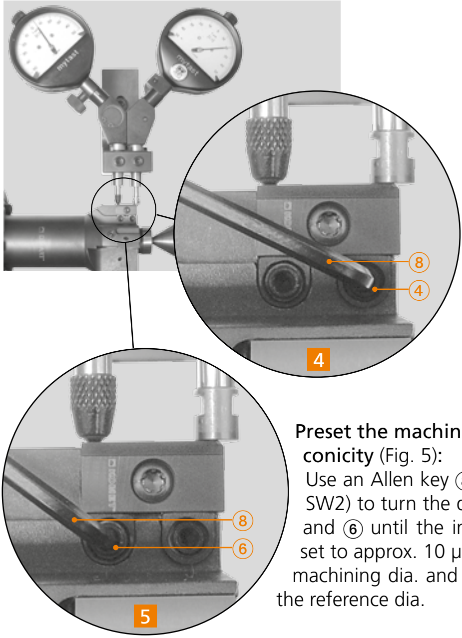


Fit the indexable insert:
Make sure that the insert seat is clean. Place the indexable insert 1 into the insert seat and tighten the clamping screw 2 only slightly.

Use TORX Plus® torque wrench 7 (2,25 Nm) (Fig.2).

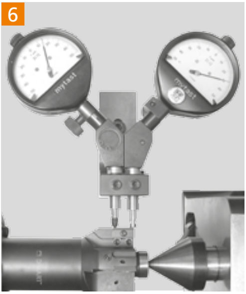
Reference dia. as reference dimension "0" for setting the machining dia. and conicity (Fig. 3), reference dia. is marked on tool.





Preset the machining dia. (Fig. 4) **and conicity** (Fig. 5)**:**
Use an Allen key ⑧ (width across flats SW2) to turn the differential screws ④ and ⑥ until the indexable insert ① is set to approx. 10 µm below the desired machining dia. and approx. 25 µm over the reference dia.

Secure the insert:
Use a TORX Plus® torque wrench ⑦ (2,25 Nm) to secure the indexable insert ① at the preset tightening torque (Fig. 2).



Set the final machining dia. (Fig. 4) **and conicity** (Fig 5)**:**
When tightened, the indexable insert ① is set to the machining diameter and the specified conicity using the differential screws ④ and ⑥.

Tool after setting (Fig 6).

DIHART DAH® Compensating Holder

Assembly instructions

Clean grinding surfaces thoroughly → dry and free of grease.

Pre-load evenly with the 6 assembling screws ② (pressing the spring washer level)

Adjusting the DAH® must be done in the machine on the spindle where the tool will be in use afterwards!

Determine the highest point by rotating (largest concentricity error). Rotate the threaded pin ④ to the highest point. Correct half of the measured runout error by inserting the thread pin ④. Repeat this procedure until the runout error is < 5 µ.

Center the indicator on the gauge line.

Tighten the assembling screw ② cross-wise. Please observe the specified starting torque M in the index-table. After fastening, fix the adjusting ring ① by locking the thread pin ④.

DAH ∅ d1	Starting torque M
63	7 – 9 Nm
81	7 – 9 Nm
115	25 – 35 Nm

Finally check the runout once more. «should be» < 5 µ

DIHART DAH® 50 HS

Simple handling – reduced machine idle times

In comparison to previous solutions the hydro-expansion chuck is integrated into the new DIHART® compensating holders. This means one less interface.

Four adjustable screws allow rapid and precise adjustment of the concentricity of the multiple blade reamer, reducing concentricity errors to virtually zero. The extremely slim design of these new compensating holders ensures that they fit easily into practically all tool magazines.

The DIHART DAH® 50 HS compensating holders enable the concentricity of a tool to be adjusted with µ-precision at the bezel position, thereby eliminating any machine spindle error.

DIHART® Fullmax

Guideline values for reaming – specially for DIHART® Fullmax

Material group Selection: L.H. fold page		Cutting speed	Feed	
			Z4 ∅ 2,97 - 4,05	Z4 ∅ 4,06 - 6,05
		v_c (m/min) min - max	f_z (mm/tooth) min - max	f_z (mm/tooth) min - max
P	1.0	180 - 250	0,100 - 0,200	0,125 - 0,250
P	2.0	180 - 250	0,100 - 0,200	0,125 - 0,250
P	2.1	180 - 250	0,100 - 0,200	0,125 - 0,250
P	3.0	180 - 250	0,100 - 0,200	0,125 - 0,250
P	4.0	180 - 250	0,100 - 0,200	0,125 - 0,250
P	4.1			
S	5.0	40 - 60	0,075 - 0,125	0,100 - 0,150
S	5.1	30 - 60	0,075 - 0,125	0,100 - 0,150
M	6.0	40 - 80	0,075 - 0,125	0,100 - 0,150
M	6.1	40 - 60	0,075 - 0,125	0,100 - 0,150
M	7.0		0,075 - 0,125	0,100 - 0,150
K	8.0	120 - 180	0,100 - 0,200	0,125 - 0,250
K	8.1			
K	9.0	200 - 250	0,100 - 0,200	0,125 - 0,250
K	9.1			
K	10.0	60 - 120	0,100 - 0,200	0,125 - 0,250
K	10.1			
K	10.2			
N	12.0	100 - 250	0,100 - 0,200	0,125 - 0,250
N	12.1	80 - 150	0,075 - 0,125	0,100 - 0,150
N	13.0			
N	13.1			
N	14.0			
H	15.0			
H	16.0	30 - 50	0,035 - 0,075	0,040 - 0,100

Reaming allowance in diameter (mm)

P S M K N		0,10-0,20	0,10-0,20
H	bis HRC48	0,10-0,20	0,10-0,20
H	bis HRC62	0,10	0,10

Guideline values for reaming – specially for DIHART® Fullmax

	Feed			
	Z6 ∅ 6,06 - 7,55 f_z (mm/tooth) min-max	Z6 ∅ 7,56 - 12,05 f_z (mm/tooth) min-max	Z6 ∅ 12,06 - 16,05 f_z (mm/tooth) min-max	Z6 ∅ 16,06 - 20,05 f_z (mm/tooth) min-max
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,100 - 0,175	0,100 - 0,175	0,125 - 0,200	0,130 - 0,230
	0,100 - 0,175	0,100 - 0,175	0,125 - 0,200	0,130 - 0,230
	0,100 - 0,175	0,100 - 0,175	0,125 - 0,200	0,130 - 0,230
	0,100 - 0,175	0,100 - 0,175	0,125 - 0,200	0,130 - 0,230
	0,100 - 0,175	0,100 - 0,175	0,125 - 0,200	0,130 - 0,230
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,150 - 0,250	0,175 - 0,300	0,200 - 0,330	0,230 - 0,370
	0,100 - 0,175	0,100 - 0,175	0,125 - 0,200	0,130 - 0,230
	0,050 - 0,100	0,050 - 0,100	0,052 - 0,130	0,080 - 0,130

	0,20	0,20	0,20-0,30	0,30
	0,20	0,20	0,20	0,20
	0,10	0,10	0,20	0,20

Important: For more application details and safety notes see ▸86-87!

DIHART® Cutting Data

Guideline values for reaming – generally

Material group Selection: L.H. fold page		Cutting speed v_c (m/min)							
		Reamers short / 3×D							
		HM	DST	TiN	DBG-N	DBF	DJC	DBC	PKD
		min-max	min-max	min-max	min-max	min-max	min-max	min-max	min-max
P	1.0	6-10	100-200	60-140			100-200		
	2.0	6-10	100-200	60-140			100-200		
	2.1	15-45	100-200	60-140			100-200		
	3.0	5-9	80-150	60-110			80-150		
	4.0	4-7		15-45					
	4.1								
S	5.0								
	5.1	5-12							
M	6.0	5-8		15-40		30-60			
	6.1	4-6		10-35		20-50			
	7.0	4-6		10-35		20-50			
K	8.0	10-25		50-130	80-220	80-220			
	8.1	6-12		30-90	40-130	40-130			
	9.0	9-18	130-300		130-300	130-300	130-300		
	9.1	9-18	100-250		100-250	100-250	100-250		
	10.0	8-15	80-180		80-180	80-180	80-180		
	10.1	6-12		30-60	50-100	50-100			
	10.2	6-12		30-70	40-130	40-130			
N	12.0	10-30	100-320	80-200					
	12.1	10-20		50-150					
	13.0	10-30						50-300	110-330
	13.1	10-30						150-300	110-550
	14.0	8-20						150-300	110-440
H	15.0				40-60				
	16.0				30-50				

	Cutting speed v_c (m/min)							
	Reamers long / 5×D							
	HM	DST	TiN	DBG-N	DBF	DJC	DBC	PKD
	min-max	min-max	min-max	min-max	min-max	min-max	min-max	min-max
	6-10	80-160	60-120			80-160		
	6-10	80-160	60-120			80-160		
	15-45	80-160	60-120			80-160		
	5-9	80-120	60-90			80-120		
	4-7		15-45					
	5-12							
	5-8		15-40		30-60			
	4-6		10-35		20-50			
	4-6		10-35		20-50			
	10-25		50-100	80-150	80-150			
	6-12		30-90	40-100	40-100			
	9-18	120-180		120-180	120-180	120-180		
	9-18	100-160		100-160	100-160	100-160		
	8-15	80-150		80-150	80-150	80-150		
	6-12		30-60	50-100	50-100	50-100		
	6-12		30-70	40-130	40-130	40-130		
	10-30	100-200	80-150					
	10-20		50-120					
	10-30						50-240	100-240
	10-30						150-250	100-300
	8-20						150-250	100-250
				40-60				
				30-50				

Important: For more application details and safety notes see ▸ 86-87!

DIHART ® Cutting Data

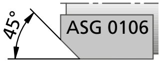
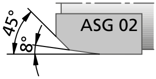
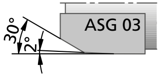
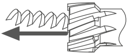
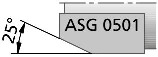
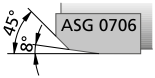
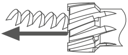
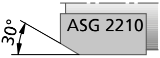
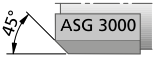
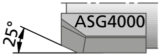
Guideline values for reaming – generally

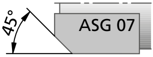
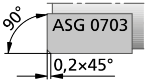
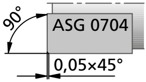
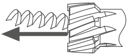
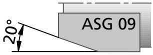
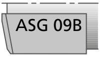
Material group	Selection: L.H. fold page	Feed f_z (mm/tooth) (with face cut, feed reduced by 30%)			
		straight fluted ASG07, ASG0106, ASG03, ASG11, ASG1101			
		< Ø 12 min-max	Ø 12 - 25 min-max	Ø 25 - 50 min-max	> Ø 50 min-max
P	1.0	0,05-0,10	0,07-0,15	0,09-0,20	0,10-0,25
P	2.0	0,05-0,10	0,07-0,15	0,09-0,20	0,10-0,25
P	2.1	0,05-0,10	0,07-0,15	0,09-0,20	0,10-0,25
P	3.0	0,04-0,08	0,06-0,12	0,07-0,16	0,08-0,20
P	4.0	0,04-0,07	0,05-0,11	0,06-0,14	0,07-0,18
P	4.1				
S	5.0				
S	5.1	0,05-0,11	0,07-0,17	0,10-0,24	0,11-0,30
M	6.0	0,04-0,08	0,06-0,12	0,07-0,16	0,08-0,20
M	6.1	0,04-0,08	0,06-0,12	0,07-0,16	0,08-0,20
M	7.0	0,04-0,08	0,06-0,12	0,07-0,16	0,08-0,20
K	8.0	0,06-0,13	0,08-0,20	0,11-0,26	0,12-0,33
K	8.1	0,06-0,12	0,08-0,18	0,11-0,24	0,12-0,30
K	9.0	0,06-0,13	0,08-0,20	0,11-0,26	0,12-0,33
K	9.1	0,06-0,13	0,08-0,20	0,11-0,26	0,12-0,33
K	10.0	0,06-0,12	0,08-0,18	0,11-0,24	0,12-0,30
K	10.1	0,06-0,12	0,08-0,18	0,11-0,24	0,12-0,30
K	10.2	0,06-0,12	0,08-0,18	0,11-0,24	0,12-0,30
N	12.0	0,05-0,12	0,07-0,18	0,09-0,24	0,10-0,30
N	12.1	0,05-0,12	0,07-0,18	0,09-0,24	0,10-0,30
N	13.0	0,05-0,12	0,07-0,18	0,09-0,24	0,10-0,30
N	13.1	0,05-0,12	0,07-0,18	0,09-0,24	0,10-0,30
N	14.0	0,05-0,12	0,07-0,18	0,09-0,24	0,10-0,30
H	15.0	0,04-0,08	0,06-0,12	0,07-0,16	0,08-0,20
H	16.0	0,04-0,08	0,06-0,12	0,07-0,16	0,08-0,20
		Reaming allowance in diameter (mm)			
		0,10-0,20	0,20-0,30	0,20-0,40	0,30-0,50

	Feed f_z (mm/tooth) (with face cut, feed reduced by 30%)				
	straight fluted ASG09, ASG09B, ASG1402				left hand spiraled ASG0501
	< Ø 12 min-max	Ø 12 - 25 min-max	Ø 25 - 50 min-max	> Ø 50 min-max	Ø 4,8 - 12,7 min-max
	0,07-0,14	0,10-0,21	0,12-0,24	0,13-0,30	0,07-0,14
	0,07-0,14	0,10-0,21	0,12-0,24	0,13-0,30	0,07-0,14
	0,07-0,14	0,10-0,21	0,12-0,24	0,13-0,30	0,07-0,14
	0,06-0,11	0,08-0,17	0,09-0,19	0,10-0,24	0,06-0,11
					0,06-0,12
					0,06-0,12
					0,06-0,12
					0,08-0,20
					0,08-0,18
					0,08-0,20
					0,08-0,20
					0,08-0,18
					0,08-0,18
					0,08-0,18
					0,07-0,18
					0,07-0,18
					0,07-0,18
					0,07-0,18
					0,07-0,18
	Reaming allowance in diameter (mm)				
	0,10-0,20	0,20-0,30	0,20-0,40	0,30-0,50	0,10-0,20

Important: For more application details and safety notes see 86-87!

DIHART® ASG – Cutting Geometry
Standard geometries

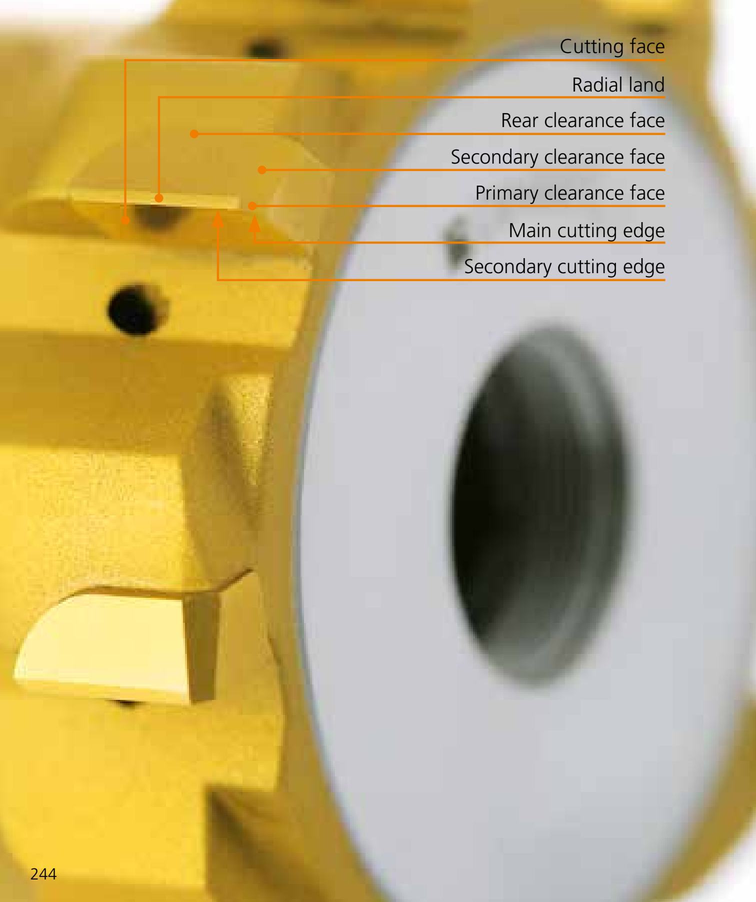
Geometry	Flute form	Chip evacuation	Bevel angles
ASG0106	straight	↔	
ASG02	straight	↔	
ASG03	straight	↔	
ASG0501	left hand spiraled		
ASG0706	straight	↔	
ASG2110	straight	→	
ASG2210	left hand spiraled		
ASG3000	straight	↔	
ASG4000	straight	←	

Geometry	Flute form	Chip evacuation comment	Bevel angles
ASG07 will be replaced by the ASG3000	straight		
ASG0703	straight	face cutting	
ASG0704	straight	face cutting, for increased positional accuracy	
ASG09 will be replaced by the ASG4000	straight		
ASG09B	straight	chip breaking < ∅ 32 mm	
ASG1402	straight	chip breaking > ∅ 32 mm	

DIHART® ASG – Cutting Geometry

The cutting geometry (ASG) comprises:

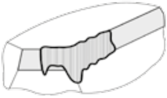
- Bevel angle
- Width of circular land
- Backtaper
- Chip angle
- Primary and secondary clearance face



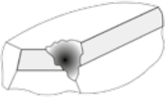
Additional high-tech coatings are available for special applications

Cutting materials	HM	HM is a fine-grained carbide, which features high abrasion resistance and achieves good results in standard materials. It is very suitable for coating, and therefore mainly used also as cutting material for coated reamers.
	DST	DST is a high-performance cutting material, and very suitable for high-speed reaming. DST is ideal for machining non-alloyed or low alloyed steels up to 1200 N/mm² tensile strength. DST is also excellent for reaming nodular iron.
Coatings	TiN	TiN is an all purpose coating material. It has a very smooth surface and has very little affinity to many materials. This avoids structure deformation which gives excellent surface-finish results when reaming, and with considerably higher cutting data than with non coated carbide reamers.
	DBC	DBC is a coating with a very high level of hardness and an extremely smooth surface. It is suitable for machining aluminium and copper alloys.
	DBF	DBF is a coating that exhibits a very high level of hardness and a high resistance to oxidation. This makes the coating suitable for cast iron machining. A very smooth layer means that stainless materials can also be successfully machined.
	DBG-N	DBG-N is a coating which offers a very high grade of hardness. The coating also has a very high oxidation resistance. This makes this particular high-performance coating very suitable for high cutting speeds, and also for using with mist coolant machining.
	DBG-U	DBG-U: The high hot hardness and thermal cycling resistance of this TiAlN coating enable its universal use for moderate and high cutting data.
	DJC	DJC is a combination of the high-performance cutting material DST and the high-performance coating DBG-N. With this combination a very high tool life with extremely high cutting data can be reached.
	DJF	DJF is an AlCrN-coated cermet that is particularly well suited for using in spheroidal iron workpieces.

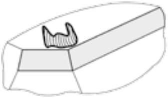
Types of tool wear



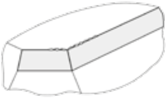
Flank wear
Reduce cutting speed or use a cutting material or coating with higher abrasion resistance.



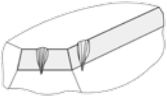
Major breakage
Reduce feed rate and stock allowance. Use carbide with coating instead of DST for interrupted bores.



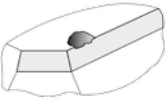
Pitting of chip surface
Reduce cutting speed or use a more positive rake angle.



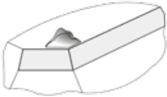
Edge wear
Increase cutting speed or use a more positive rake angle.



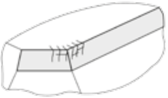
Notch wear
Reduce cutting speed or use a cutting material or coating with higher abrasion resistance.



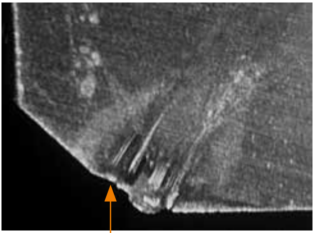
Fatigue wear
Reduce feed rate, increase stability of the reamer.



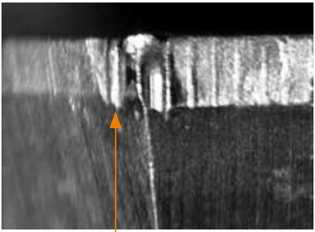
Built-up on chip surface
Use positive cutting geometry, increase oil content of coolant, reduce cutting speed v_C for uncoated carbide cutting material, increase for DST and coated cutting material.



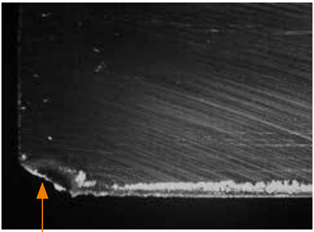
Hairline cracks
Use enough coolant and inner coolant supply, reduce cutting speed.



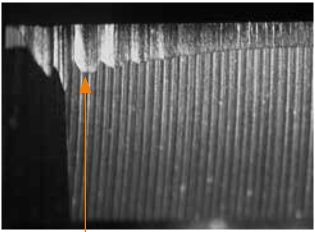
Notch wear



Notch wear

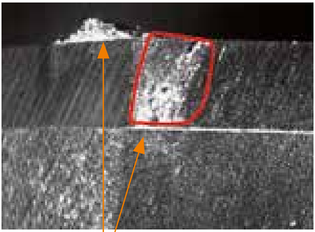


Flank wear

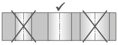


Flank wear

Built-up

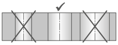


Built-up



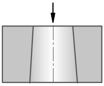
Bore too large

- Concentricity error of the reamer in the spindle → Use DAH ® compensating holder and correct concentricity
- Alignment not precise, reamer cuts at the back end → Correct alignment and use DPS floating holder
- Built-up edge → reduce cutting speed v_c for uncoated carbide cutting material, increase for DST and coated cutting material or increase the oil content of the coolant
- Reamer too big → have the reamer reworked



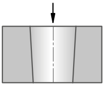
Bore too small

- Worn reamer → have the reamer readjusted, replaced or repaired
- Reaming allowance too small → Increase reaming allowance
- Cutting forces too big → reduce feed or choose a different cutting geometry (ASG)
- Reamer too small → have reamer readjusted, replaced or repaired



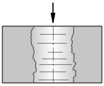
Conical bore, tapered

- Faulty alignment → Correct alignment and use DPS floating holder
- Misalignment of head-stock in relation to turret → correct turret and use DPS floating holder



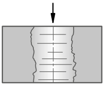
Conical bore, lipped

- Faulty alignment. Cutting edges press at start → Correct alignment and use DPS floating holder



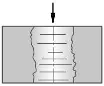
Bore not true

- Concentricity error of reamer too large → correct concentricity using DAH ® compensation system
- Faulty alignment → Correct alignment and use DPS floating holder
- Asymmetrical cutting through uneven entry surface → Countersink bore
- Deformation through clamping of the work piece → Correct clamping of the work piece
- Poor premachining → optimise premachining
- Feed too high → reduce feed



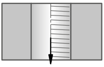
Bore shows chatter marks

- Cutting speed too high → reduce cutting speed
- L to D ratio too large → reduce the entry speed, pilot the bore or choose a different cutting geometry (ASG)



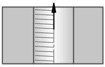
Surface quality unsatisfactory

- Cutting edge build-up → reduce cutting speed vc for uncoated carbide cutting material, increase for DST and coated cutting material or increase oil content of the coolant
- Cutters worn → have cutters repaired or replace tool
- Concentricity error of reamer → correct concentricity using DAH ® compensation system
- Failing or insufficient coolant, chips getting jammed → use internal coolant supply and increase coolant pressure
- Unsuitable coolant → increase the oil content of the coolant
- Wrong cutting data → use data according to catalogue recommendation



Scoring in bore «feed marks»

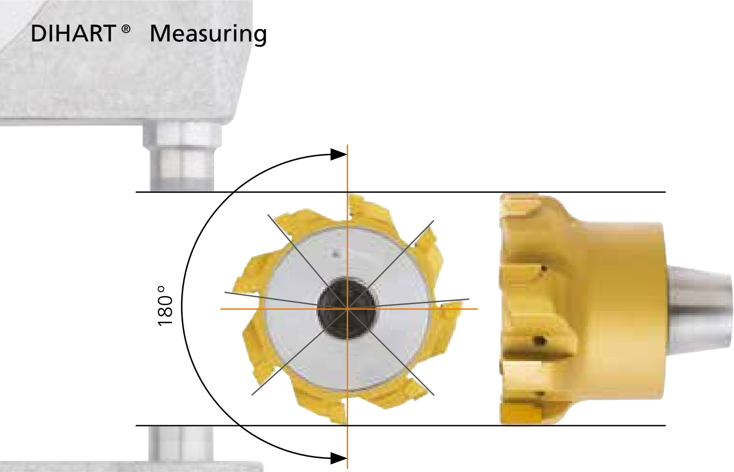
- Cutters defective (outbreaks) → replace reamer or have repaired
- Cutting edge build-ups → reduce cutting speed vc for uncoated carbide cutting material, and increase for DST and coated cutting material or increase oil content of the coolant



Scoring in bore «retraction marks»

- Reamer is allowed to travel too far out of the bore → Only allow the reamer to travel out of the bore 2 mm more than the cutting length at the most
- Material springs back → retraction not at a high speed, but with increased (2-3 times) feed speed

DIHART ® Measuring



⚠

Unequal angular position!
Only two cutting edges are 180° in opposite line.
→ Measuring teeth
Because the tools are tapered measurement has to be done at the front of the cutting edge.

PCD tipped reamers require non-contact measuring device!

Mark of measuring teeth
• Drive pin, lobe
• Number
• Punch-mark

TOOLS PLUS IDEAS –
a PLUS for our customers and the environment

The company targets

The KOMET GROUP pursues a consistent policy of investments and achieves long-term and profitable growth via continuous improvement of products and processes as well as via consistent qualification of employees. This increases the value of the company. The KOMET GROUP consistently increases its innovation quota via research and development, offering the market new products every year. The KOMET GROUP is a premium quality manufacturer and motivates employee qualification and customers in their IDEAS FACTORY. The training quota of vocational beginners is exemplary for the entire field of business.

The products and services

KOMET GROUP products and services offer the customer incomparable added value. The KOMET GROUP develops, manufactures and sells the most comprehensive, modular portfolio on bore machining as full-range suppliers. The KOMET GROUP offers the most innovative technologies, thereby taking the highest economic viability, best quality and most attractive designs into account. The KOMET GROUP sees itself not purely as a tool manufacturer, but rather as suppliers of innovative solutions and ideas for the benefit of the customer: TOOLS AND IDEAS.

The customer

The KOMET GROUP places value on long-term, binding customer relations, seeing itself as a partner of the customer in a balance of benefit supplies and benefit harvests. The KOMET GROUP records customers' demands and then produces the most effective ideas and tool solutions for their machining tasks. The KOMET GROUP offers the customer information and collaboration via their worldwide presence in local Service Centres. The IDEAS FACTORY supports vocation-related training and further qualifications for customers.

The environment / surroundings

The KOMET GROUP feels itself obliged to avoid any wastage, and therefore commits itself to responsible usage of raw materials and careful utilisation of remaining materials.
The KOMET GROUP management is well aware of its responsibilities towards society, and creates the foundations for modern working environments and working conditions. The specifications on ergonomics and work safety are taken into account. Beholden to the founder, Robert Breuning, the KOMET GROUP supports the site at Besigheim, maintaining direct contact to schools and social facilities in the region.

With these claims in mind, the KOMET GROUP has introduced a modern, integrated management system, known as KMS (KOMET Management System), which is certified in accordance with ISO 9001:2008, ISO 14001:2009 and the German „Akkreditierungs- und Zulassungsverordnung Arbeitsförderung – AZAV".

Certification

http://www.kometgroup.com/navigation-top/download/service/zertifikate.html

Patentes

ABS ®	Patent applied for inside and outside Germany
KUB K2 ®	Patented design
KUB Quatron ®	Patent applications
KUB Pentron ®	Patent applications
KUB Trigon ®	EP 883 455 and other patents
KUB Duon ®	EP 1 296 793 and other patents and patent applications
KUB Centron ®	EP 0 586 423 and other patent applications
KUB ® V464	EP 0 586 423 and other patents
MicroKom *BluFlex* ®	Patent applied for inside and outside Germany
UniTurn ®	EP 0 973 625 and other patents and patent applications
DAH Zero ®	Patent applications
Reamax ®	Patent applied for inside and outside Germany
Duomax	Patent applications
MicroSet	Patent applications

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