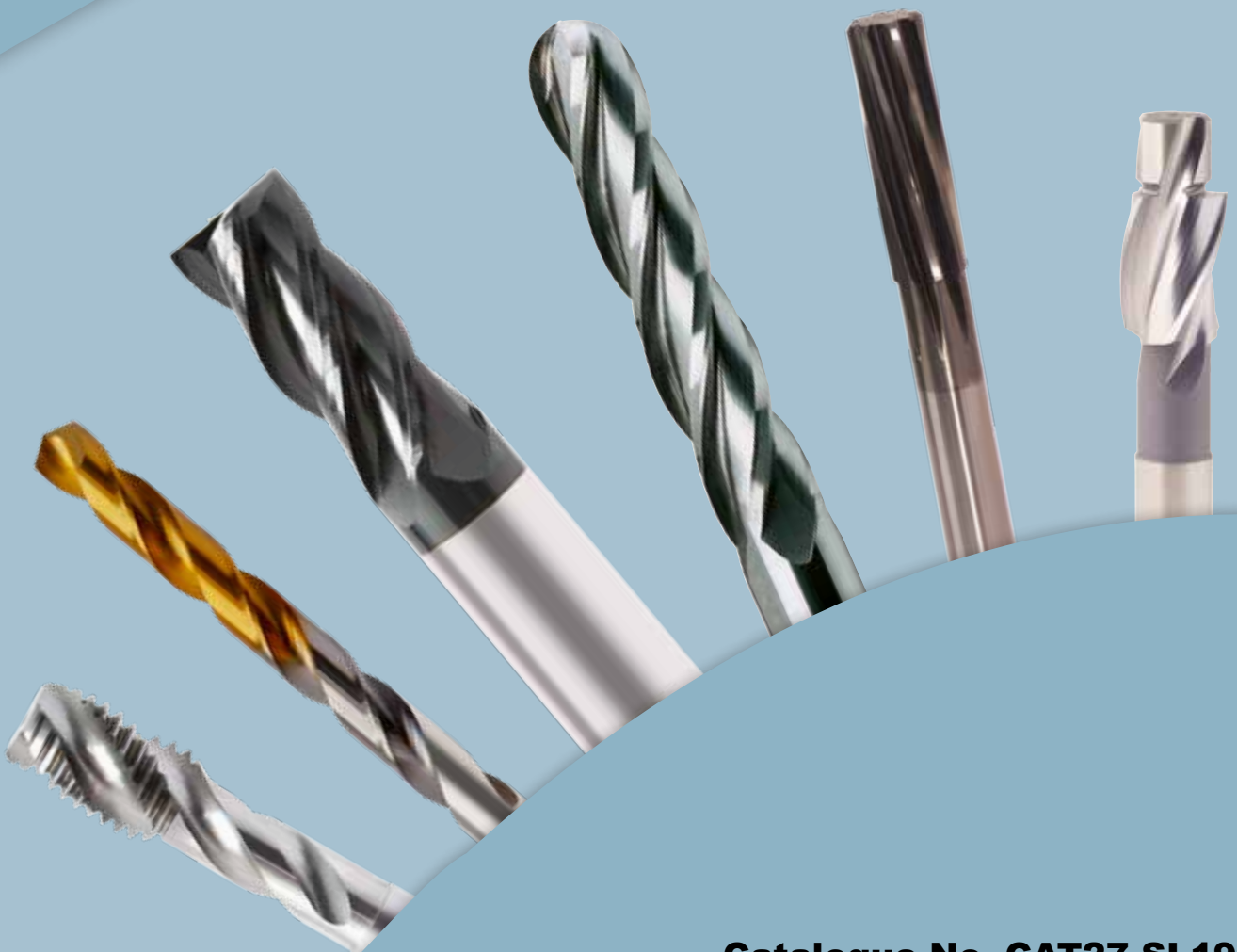




STANDARD LINE



Catalogue No. CAT27 SL19/1

MAIN INDEX

	HX2 END MILLS	P.3-18
	CARBIDE END MILLS	P.21-60
	HSS PM END MILLS	P.63-73
	FL. SHANK END MILLS	P.75-135
	SC. SHANK END MILLS	P.137-166
	FORM TOOLS	P.169-179
	HSS & HSSCo DRILLS	P.181-227
	REAMERS	P.229-251
	COUNTERSINKS	P.253-263
	PM & HAND TAPS	P.265-275
	DIES & ACCESSORIES	P.277-287
	GENERAL INFORMATION	P.289-304

SUPERIOR PERFORMANCE



HX2 MULTI HELIX

HX2 END MILLS



Designed
for Stainless Steels,
Titanium, Inconel, Cast Iron
and Steel <HRc40



Chatter free design allows for increased cutting depths and feed rates.

Multiple helix flute design for silent machining and excellent surface finish.

Unique sinusoidal flute geometry for reduced resonance vibration and smooth chip evacuation.

Premium grade carbide substrate and high heat resistant coating for increased tool life.

IDEAL FOR MATERIAL GROUPS



●: Excellent ○: Good

P				H		M			K				S					N							O				HX2 END MILLS					
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84	Code	Item	Description	Page No.
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Short Length 4 Flute ø3.0mm - 20.0mm	P.7
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Short Length 4 Flute Corner Radius ø3.0mm - 20.0mm	P.8
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Long Length 4 Flute ø3.0mm - 25.0mm	P.9
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Long Length 4 Flute Corner Radius ø3.0mm - 20.0mm	P.10
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Extended Neck 4 Flute ø3.0mm - 20.0mm	P.11
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Long Length 4 Flute Ball Nose ø3.0mm - 25.0mm	P.12
○	○	○	○			●	●	●	○	○	○	○	●	●	●	●	●	●															Long Length 5 Flute ø6.0mm - 25.0mm	P.13
																													Cutting Data	P.15				

HX2 MULTIPLE HELIX MILLING CUTTERS



COMPLETELY NEW MILLING GENERATION
WORLD'S FIRST. VERY SMOOTH CHIP REMOVAL AND SILENT MACHINING
AVOIDS RESONANCE VIBRATION DUE TO THE UNIQUE SINUSOIDAL FLUTE FORM DESIGN
IMPROVES SURFACE FINISH DUE TO THE CHATTER FREE DESIGN
INCREASED CUTTING DEPTH AND FEED RATES

APPLICATION

HX2 : STAINLESS STEELS, TITANIUM ALLOYS, INCONEL

MATERIAL	K30/40	PREMIUM GRADE CARBIDE
COATING	AlTiN	HARDNESS: HV (0.05) = 3,500 OXIDISATION TEMP: 900 DEG C
GEOMETRY	SINUSOIDAL	HIGH RAKE MEDIUM CORE

HX2 VS COMPETITORS

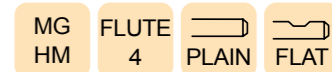
HX2 CHARACTERISTICS

HX2	CONVENTIONAL	HX2	CONVENTIONAL
CROSS SECTION OF CORE			
		Chip flow: Very smooth	Chip flow: Not smooth

GEOMETRY COMPARISON BETWEEN HX2 AND COMPETITORS

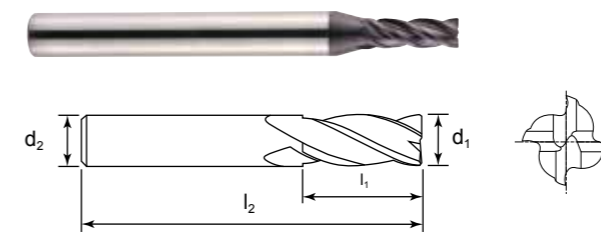
	HX2 END MILL	COMPETITORS END MILLS
HELIX	SINUSOIDAL	UNEQUAL CONSTANT
END INDEX	 EQUAL	 UNEQUAL
RADIAL RAKE ANGLE	CHANGEABLE	CONSTANT
RADIAL PRIMARY RELIEF & TYPE	CHANGEABLE & ECCENTRIC	CONSTANT & ECCENTRIC
FLUTE FORM DESIGN	UNIQUE	CONVENTIONAL

4 FLUTE SHORT LENGTH HX2



Series No. 136123, 136323

▶ cutting conditions : p.16



Minimized tool deflection
 Corner protected
 Reduced tool vibration

EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d ₁	SHANK DIAMETER d ₂	LENGTH OF CUT l ₁	OVERALL LENGTH l ₂
1361230300	1363230300	3.0	6	7.0	54
1361230400	1363230400	4.0	6	8.0	54
1361230500	1363230500	5.0	6	10.0	54
1361230600	1363230600	6.0	6	10.0	54
1361230800	1363230800	8.0	8	12.0	58
1361231000	1363231000	10.0	10	14.0	66
1361231200	1363231200	12.0	12	16.0	73
1361231400	1363231400	14.0	14	18.0	75
1361231600	1363231600	16.0	16	22.0	82
1361231800	1363231800	18.0	18	24.0	84
1361232000	1363232000	20.0	20	26.0	92

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

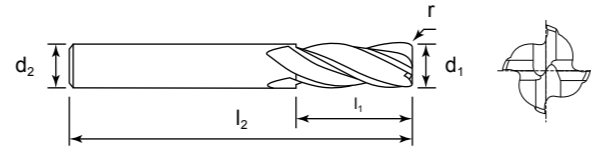
●: Excellent ○: Good

P	H	M	K	S	N	O									
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	●	●	○	○	●	●	●							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○		●		○	○	●	●	●						

4 FLUTE SHORT LENGTH CORNER RADIUS HX2



MG HM FLUTE 4 PLAIN FLAT



Series No. 137123, 137323

▶ cutting conditions : p.16

Minimized tool deflection
Corner protected
Reduced tool vibration

EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1371230300	1373230300	3.0	0.3	6	7.0	54
1371230400	1373230400	4.0	0.3	6	8.0	54
1371230500	1373230500	5.0	0.3	6	10.0	54
1371230600	1373230600	6.0	0.5	6	10.0	54
1371230800	1373230800	8.0	0.5	8	12.0	58
1371231000	1373231000	10.0	0.5	10	14.0	66
1371231200	1373231200	12.0	0.7	12	16.0	73
1371231400	1373231400	14.0	0.7	14	18.0	75
1371231600	1373231600	16.0	1.0	16	22.0	82
1371231800	1373231800	18.0	1.0	18	24.0	84
1371232000	1373232000	20.0	1.0	20	26.0	92

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

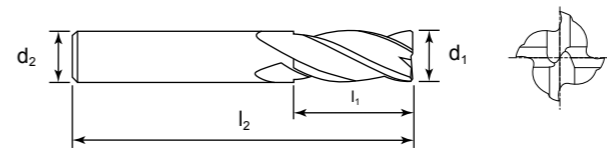
●: Excellent ○: Good

P	H	M	K	S	N	O									
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	●	●	○	○	●	●	●							
13	14	16	23	33	34	51	52	53	71	72	73	74	83	84	
○	○	●	○	○	●	●	●								

4 FLUTE LONG LENGTH HX2



MG HM FLUTE 4 PLAIN FLAT



Series No. 138123, 138323

▶ cutting conditions : p.16

Minimized tool deflection
Corner protected
Reduced tool vibration

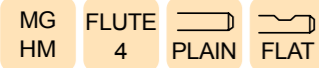
EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1381230300	1383230300	3.0	6	8.0	57
1381230400	1383230400	4.0	6	11.0	57
1381230500	1383230500	5.0	6	13.0	57
1381230600	1383230600	6.0	6	13.0	57
1381230800	1383230800	8.0	8	19.0	63
1381231000	1383231000	10.0	10	22.0	72
1381231200	1383231200	12.0	12	26.0	83
1381231400	1383231400	14.0	14	26.0	83
1381231600	1383231600	16.0	16	32.0	92
1381231800	1383231800	18.0	18	32.0	92
1381232000	1383232000	20.0	20	38.0	104
1381232500	1383232500	25.0	25	38.0	108

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent ○: Good

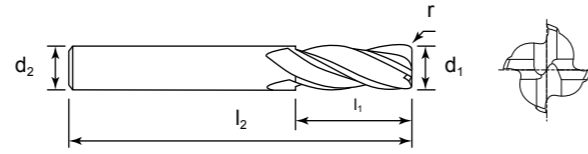
P	H	M	K	S	N	O									
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	●	●	○	○	●	●	●							
13	14	16	23	33	34	51	52	53	71	72	73	74	83	84	
○	○	●	○	○	●	●	●								

4 FLUTE LONG LENGTH CORNER RADIUS HX2



Series No. 139123, 139323

▶ cutting conditions : p.16



Minimized tool deflection
Corner protected
Reduced tool vibration

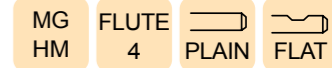
EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d ₁	CORNER RADIUS r	SHANK DIAMETER d ₂	LENGTH OF CUT l ₁	OVERALL LENGTH l ₂
1391230300	1393230300	3.0	0.3	6	8.0	57
1391230400	1393230400	4.0	0.3	6	11.0	57
1391230500	1393230500	5.0	0.3	6	13.0	57
1391230600	1393230600	6.0	0.5	6	13.0	57
1391230800	1393230800	8.0	0.5	8	19.0	63
1391231000	1393231000	10.0	0.5	10	22.0	72
1391231200	1393231200	12.0	0.7	12	26.0	83
1391231400	1393231400	14.0	0.7	14	26.0	83
1391231600	1393231600	16.0	1.0	16	32.0	92
1391231800	1393231800	18.0	1.0	18	32.0	92
1391232000	1393232000	20.0	1.0	20	38.0	104

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent ○: Good

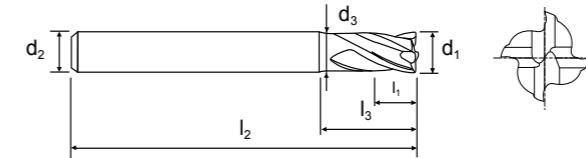
P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
○	○		●	●	○	○	●	●	●							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
○	○		●		○	○	●	●	●							

4 FLUTE EXTENDED NECK HX2



Series No. 146123, 146323

▶ cutting conditions : p.16



Minimized tool deflection
Corner protected
Reduced tool vibration

EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d ₁	SHANK DIAMETER d ₂	LENGTH OF CUT l ₁	EFFECTIVE LENGTH l ₃	OVERALL LENGTH l ₂	NECK DIAMETER d ₃
1461230300	1463230300	3.0	6	7.0	12.0	54	2.7
1461230400	1463230400	4.0	6	8.0	15.0	57	3.7
1461230500	1463230500	5.0	6	10.0	17.0	57	4.7
1461230600	1463230600	6.0	6	10.0	22.0	63	3.7
1461230800	1463230800	8.0	8	12.0	17.0	57	4.7
14612309001	14632309001	6.0	6	10.0	27.0	67	4.7
14612309002	14632309002	6.0	6	10.0	15.0	57	5.5
14612309001	14632309001	6.0	6	10.0	20.0	62	5.5
14612309002	14632309002	6.0	6	10.0	32.0	74	5.5
1461230800	1463230800	8.0	8	12.0	20.0	63	7.5
14612309003	14632309003	8.0	8	12.0	30.0	73	7.5
14612309004	14632309004	8.0	8	12.0	46.0	90	7.5
1461231000	1463231000	10.0	10	14.0	25.0	72	9.2
14612309005	14632309005	10.0	10	14.0	35.0	82	9.2
14612309006	14632309006	10.0	10	14.0	55.0	102	9.2
1461231200	1463231200	12.0	12	16.0	30.0	83	11
14612309007	14632309007	12.0	12	16.0	40.0	93	11
14612309008	14632309008	12.0	12	16.0	64.0	117	11
1461231600	1463231600	16.0	16	22.0	38.0	92	15
14612309009	14632309009	16.0	16	22.0	55.0	109	15
14612309010	14632309010	16.0	16	22.0	87.0	141	15
1461232000	1463232000	20.0	20	26.0	50.0	104	19
14612309011	14632309011	20.0	20	26.0	70.0	124	19
14612309012	14632309012	20.0	20	26.0	110.0	164	19

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
○	○		●	●	○	○	●	●	●							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
○	○		●		○	○	●	●	●							

4 FLUTE LONG LENGTH BALL NOSE HX2

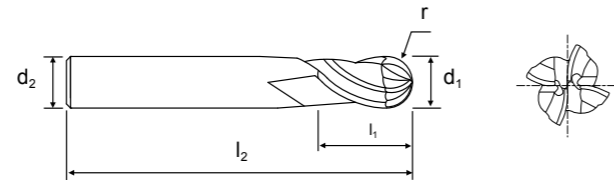


MG HM FLUTE 4 PLAIN FLAT



Series No. 134123, 134323

▶ cutting conditions : p.17



Minimized tool deflection
Reduced tool vibration

EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d ₁	RADIUS r	SHANK DIAMETER d ₂	LENGTH OF CUT l ₁	OVERALL LENGTH l ₂
1341230300	1343230300	3.0	1.5	6	8.0	57
1341230400	1343230400	4.0	2.0	6	11.0	57
1341230500	1343230500	5.0	2.5	6	13.0	57
1341230600	1343230600	6.0	3.0	6	13.0	57
1341230800	1343230800	8.0	4.0	8	19.0	63
1341231000	1343231000	10.0	5.0	10	22.0	72
1341231200	1343231200	12.0	6.0	12	26.0	83
1341231400	1343231400	14.0	7.0	14	26.0	83
1341231600	1343231600	16.0	8.0	16	32.0	92
1341231800	1343231800	18.0	9.0	18	32.0	92
1341232000	1343232000	20.0	10.0	20	38.0	104
1341232500	1343232500	25.0	12.5	25	38.0	108

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
○	○		●	●	○	○	●	●	●							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
○	○		●		○	○	●	●	●							

5 FLUTE LONG LENGTH HX2

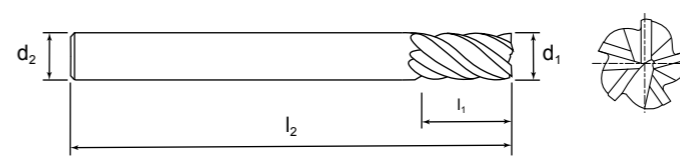


MG HM FLUTE 5 PLAIN FLAT



Series No. 135123, 135323

▶ cutting conditions : p.18



Minimized tool deflection
Corner protected
Reduced tool vibration

EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d ₁	SHANK DIAMETER d ₂	LENGTH OF CUT l ₁	OVERALL LENGTH l ₂
1351230600	1353230600	6.0	6	13.0	57
1351230800	1353230800	8.0	8	19.0	63
1351231000	1353231000	10.0	10	22.0	72
1351231200	1353231200	12.0	12	26.0	83
1351231400	1353231400	14.0	14	26.0	83
1351231600	1353231600	16.0	16	32.0	92
1351231800	1353231800	18.0	18	32.0	92
1351232000	1353232000	20.0	20	38.0	104
1351232500	1353232500	25.0	25	38.0	108

MILL DIA. TOLERANCE(mm)	SHANK DIA. TOLERANCE
0~-0.03	h6

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
○	○		●	●	○	○	●	●	●							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
○	○		●		○	○	●	●	●							



HX2
CUTTING DATA

HX2 CUTTING CONDITION



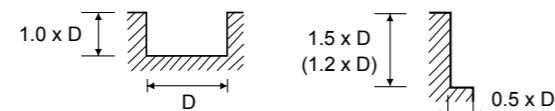
136123, 136323, 137123, 137323, 138123, 138323, 139123, 139323, 146323, 146123 (4 Flute, All Square End)



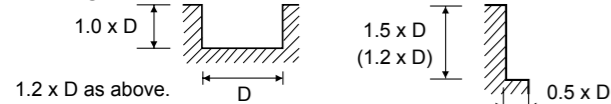
MATERIAL GROUP	HRc		Size (mm)												
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
P	11 12 13 14	< 30	v_c (m/min)	125	125	125	125	125	140	140	140	140	140	140	140
			n	13475	10105	8085	6735	5050	4455	3710	3180	2785	2475	2225	1780
			f_z	0.005	0.008	0.011	0.016	0.027	0.039	0.047	0.049	0.053	0.059	0.065	0.063
			f (mm/min)	275	330	340	435	555	690	695	620	590	585	580	450
M	21 22	30-45	v_c (m/min)	95	95	95	95	95	95	95	95	95	95	95	95
			n	10185	7600	6110	5095	3820	3055	2545	2180	1910	1695	1525	1215
			f_z	0.005	0.008	0.013	0.018	0.028	0.048	0.056	0.06	0.063	0.07	0.077	0.078
			f (mm/min)	195	250	310	360	435	590	565	520	480	475	470	380
K	31 32 33 34		v_c (m/min)	135	135	135	135	135	135	135	135	135	135	135	
			n	14260	10750	8655	7130	5345	4275	3565	3055	2670	2375	2140	1710
			f_z	0.004	0.006	0.009	0.013	0.022	0.034	0.04	0.043	0.045	0.05	0.055	0.056
			f (mm/min)	205	255	310	360	465	585	565	520	480	475	470	380
S	41 42 43 51 52 53		v_c (m/min)	95	95	95	95	95	95	95	95	95	95	95	
			n	10185	7600	6110	5095	3820	3055	2545	2180	1910	1695	1525	1215
			f_z	0.005	0.008	0.013	0.018	0.028	0.048	0.056	0.06	0.063	0.07	0.077	0.078
			f (mm/min)	195	250	310	360	435	590	565	520	480	475	470	380
			v_c (m/min)	25	25	25	25	25	25	25	25	25	25		
			n	2715	2005	1630	1355	1015	815	675	580	505	450	405	320
			f_z	0.005	0.007	0.012	0.018	0.031	0.018	0.056	0.06	0.064	0.069	0.077	0.086
			f (mm/min)	55	55	80	95	125	155	150	140	130	125	125	110

STEEL, STAINLESS STEEL, CAST IRON

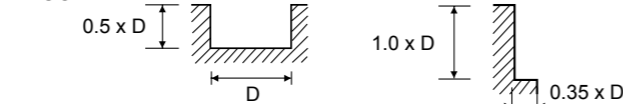
1.2 x D axial cutting depth should be applied for short length tools above ø8mm



TITANIUM



INCONEL



► The data shown is based on medial length tools. Please adjust machining conditions according to length.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HX2 CUTTING CONDITION

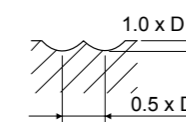


134123, 134323 (4 Flute Ball Nose)

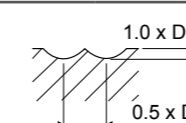


MATERIAL GROUP	HRc		Size (mm)												
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	
P	11 12 13 14	< 30	v_c (m/min)	135	135	135	135	135	135	135	135	135	135	135	135
			n	14324	10740	8590	7460	5370	4290	3580	3070	2680	2380	2140	1710
			f_z	0.025	0.025	0.03	0.038	0.06	0.06	0.07	0.075	0.075	0.08	0.09	0.099
			f (mm/min)	1430	1070	1030	1140	1280	1030	1000	920	800	760	770	680
M	21 22	30-45	v_c (m/min)	75	75	75	75	75	75	75	75	75	75	75	75
			n	8220	6160	4930	4110	3080	2460	2050	1700	1540	1370	1230	980
			f_z	0.02	0.02	0.025	0.041	0.045	0.05	0.055	0.06	0.06	0.064	0.065	0.069
			f (mm/min)	650	490	490	670	550	490	450	400	370	350	320	270
K	23		v_c (m/min)	70	70	70	70	70	70	70	70	70	70	70	70
			n	7420	5570	4450	3710	2780	2220	1850	1590	1390	1230	1110	890
			f_z	0.015	0.015	0.025	0.03	0.04	0.045	0.05	0.054	0.054	0.059	0.059	0.059
			f (mm/min)	440	330	440	440	440	400	370	340	300	290	260	210
S	31 32 33 34		v_c (m/min)	135	135	135	135	135	135	135	135	135	135	135	
			n	14324	10740	8590	7460	5370	4290	3580	3070	2680	2380	2140	1710
			f_z	0.025	0.025	0.03	0.038	0.06	0.06	0.07	0.075	0.075	0.08	0.09	0.099
			f (mm/min)	1430	1070	1030	1140	1280	1030	1000	920	800	760	770	680
S	41 42 43 51 52 53		v_c (m/min)	55	55	55	55	55	55	55	55	55	55	55	
			n	5830	4370	3500	2910	2180	1750	1450	1250	1090	970	870	700
			f_z	0.012	0.012	0.015	0.02	0.03	0.03	0.04	0.042	0.044	0.049	0.06	0.068
			f (mm/min)	280	210	210	230	260	210	230	210	190	190	210	190
			v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30	
			n	3180	2380	1910	1590	1190	950	790	680	590	530	470	380
			f_z	0.011	0.011	0.01	0.016	0.025	0.026	0.038	0.04	0.047	0.052	0.053	0.053
			f (mm/min)	140	100	80	100	120	100	120	115	110	110	100	80

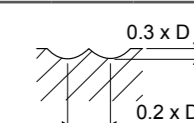
STEEL, STAINLESS STEEL, CAST IRON



TITANIUM



INCONEL



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HX2 CUTTING CONDITION

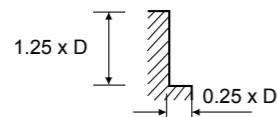


135123, 135323 (5 Flute)

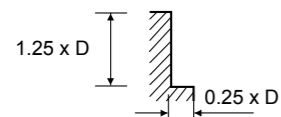


MATERIAL GROUP	HRc		Size (mm)								
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	< 30	v _c (m/min)	135	135	135	135	135	135	135	135	135
		n	7270	5450	4360	3630	3110	2720	2390	2180	1720
		f _z	0.034	0.038	0.05	0.063	0.069	0.076	0.082	0.089	0.09
		f (mm/min)	1240	1040	1100	1150	1080	1040	980	970	770
M		v _c (m/min)	115	115	115	115	115	115	115	115	115
		n	6060	4540	3630	3030	2600	2270	2030	1810	1460
		f _z	0.03	0.032	0.038	0.063	0.065	0.069	0.072	0.076	0.077
		f (mm/min)	920	720	690	960	850	780	730	690	560
		v _c (m/min)	105	105	105	105	105	105	105	105	105
		n	5660	4240	3390	3830	2420	2120	1850	1690	1340
		f _z	0.03	0.032	0.038	0.043	0.064	0.068	0.072	0.076	0.077
		f (mm/min)	860	670	640	820	770	720	670	640	510
K		v _c (m/min)	135	135	135	135	135	135	135	135	135
		n	7270	5450	4360	3630	3110	2720	2390	2180	1720
		f _z	0.034	0.038	0.05	0.063	0.069	0.076	0.082	0.089	0.09
		f (mm/min)	1240	1040	1100	1150	1080	1040	980	970	770
S		v _c (m/min)	85	85	85	85	85	85	85	85	85
		n	4440	3330	2660	220	1900	1660	1500	1330	1080
		f _z	0.03	0.031	0.038	0.05	0.057	0.063	0.069	0.075	0.078
		f (mm/min)	670	520	500	560	540	520	510	500	420
		v _c (m/min)	25	25	25	25	25	25	25	25	25
		n	1450	1090	870	720	620	540	440	430	320
		f _z	0.017	0.02	0.025	0.036	0.045	0.048	0.054	0.06	0.062
		f (mm/min)	120	110	110	130	140	130	120	130	100

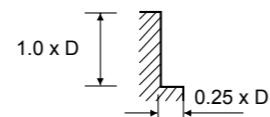
STEEL, STAINLESS STEEL, CAST IRON



TITANIUM



INCONEL



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \times 1000}{\pi \times \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \times \pi \times \phi}{1000}$$

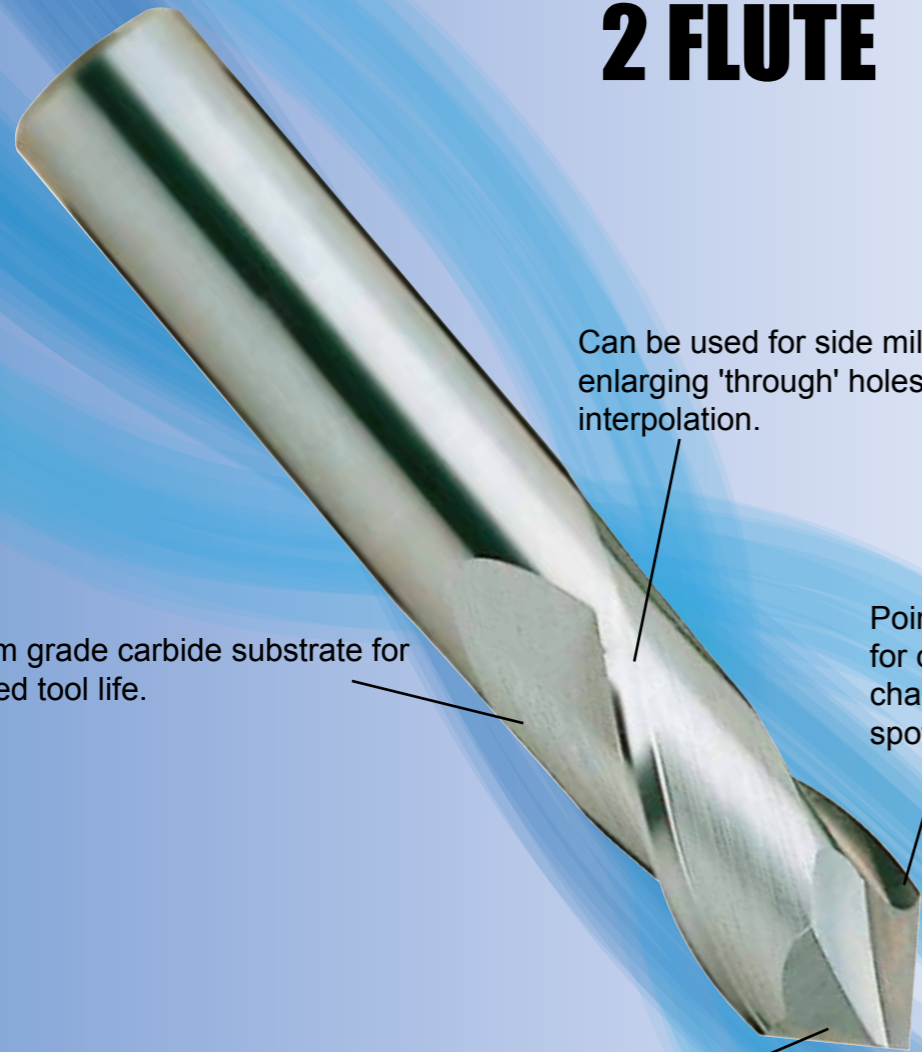
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.



SUPERIOR PERFORMANCE



DRILL MILL 2 FLUTE



Can be used for side milling and enlarging 'through' holes by interpolation.

Point can be used for countersinking, chamfering and spotting.

90° included point angle.

Premium grade carbide substrate for increased tool life.

IDEAL FOR MATERIAL GROUPS



STANDARD CARBIDE END MILLS



K30 Micro-grain carbide for general use on a wide variety of materials



●: Excellent ○: Good

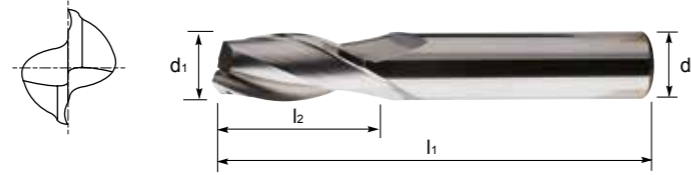
P				H		M			K				S					N							O				CHAMFER TOOLS						
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84	Uncoated	TiAlN Coated	Item	Description	Page No.
●	●	●	●			○	○		●	●	●		○	○									○	○	○						197303	-		Drill Mill 90° ø3.0mm - 20.0mm	P.38
●	●	●	●			○	○		●	●	●		●	●		●	●		●	●	●		○	○	○							199323		Chamfer Mill 90° ø6.0mm - 12.0mm	P.38
2-FLUTE END MILLS																																			
●	●	●	●			○	○		●	●	●		○	○					○	○	○		○	○	○						301303	301323		Standard Length ø1.0mm - 25.0mm	P.24
●	●	●	●			○	○		●	●	●		○	○					○	○	○		○	○	○						302303	302323		Long Series ø3.0mm - 25.0mm	P.25
●	●	●	●			○	○		●	●	●		○	○									○	○	○						-	120323		Standard Length Corner Radius ø2.0mm - 12.0mm	P.36
●	●	●	●			○	○		●	●	●		○	○									○	○	○						-	121323		Long Series Corner Radius ø3.0mm - 12.0mm	P.37
●	●	●	●			○	○		●	●	●		○	○									○	○	○						313303	313323		Standard Length Ball Nose ø1.0mm - 25.0mm	P.30
●	●	●	●			○	○		●	●	●		○	○									○	○	○						314303	314323		Long Series Ball Nose ø3.0mm - 25.0mm	P.31
●	●	●	●			○	○		●	●	●		○	○									○	○	○						162303	162323		Extra Length 2 Flute Ball Nose ø3.0mm - 20.0mm	P.39
3-FLUTE END MILLS																																			
●	●	●	●			○	○		●	●	●		○	○									○	○	○						304303	304323		Standard Length ø1.0mm - 25.0mm	P.26
●	●	●	●			○	○		●	●	●		○	○									○	○	○						305303	305323		Long Series ø3.0mm - 25.0mm	P.27
●	●	●	●			○	○		●	●	●		○	○									○	○	○						307303	307323		Standard Length Ball Nose ø1.0mm - 16.0mm	P.32
●	●	●	●			○	○		●	●	●		○	○									○	○	○						308303	308323		Long Series Ball Nose ø3.0mm - 25.0mm	P.33
4-FLUTE END MILLS																																			
●	●	●	●			○	○		●	●	●		○	○									○	○	○						310303	310323		Standard Length ø1.0mm - 25.0mm	P.28
●	●	●	●			○	○		●	●	●		○	○									○	○	○						311303	311323		Long Series ø3.0mm - 25.0mm	P.29
●	●	●	●			○	○		●	●	●		○	○									○	○	○						-	140323		Standard Length Corner Radius ø2.0mm - 12.0mm	P.36
●	●	●	●			○	○		●	●	●		○	○									○	○	○						-	142323		Long Series Corner Radius ø3.0mm - 12.0mm	P.37
●	●	●	●			○	○		●	●	●		○	○									○	○	○						315303	315323		Standard Length Ball Nose ø1.0mm - 25.0mm	P.34
●	●	●	●			○	○		●	●	●		○	○									○	○	○						316303	316323		Long Series Ball Nose ø3.0mm - 25.0mm	P.35
Imperial Size End Mills																																			
Cutting Data																																			

2 FLUTE, STANDARD, PLAIN SHANK



Series No. 301303,301323

▶ cutting conditions : p.42-43



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
1.0	3.0	4.0	38.0	3013030100	3013230100
1.5		4.5		3013030150	3013230150
2.0		6.3		3013030200	3013230200
2.5		9.5		3013030250	3013230250
3.0		12.0		3013030300	3013230300
3.5	4.0	12.0	50.0	3013030350	3013230350
4.0		14.0		3013030400	3013230400
4.5		16.0		3013030450	3013230450
5.0	6.0	16.0	58.0	3013030500	3013230500
6.0		19.0		3013030600	3013230600
7.0	8.0	19.0	63.0	3013030700	3013230700
8.0		20.0		3013030800	3013230800
9.0	10.0	22.0	75.0	3013030900	3013230900
10.0		22.0		3013031000	3013231000
11.0	12.0	25.0	89.0	3013031100	3013231100
12.0		25.0		3013031200	3013231200
14.0	14.0	32.0	100.0	3013031400	3013231400
16.0	16.0	32.0		3013031600	3013231600
18.0	18.0	38.0		3013031800	3013231800
20.0	20.0	38.0	100.0	3013032000	3013232000
25.0	25.0	38.0		3013032500	3013232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

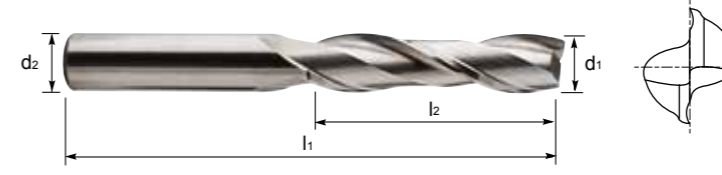
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13

2 FLUTE, LONG, PLAIN SHANK



Series No. 302303,302323

▶ cutting conditions : p.42-43



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
3.0	3.0	25.0	65.0	3023030300	3023230300
4.0	4.0	25.0		3023030400	3023230400
5.0	5.0	25.0		75.0	3023030500
6.0	6.0	25.0	3023030600		3023230600
8.0	8.0	25.0	3023030800		3023230800
10.0	10.0	38.0	100.0	3023031000	3023231000
12.0	12.0	50.0		3023031200	3023231200
14.0	14.0	75.0	150.0	3023031400	3023231400
16.0	16.0	75.0		3023031600	3023231600
18.0	18.0	75.0		3023031800	3023231800
20.0	20.0	75.0		3023032000	3023232000
25.0	25.0	75.0		3023032500	3023232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

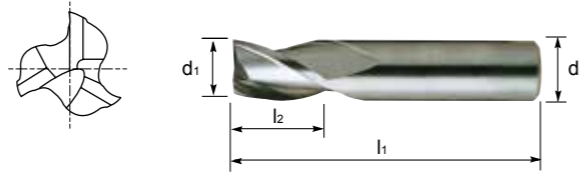
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13

3 FLUTE, STANDARD, PLAIN SHANK



Series No. 304303,304323

▶ cutting conditions : p.44-47



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
1.0	3.0	4.0	38.0	3043030100	3043230100
1.5		4.5		3043030150	3043230150
2.0		6.3		3043030200	3043230200
2.5		9.5		3043030250	3043230250
3.0		12.0		3043030300	3043230300
3.5	4.0	12.0	50.0	3043030350	3043230350
4.0		14.0		3043030400	3043230400
4.5		16.0		3043030450	3043230450
5.0	6.0	16.0	58.0	3043030500	3043230500
6.0		19.0		3043030600	3043230600
7.0	8.0	19.0	63.0	3043030700	3043230700
8.0		20.0		3043030800	3043230800
9.0	10.0	22.0	75.0	3043030900	3043230900
10.0		22.0		3043031000	3043231000
11.0		25.0		3043031100	3043231100
12.0	12.0	25.0	89.0	3043031200	3043231200
14.0	14.0	32.0		3043031400	3043231400
16.0	16.0	32.0		3043031600	3043231600
18.0	18.0	38.0	100.0	3043031800	3043231800
20.0	20.0	38.0		3043032000	3043232000
25.0	25.0	38.0		3043032500	3043232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

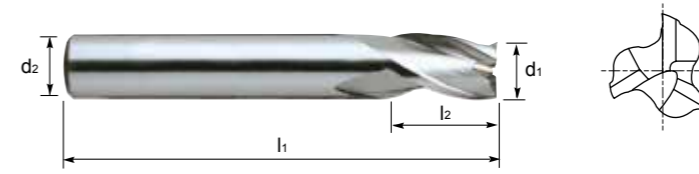
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

3 FLUTE, LONG, PLAIN SHANK



Series No. 305303,305323

▶ cutting conditions : p.44-47



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
3.0	3.0	25.0	75.0	3053030300	3053230300
4.0	4.0	25.0		3053030400	3053230400
5.0	6.0	25.0		3053030500	3053230500
6.0	6.0	25.0		3053030600	3053230600
8.0	8.0	25.0		3053030800	3053230800
10.0	10.0	38.0	100.0	3053031000	3053231000
12.0	12.0	50.0		3053031200	3053231200
14.0	14.0	75.0	150.0	3053031400	3053231400
16.0	16.0	75.0		3053031600	3053231600
18.0	18.0	75.0		3053031800	3053231800
20.0	20.0	75.0		3053032000	3053232000
25.0	25.0	75.0		3053032500	3053232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

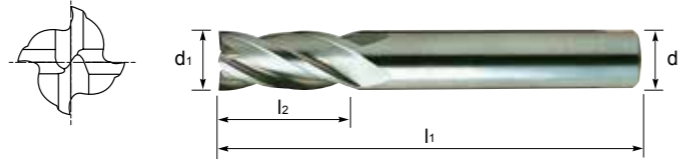
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

4 FLUTE, STANDARD, PLAIN SHANK



Series No. 310303,310323

▶ cutting conditions : p.48-49



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
1.0	3.0	4.0	38.0	3103030100	3103230100
1.5		4.5		3103030150	3103230150
2.0		6.3		3103030200	3103230200
2.5		9.5		3103030250	3103230250
3.0		12.0		3103030300	3103230300
3.5	4.0	12.0	50.0	3103030350	3103230350
4.0		14.0		3103030400	3103230400
4.5		16.0		3103030450	3103230450
5.0	6.0	16.0	58.0	3103030500	3103230500
6.0		19.0		3103030600	3103230600
7.0	8.0	19.0	63.0	3103030700	3103230700
8.0		20.0		3103030800	3103230800
9.0	10.0	22.0	75.0	3103030900	3103230900
10.0		22.0		3103031000	3103231000
11.0	12.0	25.0	75.0	3103031100	3103231100
12.0		25.0		3103031200	3103231200
14.0	14.0	32.0	89.0	3103031400	3103231400
16.0	16.0	32.0		3103031600	3103231600
18.0	18.0	38.0	100.0	3103031800	3103231800
20.0	20.0	38.0		3103032000	3103232000
25.0	25.0	38.0		3103032500	3103232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

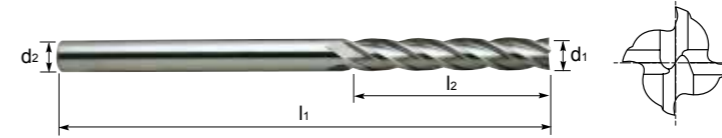
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

4 FLUTE, LONG, PLAIN SHANK



Series No. 311303,311323

▶ cutting conditions : p.48-49



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
3.0	3.0	25.0	65.0	3113030300	3113230300
4.0	4.0	25.0		3113030400	3113230400
5.0	5.0	25.0		3113030500	3113230500
6.0	6.0	25.0	75.0	3113030600	3113230600
8.0	8.0	25.0		3113030800	3113230800
10.0	10.0	38.0		3113031000	3113231000
12.0	12.0	50.0	100.0	3113031200	3113231200
16.0	16.0	58.0		3113039016	3113239016
18.0	18.0	58.0		3113039018	3113239018
20.0	20.0	58.0	125.0	3113039020	3113239020
25.0	25.0	58.0		3113039025	3113239025
12.0	12.0	75.0		150.0	3113039001
14.0	14.0	75.0	3113031400		3113231400
16.0	16.0	75.0	3113031600		3113231600
18.0	18.0	75.0	3113031800		3113231800
20.0	20.0	75.0	3113032000		3113232000
25.0	25.0	75.0	3113032500		3113232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

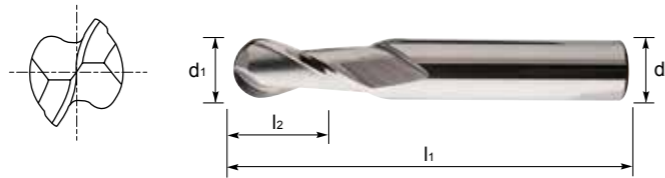
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

2 FLUTE, STANDARD, BALL NOSE



Series No. 313303,313323

▶ cutting conditions : p.50-51



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
1.0	3.0	4.0	38.0	3133030100	3133230100
1.5		4.5		3133030150	3133230150
2.0		6.3		3133030200	3133230200
2.5		9.5		3133030250	3133230250
3.0		12.0		3133030300	3133230300
3.5	4.0	12.0	50.0	3133030350	3133230350
4.0		14.0		3133030400	3133230400
4.5		16.0		3133030450	3133230450
5.0	6.0	16.0	58.0	3133030500	3133230500
6.0		19.0		3133030600	3133230600
7.0	8.0	19.0	63.0	3133030700	3133230700
8.0		20.0		3133030800	3133230800
9.0	10.0	22.0	75.0	3133030900	3133230900
10.0		22.0		3133031000	3133231000
11.0	12.0	25.0	75.0	3133031100	3133231100
12.0		25.0		3133031200	3133231200
14.0	14.0	32.0	89.0	3133031400	3133231400
16.0	16.0	32.0		3133031600	3133231600
18.0	18.0	38.0	100.0	3133031800	3133231800
20.0	20.0	38.0		3133032000	3133232000
25.0	25.0	38.0		3133032500	3133232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

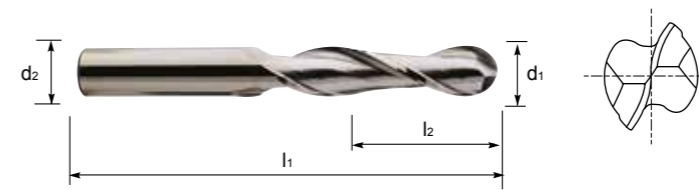
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

2 FLUTE, LONG, BALL NOSE



Series No. 314303,314323

▶ cutting conditions : p.50-51



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
3.0	3.0	25.0	75.0	3143030300	3143230300
4.0	4.0	25.0		3143030400	3143230400
5.0	6.0	25.0		3143030500	3143230500
6.0	6.0	25.0		3143030600	3143230600
8.0	8.0	25.0		3143030800	3143230800
10.0	10.0	38.0	100.0	3143031000	3143231000
12.0	12.0	50.0		3143031200	3143231200
14.0	14.0	75.0	150.0	3143031400	3143231400
16.0	16.0	75.0		3143031600	3143231600
18.0	18.0	75.0		3143031800	3143231800
20.0	20.0	75.0		3143032000	3143232000
25.0	25.0	75.0		3143032500	3143232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

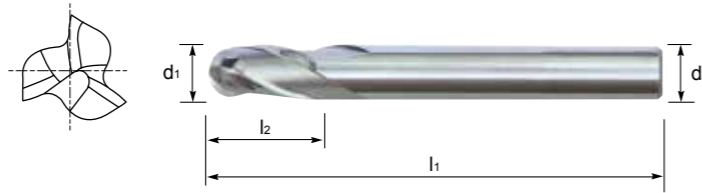
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

3 FLUTE, STANDARD, BALL NOSE



Series No. 307303,307323

▶ cutting conditions : p.52-53



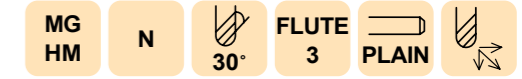
Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAIN Carbide
1.0	3.0	4.0	38.0	3073030100	3073230100
2.0		6.3		3073030200	3073230200
3.0		12.0		3073030300	3073230300
4.0	4.0	14.0	51.0	3073030400	3073230400
5.0	6.0	16.0		3073030500	3073230500
6.0	8.0	19.0	58.0	3073030600	3073230600
8.0		20.0	63.0	3073030800	3073230800
10.0		22.0	73.0	3073031000	3073231000
12.0	12.0	25.0	74.0	3073031200	3073231200
16.0	16.0	32.0	89.0	3073031600	3073231600

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

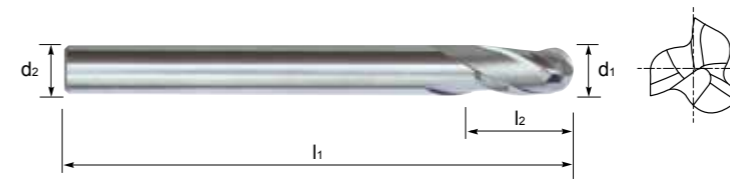
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13

3 FLUTE, LONG, BALL NOSE



Series No. 308303,308323

▶ cutting conditions : p.52-53



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAIN Carbide
3.0	3.0	25.0	75.0	3083030300	3083230300
4.0	4.0	25.0		3083030400	3083230400
5.0	6.0	25.0		3083030500	3083230500
6.0	6.0	25.0		3083030600	3083230600
8.0	8.0	25.0	100.0	3083030800	3083230800
10.0	10.0	38.0		3083031000	3083231000
12.0	12.0	50.0		3083031200	3083231200
16.0	16.0	75.0		3083031600	3083231600
20.0	20.0	75.0	150.0	3083032000	3083232000
25.0	25.0	75.0		3083032500	3083232500

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

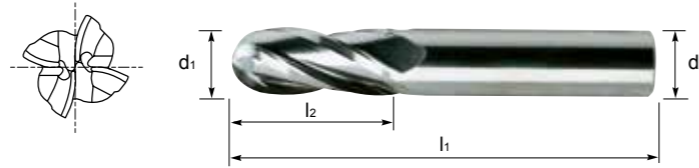
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13

4 FLUTE, STANDARD, BALL NOSE



Series No. 315303,315323

▶ cutting conditions : p.54-55



Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
1.0	3.0	4.0	38.0	3153030100	3153230100
1.5		4.5		3153030150	3153230150
2.0		6.3		3153030200	3153230200
2.5		9.5		3153030250	3153230250
3.0		12.0		3153030300	3153230300
3.5	4.0	12.0	50.0	3153030350	3153230350
4.0		14.0		3153030400	3153230400
4.5		16.0		3153030450	3153230450
5.0	6.0	16.0	58.0	3153030500	3153230500
6.0		19.0		3153030600	3153230600
7.0	8.0	19.0	63.0	3153030700	3153230700
8.0		20.0		3153030800	3153230800
9.0	10.0	22.0	75.0	3153030900	3153230900
10.0		22.0		3153031000	3153231000
11.0	12.0	25.0	89.0	3153031100	3153231100
12.0		25.0		3153031200	3153231200
14.0	14.0	32.0	100.0	3153031400	3153231400
16.0	16.0	32.0		3153031600	3153231600
18.0	18.0	38.0	100.0	3153031800	3153231800
20.0	20.0	38.0		3153032000	3153232000
25.0	25.0	38.0		3153032500	3153232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

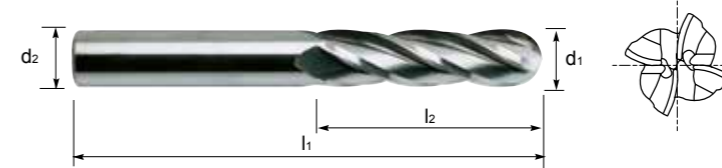
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

4 FLUTE, LONG, BALL NOSE



Series No. 316303,316323

▶ cutting conditions : p.54-55

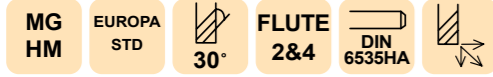


Mill Dia. h10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	Carbide	TiAlN Carbide
3.0	3.0	25.0	75.0	3163030300	3163230300
4.0	4.0	25.0		3163030400	3163230400
5.0	6.0	25.0		3163030500	3163230500
6.0	6.0	25.0		3163030600	3163230600
8.0	8.0	25.0		3163030800	3163230800
10.0	10.0	38.0	100.0	3163031000	3163231000
12.0	12.0	50.0		3163031200	3163231200
16.0	16.0	75.0	150.0	3163031600	3163231600
20.0	20.0	75.0		3163032000	3163232000
25.0	25.0	75.0		3163032500	3163232500

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 - 40	0 - 48	0 - 58	0 - 70	0 - 84
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13

2&4 FLUTE, STANDARD LENGTH, CORNER RADIUS



Series No. 120323,140323

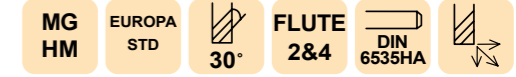
▶ cutting conditions : p.56-57

Suitable for dry milling applications at high temperatures.
Excellent high-performance end mills.

CORNER RADIUS	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	EUROPA CODE 2 FLUTE	EUROPA CODE 4 FLUTE
R0.2	2.0	4	4	50	1203230200	1403230200
R0.3	2.0	4	4	50	1203239001	1403239001
R0.5	2.0	4	4	50	1203239002	1403239002
R0.2	2.5	4	5	50	1203230250	1403230250
R0.3	2.5	4	5	50	1203239003	1403239003
R0.5	2.5	4	5	50	1203239004	1403239004
R0.2	3.0	4	6	50	1203230300	1403230300
R0.3	3.0	4	6	50	1203239005	1403239005
R0.5	3.0	4	6	50	1203239006	1403239006
R1.0	3.0	4	6	50	1203239007	1403239007
R0.2	4.0	4	8	50	1203230400	1403230400
R0.3	4.0	4	8	50	1203239008	1403239008
R0.5	4.0	4	8	50	1203239009	1403239009
R1.0	4.0	4	8	50	1203239010	1403239010
R0.2	5.0	6	10	50	1203230500	1403230500
R0.3	5.0	6	10	50	1203239011	1403239011
R0.5	5.0	6	10	50	1203239012	1403239012
R1.0	5.0	6	10	50	1203239013	1403239013
R0.2	6.0	6	12	50	1203230600	1403230600
R0.3	6.0	6	12	50	1203239014	1403239014
R0.5	6.0	6	12	50	1203239015	1403239015
R1.0	6.0	6	12	50	1203239016	1403239016
R0.5	8.0	8	16	60	1203230800	1403230800
R1.0	8.0	8	16	60	1203239017	1403239017
R1.5	8.0	8	16	60	1203239018	1403239018
R2.0	8.0	8	16	60	1203239019	1403239019
R2.5	8.0	8	16	60	1203239020	1403239020
R0.5	10.0	10	20	75	1203231000	1403231000
R1.0	10.0	10	20	75	1203239021	1403239021
R1.5	10.0	10	20	75	1203239022	1403239022
R2.0	10.0	10	20	75	1203239023	1403239023
R2.5	10.0	10	20	75	1203239024	1403239024
R0.5	12.0	12	24	75	1203231200	1403231200
R1.0	12.0	12	24	75	1203239025	1403239025
R1.5	12.0	12	24	75	1203239026	1403239026
R2.0	12.0	12	24	75	1203239027	1403239027
R2.5	12.0	12	24	75	1203239028	1403239028

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

2&4 FLUTE, LONG LENGTH, CORNER RADIUS



Series No. 121323,142323

▶ cutting conditions : p.56-57

Suitable for dry milling applications at high temperatures.
Excellent high-performance end mills.

CORNER RADIUS	MILL DIAMETER	SHANK DIAMETER	LENGTH OF CUT	OVERALL LENGTH	EUROPA CODE 2 FLUTE	EUROPA CODE 4 FLUTE
R0.5	3.0	4	6	75	1213239006	1423239006
R1.0	3.0	4	6	75	1213239007	1423239007
R0.5	4.0	4	8	75	1213239009	1423239009
R1.0	4.0	4	8	75	1213239010	1423239010
R0.5	5.0	6	10	75	1213239012	1423239012
R1.0	5.0	6	10	75	1213239013	1423239013
R0.5	6.0	6	12	75	1213239015	1423239015
R1.0	6.0	6	12	75	1213239016	1423239016
R0.5	8.0	8	16	100	1213230800	1423230800
R1.0	8.0	8	16	100	1213239017	1423239017
R1.5	8.0	8	16	100	1213239018	1423239018
R2.0	8.0	8	16	100	1213239019	1423239019
R2.5	8.0	8	16	100	1213239020	1423239020
R0.5	10.0	10	20	100	1213231000	1423231000
R1.0	10.0	10	20	100	1213239021	1423239021
R1.5	10.0	10	20	100	1213239022	1423239022
R2.0	10.0	10	20	100	1213239023	1423239023
R2.5	10.0	10	20	100	1213239024	1423239024
R0.5	12.0	12	24	100	1213231200	1423231200
R1.0	12.0	12	24	100	1213239025	1423239025
R1.5	12.0	12	24	100	1213239026	1423239026
R2.0	12.0	12	24	100	1213239027	1423239027
R2.5	12.0	12	24	100	1213239028	1423239028

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

2 FLUTE DRILL MILL



Series No. 197303

▶ cutting conditions : p.58-60

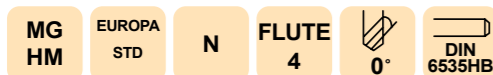


- Performs many drilling and milling operations not presently done with the standard end mill.
- Among the many vertical milling machine operations, the Drill Mill performs are :
Drilling, Slotting, NC Milling Drilling & Slotting, Profile Milling, Chamfering.

EUROPA CODE PLAIN	Mill Diameter	Shank Diameter h6	Length of Cut	Overall Length
1973030300	3.0	4	6	50
1973030400	4.0	5	8	50
1973030500	5.0	6	10	50
1973030600	6.0	8	12	60
1973030800	8.0	10	16	70
1973031000	10.0	12	18	70
1973031200	12.0	12	20	70
1973031400	14.0	14	24	80
1973031600	16.0	16	26	80
1973032000	20.0	20	32	100

▶ TiAIN Coating to Order

2 FLUTE DRILL MILL



Series No. 199323

▶ cutting conditions : p.58-60



- For chamfering in a wide range of materials.

EUROPA CODE PLAIN	Mill Diameter	Shank Diameter h6	Overall Length
1993230600	6.0	6	54
1993230800	8.0	8	58
1993231000	10.0	10	66
1993231200	12.0	12	73

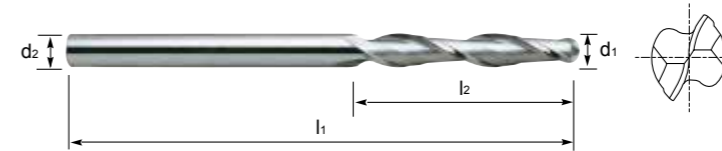
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
∅3 ~ ∅10=h9 ∅12 ~ ∅20=d9	h6

2 FLUTE, EXTRA LONG LENGTH, BALL NOSE



Series No. 162303

▶ cutting conditions : p.50-51



Mill Dia. h10(d1)	Shank Dia. h6(d2)	Length of Cut l2	Overall Length l1	Carbide	TiAIN Carbide
3.0	3.0	30	75	1623030300	1623230300
4.0	4.0	30	75	1623030400	1623230400
5.0	5.0	40	100	1623030500	1623230500
6.0	6.0	50	150	1623030600	1623230600
8.0	8.0	50	150	1623030800	1623230800
10.0	10.0	60	150	1623031000	1623231000
12.0	12.0	75	150	1623031200	1623231200
14.0	14.0	75	150	1623031400	1623231400
16.0	16.0	75	150	1623031600	1623231600
18.0	18.0	75	150	1623031800	1623231800
20.0	20.0	75	150	1623032000	1623232000

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13



Imperial sizes available while stocks last.
Contact sales office for dimensions.
Please check stock before ordering.

Code	Item	Description
2-FLUTE END MILLS		
501303 501323		Standard Length ø1/16" - 1"
502303 502323		Long Series ø1/8" - 1"
513303 513323		Standard Length Ball Nose ø1/16" - 1"
514303 514323		Long Series Ball Nose ø1/8" - 3/4"
3-FLUTE END MILLS		
507303 507323		Standard Length ø1/16" - 1"
508303 508323		Long Series ø1/8" - 1"
519303 519323		Standard Length Ball Nose ø1/16" - 1"
520303 520323		Long Series Ball Nose ø1/8" - 3/4"
4-FLUTE END MILLS		
510303 510323		Standard Length ø1/16" - 1"
511303 511323		Long Series ø1/8" - 1"
515303 515323		Standard Length Ball Nose ø1/16" - 1"
517303 517323		Long Series Ball Nose ø1/8" - 1"

► TiAlN Coating to Order

STANDARD CARBIDE CUTTING DATA

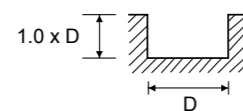
K30 CARBIDE CUTTING CONDITION



301303, 302303 (2 Flute)



MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0		
P	< 30	11	v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30	30
		12	n	4800	3200	2400	1900	1600	1200	950	800	700	600	480	
			f_z	0.007	0.013	0.017	0.021	0.025	0.033	0.042	0.05	0.057	0.071	0.089	
			f (mm/min)	70	80	80	80	80	80	80	80	80	85	85	
	30-40	13	v_c (m/min)	25	25	25	25	25	25	25	25	25	25	25	
		14	n	4000	2600	2000	1600	1300	1000	800	660	570	500	400	
			f_z	0.007	0.012	0.015	0.019	0.023	0.03	0.038	0.045	0.053	0.075	0.094	
			f (mm/min)	55	60	60	60	60	60	60	60	60	75	75	
M		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50		
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800		
		f_z	0.004	0.006	0.008	0.01	0.013	0.016	0.02	0.025	0.03	0.038	0.05		
		f (mm/min)	65	65	65	65	65	65	65	65	65	75	80		
K		v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40		
		n	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640		
		f_z	0.012	0.018	0.023	0.03	0.043	0.059	0.077	0.105	0.122	0.141	0.188		
		f (mm/min)	150	150	150	150	180	190	200	210	220	225	240		
N		v_c (m/min)	75	75	75	75	75	75	75	75	75	75	75		
		n	12000	8000	6000	4800	4000	3000	2400	2000	1700	1500	1200		
		f_z	0.010	0.015	0.02	0.025	0.033	0.043	0.054	0.065	0.075	0.087	0.108		
		f (mm/min)	240	240	240	240	260	260	260	260	260	260	260		
	71		v_c (m/min)	100	105	100	100	100	100	100	100	100	100	100	
			n	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600	
			f_z	0.01	0.015	0.02	0.025	0.032	0.043	0.053	0.065	0.074	0.085	0.106	
			f (mm/min)	320	320	320	320	340	340	340	340	340	340	340	
S		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50		
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800		
		f_z	0.004	0.006	0.008	0.01	0.013	0.016	0.02	0.025	0.03	0.038	0.05		
		f (mm/min)	65	65	65	65	65	65	65	65	65	75	80		



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

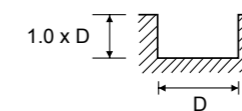
K30 CARBIDE CUTTING CONDITION



301323, 302323 (2 Flute TiAlN)



MATERIAL GROUP	HRc		Size (mm)											
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	
P	< 30	11	v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40
		12	n	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670
			f_z	0.007	0.012	0.016	0.021	0.025	0.033	0.041	0.049	0.056	0.071	0.089
			f (mm/min)	100	110	110	110	110	110	110	110	110	120	120
	30-40	13	v_c (m/min)	35	35	35	35	35	35	35	35	35	35	35
		14	n	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
			f_z	0.007	0.012	0.015	0.019	0.023	0.03	0.038	0.046	0.053	0.075	0.094
			f (mm/min)	75	85	85	85	85	85	85	85	85	105	105
M		v_c (m/min)	70	70	70	70	70	70	70	70	70	70	70	
		n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120	
		f_z	0.004	0.006	0.008	0.01	0.012	0.016	0.02	0.025	0.029	0.038	0.049	
		f (mm/min)	90	90	90	90	90	90	90	90	90	105	110	
K		v_c (m/min)	55	55	55	55	55	55	55	55	55	55	55	
		n	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900	
		f_z	0.012	0.018	0.023	0.03	0.043	0.059	0.077	0.105	0.123	0.141	0.186	
		f (mm/min)	210	210	210	210	250	265	280	295	310	315	335	
N		v_c (m/min)	105	105	105	105	105	105	105	105	105	105	105	
		n	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680	
		f_z	0.01	0.015	0.02	0.025	0.033	0.043	0.054	0.065	0.077	0.087	0.109	
		f (mm/min)	335	335	335	335	365	365	365	365	365	365	365	
	71		v_c (m/min)	140	145	140	140	140	140	140	135	140	140	140
			n	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240
			f_z	0.01	0.015	0.02	0.025	0.032	0.042	0.053	0.065	0.074	0.085	0.106
			f (mm/min)	450	450	450	450	475	475	475	475	475	475	475
S		v_c (m/min)	70	70	70	70	70	70	70	70	70	70	70	
		n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120	
		f_z	0.004	0.006	0.008	0.01	0.012	0.016	0.02	0.025	0.029	0.038	0.049	
		f (mm/min)	90	90	90	90	90	90	90	90	90	105	110	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

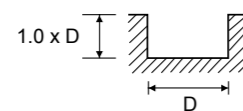


304303, 305303 (3 Flute)



SLOTING

MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0		
P	< 30	11	v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30	30
		12	n	4800	3200	2400	1900	1600	1200	950	800	700	600	480	
			f_z	0.004	0.008	0.01	0.012	0.015	0.019	0.025	0.029	0.033	0.042	0.052	
			f (mm/min)	60	75	75	70	70	70	70	70	70	75	75	
	30-40	13	v_c (m/min)	25	25	25	25	25	25	25	25	25	25	25	
		14	n	4000	2600	2000	1600	1300	1000	800	660	570	500	400	
			f_z	0.004	0.007	0.009	0.011	0.014	0.018	0.023	0.028	0.032	0.043	0.054	
			f (mm/min)	50	55	55	55	55	55	55	55	55	65	65	
M		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50		
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800		
		f_z	0.002	0.003	0.005	0.006	0.008	0.01	0.013	0.015	0.018	0.023	0.029		
		f (mm/min)	55	55	55	55	60	60	60	60	60	70	70		
K		v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40		
		n	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640		
		f_z	0.007	0.011	0.014	0.018	0.025	0.035	0.046	0.063	0.074	0.083	0.112		
		f (mm/min)	140	140	130	135	160	170	180	190	200	200	215		
N		v_c (m/min)	75	75	75	75	75	75	75	75	75	75	75		
		n	12000	8000	6000	4800	4000	3000	2400	2000	1700	1500	1200		
		f_z	0.006	0.009	0.012	0.015	0.02	0.026	0.032	0.039	0.045	0.051	0.064		
		f (mm/min)	220	220	220	220	240	230	230	230	230	230	230		
	71	v_c (m/min)	100	105	100	100	100	100	100	100	100	100	100		
		n	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600		
		f_z	0.006	0.009	0.012	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.063		
		f (mm/min)	290	300	290	290	305	310	305	300	300	300	300		
S		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50		
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800		
		f_z	0.002	0.003	0.005	0.006	0.008	0.01	0.013	0.015	0.018	0.023	0.029		
		f (mm/min)	55	55	55	55	60	60	60	60	60	70	70		



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

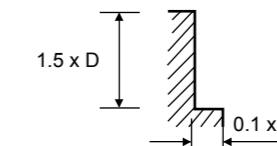


304303, 305303 (3 Flute)



PROFILING

MATERIAL GROUP	HRc		Size (mm)											
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	
P	< 30	11	v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30
		12	n	4800	3200	2400	1900	1600	1200	950	800	700	600	480
			f_z	0.011	0.018	0.025	0.032	0.038	0.05	0.063	0.075	0.086	0.106	0.132
			f (mm/min)	160	170	180	180	180	180	180	180	180	190	190
	30-40	13	v_c (m/min)	25	25	25	25	25	25	25	25	25	25	25
		14	n	4000	2600	2000	1600	1300	1000	800	660	570	500	400
			f_z	0.01	0.017	0.022	0.027	0.033	0.043	0.054	0.066	0.076	0.107	0.133
			f (mm/min)	120	130	130	130	130	130	130	130	130	160	160
M		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50	
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800	
		f_z	0.006	0.009	0.012	0.015	0.019	0.025	0.031	0.038	0.045	0.057	0.075	
		f (mm/min)	140	140	140	140	150	150	150	150	150	170	180	
K		v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40	
		n	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640	
		f_z	0.017	0.026	0.035	0.045	0.063	0.09	0.115	0.157	0.181	0.213	0.281	
		f (mm/min)	330	330	340	340	400	430	450	470	490	510	540	
N		v_c (m/min)	75	75	75	75	75	75	75	75	75	75	75	
		n	12000	8000	6000	4800	4000	3000	2400	2000	1700	1500	1200	
		f_z	0.015	0.022	0.03	0.037	0.048	0.064	0.081	0.094	0.114	0.129	0.161	
		f (mm/min)	540	530	540	530	580	580	580	580	580	580	580	
	71	v_c (m/min)	100	105	100	100	100	100	100	100	100	100	100	
		n	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600	
		f_z	0.015	0.021	0.03	0.037	0.048	0.063	0.079	0.097	0.11	0.127	0.158	
		f (mm/min)	720	690	720	710	760	760	760	760	760	760	760	
S		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50	
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800	
		f_z	0.006	0.009	0.012	0.015	0.019	0.025	0.031	0.038	0.045	0.057	0.075	
		f (mm/min)	140	140	140	140	150	150	150	150	150	170	180	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

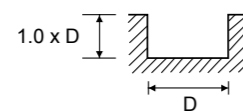


304323, 305323 (3 Flute TiAlN)



SLOTTING

MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0		
P	< 30	11	v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40	40
		12	n	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670	
			f_z	0.004	0.008	0.01	0.013	0.015	0.02	0.025	0.03	0.034	0.042	0.052	
			f (mm/min)	85	105	105	100	100	100	100	100	100	105	105	
	30-40	13	v_c (m/min)	35	35	35	35	35	35	35	35	35	35	35	
		14	n	5600	3640	2800	2240	1820	1400	1120	924	798	700	560	
			f_z	0.004	0.007	0.009	0.011	0.014	0.018	0.022	0.027	0.031	0.043	0.054	
			f (mm/min)	70	75	75	75	75	75	75	75	75	90	90	
M		21	v_c (m/min)	70	70	70	70	70	70	70	70	70	70		
		22	n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120	
			f_z	0.002	0.003	0.004	0.006	0.008	0.01	0.013	0.016	0.018	0.024	0.03	
			f (mm/min)	75	75	75	75	85	85	85	85	85	100	100	
K		31	v_c (m/min)	55	55	55	55	55	55	55	55	55	55		
		32	n	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900	
		33	f_z	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.074	0.083	0.111	
			f (mm/min)	195	195	180	190	225	240	250	265	280	280	300	
N		61	v_c (m/min)	105	105	105	105	105	105	105	105	105	105		
		62	n	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680	
		63	f_z	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.038	0.045	0.051	0.063	
			f (mm/min)	310	310	310	310	335	320	320	320	320	320	320	
		71	v_c (m/min)	140	145	140	140	140	140	135	140	140	140		
		72	n	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240	
		73	f_z	0.006	0.009	0.012	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.063	
			f (mm/min)	405	420	405	405	425	435	425	420	420	420	420	
S		41	v_c (m/min)	70	70	70	70	70	70	70	70	70	70		
		42	n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120	
		43	f_z	0.002	0.003	0.004	0.006	0.008	0.01	0.013	0.016	0.018	0.024	0.03	
			f (mm/min)	75	75	75	75	85	85	85	85	85	100	100	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

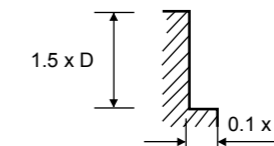


304323, 305323 (3 Flute TiAlN)



PROFILING

MATERIAL GROUP	HRc		Size (mm)											
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	
P	< 30	11	v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40
		12	n	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670
			f_z	0.011	0.018	0.025	0.031	0.037	0.05	0.063	0.074	0.085	0.105	0.132
			f (mm/min)	225	240	250	250	250	250	250	250	250	265	256
	30-40	13	v_c (m/min)	35	35	35	35	35	35	35	35	35	35	35
		14	n	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
			f_z	0.01	0.016	0.021	0.027	0.033	0.043	0.054	0.065	0.075	0.107	0.134
			f (mm/min)	170	180	180	180	180	180	180	180	180	225	225
M		21	v_c (m/min)	70	70	70	70	70	70	70	70	70	70	
		22	n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120
			f_z	0.006	0.009	0.012	0.015	0.019	0.025	0.031	0.038	0.045	0.057	0.074
			f (mm/min)	195	195	195	195	210	210	210	210	210	240	250
K		31	v_c (m/min)	55	55	55	55	55	55	55	55	55	55	
		32	n	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900
		33	f_z	0.017	0.026	0.035	0.045	0.063	0.089	0.115	0.157	0.181	0.213	0.28
			f (mm/min)	460	460	475	475	560	600	630	660	685	715	755
N		61	v_c (m/min)	105	105	105	105	105	105	105	105	105	105	
		62	n	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680
		63	f_z	0.015	0.022	0.03	0.037	0.048	0.064	0.08	0.096	0.113	0.129	0.161
			f (mm/min)	755	740	755	740	810	810	810	810	810	810	810
		71	v_c (m/min)	140	145	140	140	140	140	135	140	140	140	
		72	n	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240
		73	f_z	0.015	0.021	0.03	0.037	0.048	0.063	0.079	0.098	0.11	0.127	0.158
			f (mm/min)	1010	965	1010	995	1065	1065	1065	1065	1065	1065	1065
S		41	v_c (m/min)	70	70	70	70	70	70	70	70	70	70	
		42	n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120
		43	f_z	0.006	0.009	0.012	0.015	0.019	0.025	0.031	0.038	0.045	0.057	0.074
			f (mm/min)	195	195	195	195	210	210	210	210	210	240	250



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

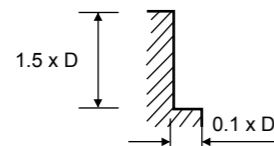


310303, 311303, (4 Flute)



PROFILING

MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0		
P	< 30	11	v _c (m/min)	30	30	30	30	30	30	30	30	30	30	30	30
		12	n	4800	3200	2400	1900	1600	1200	950	800	700	600	480	
			f _z	0.011	0.019	0.025	0.032	0.038	0.05	0.063	0.075	0.086	0.108	0.135	
			f (mm/min)	210	240	240	240	240	240	240	240	240	260	260	
	30-40	13	v _c (m/min)	25	25	25	25	25	25	25	25	25	25	25	
		14	n	4000	2600	2000	1600	1300	1000	800	660	570	500	400	
			f _z	0.01	0.017	0.023	0.028	0.035	0.045	0.056	0.068	0.079	0.11	0.138	
			f (mm/min)	160	180	180	180	180	180	180	180	180	220	220	
M		v _c (m/min)	50	50	50	50	50	50	50	50	50	50	50		
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800		
		f _z	0.006	0.009	0.013	0.016	0.019	0.025	0.031	0.038	0.045	0.056	0.075		
		f (mm/min)	200	200	200	200	200	200	200	200	200	225	240		
K		v _c (m/min)	40	40	40	40	40	40	40	40	40	40	40		
		n	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640		
		f _z	0.017	0.027	0.035	0.045	0.064	0.089	0.115	0.158	0.183	0.213	0.281		
		f (mm/min)	450	450	450	450	540	570	600	630	660	680	720		
N		61	v _c (m/min)	75	75	75	75	75	75	75	75	75	75		
		62	n	12000	8000	6000	4800	4000	3000	2400	2000	1700	1500	1200	
		63	f _z	0.015	0.023	0.03	0.038	0.049	0.065	0.081	0.098	0.115	0.13	0.163	
			f (mm/min)	720	720	720	720	780	780	780	780	780	780	780	
	71	v _c (m/min)	100	105	100	100	100	100	100	100	100	100	100		
		n	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600		
		f _z	0.015	0.022	0.03	0.038	0.048	0.064	0.08	0.098	0.111	0.128	0.159		
		f (mm/min)	960	960	960	960	1020	1020	1020	1020	1020	1020	1020		
S		v _c (m/min)	50	50	50	50	50	50	50	50	50	50	50		
		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800		
		f _z	0.006	0.009	0.013	0.016	0.019	0.025	0.031	0.038	0.045	0.056	0.075		
		f (mm/min)	200	200	200	200	200	200	200	200	200	225	240		



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

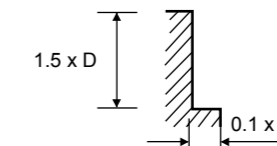


310303, 311303, (4 Flute TiAlN)



PROFILING

MATERIAL GROUP	HRc		Size (mm)											
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0	
P	< 30	11	v _c (m/min)	40	40	40	40	40	40	40	40	40	40	40
		12	n	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670
			f _z	0.011	0.019	0.025	0.031	0.037	0.05	0.063	0.075	0.085	0.108	0.136
			f (mm/min)	295	335	335	335	335	335	335	335	335	365	365
	30-40	13	v _c (m/min)	35	35	35	35	35	35	35	35	35	35	35
		14	n	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
			f _z	0.01	0.017	0.022	0.028	0.034	0.045	0.056	0.068	0.078	0.111	0.138
			f (mm/min)	225	250	250	250	250	250	250	250	250	310	310
M		v _c (m/min)	70	70	70	70	70	70	70	70	70	70	70	
		n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120	
		f _z	0.006	0.009	0.013	0.016	0.019	0.025	0.031	0.038	0.045	0.056	0.075	
		f (mm/min)	280	280	280	280	280	280	280	280	280	315	315	
K		v _c (m/min)	55	55	55	55	55	55	55	55	55	55	55	
		n	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900	
		f _z	0.017	0.027	0.035	0.045	0.064	0.089	0.115	0.157	0.184	0.212	0.281	
		f (mm/min)	630	630	630	630	755	800	840	880	925	950	1010	
N		61	v _c (m/min)	105	105	105	105	105	105	105	105	105	105	
		62	n	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680
		63	f _z	0.015	0.023	0.03	0.0358	0.049	0.065	0.081	0.097	0.114	0.13	0.162
			f (mm/min)	1010	1010	1010	1010	1090	1090	1090	1090	1090	1090	1090
	71	v _c (m/min)	140	145	140	140	140	140	140	135	140	140	140	
		n	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240	
		f _z	0.015	0.022	0.03	0.038	0.048	0.064	0.08	0.098	0.111	0.128	0.16	
		f (mm/min)	1345	1345	1345	1345	1430	1430	1430	1430	1430	1430	1430	
S		v _c (m/min)	70	70	70	70	70	70	70	70	70	70	70	
		n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120	
		f _z	0.006	0.009	0.013	0.016	0.019	0.025	0.031	0.038	0.045	0.056	0.075	
		f (mm/min)	280	280	280	280	280	280	280	280	280	315	315	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \phi}{1000}$$

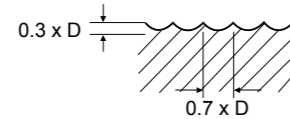
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION



313303, 314303, 162303 (2 Flute, Ball Nose)

MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	
P	< 30	v _c (m/min)	35	35	35	35	30	30	30	35	35	35	35	30	
		n	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500	
		f _z	0.009	0.014	0.019	0.025	0.029	0.037	0.048	0.049	0.057	0.065	0.073	0.085	
	f (mm/min)	90	10	10	105	10	95	95	85	85	85	85	85		
30-40	v _c (m/min)	30	25	25	25	25	30	25	30	25	25	25	25		
	n	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430		
	f _z	0.005	0.008	0.011	0.013	0.016	0.02	0.026	0.031	0.036	0.042	0.047	0.052		
f (mm/min)	45	45	45	45	45	45	45	45	45	45	45	45			
K	31-33	v _c (m/min)	45	45	45	45	45	45	45	45	45	45	45		
		n	7300	4900	3600	2900	2400	1800	1430	1200	1000	920	810	730	
		f _z	0.01	0.016	0.0258	0.04	0.052	0.089	0.112	0.133	0.163	0.177	0.201	0.199	
		f (mm/min)	150	160	200	230	250	320	320	320	325	325	325	290	
N	71-73	v _c (m/min)	135	135	135	140	135	140	135	135	130	135	135	130	
		n	21500	14300	10900	8800	7260	5500	4300	3600	3000	2700	2400	2100	
		f _z	0.007	0.01	0.013	0.019	0.023	0.035	0.044	0.061	0.073	0.07	0.079	0.09	
		f (mm/min)	280	280	280	330	330	380	380	440	440	380	380	380	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \varnothing}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \varnothing}{1000}$$

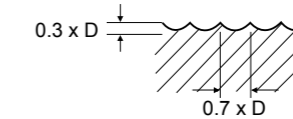
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION



313323, 314323, 162323 (2 Flute, Ball Nose, TiAlN)

MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	
P	< 30	v _c (m/min)	45	45	45	45	45	45	45	45	45	45	45	45	
		n	7280	4900	3640	2940	2380	1780	1400	1220	1050	910	810	700	
		f _z	0.009	0.014	0.019	0.025	0.029	0.038	0.048	0.049	0.058	0.066	0.074	0.086	
	f (mm/min)	125	140	140	145	140	135	135	120	120	120	120	120		
30-40	v _c (m/min)	40	40	35	35	40	40	40	40	40	40	40	40		
	n	6160	4060	2940	2380	2000	1540	1220	1020	870	755	670	600		
	f _z	0.005	0.008	0.011	0.014	0.016	0.021	0.027	0.032	0.037	0.043	0.049	0.054		
f (mm/min)	65	65	65	65	65	65	65	65	65	65	65	65			
K	31-33	v _c (m/min)	65	65	65	65	65	65	65	65	65	65	65		
		n	10220	6860	5040	4060	33360	2520	2000	1680	1400	1290	1135	1020	
		f _z	0.01	0.016	0.028	0.039	0.052	0.059	0.113	0.134	0.163	0.176	0.2	0.199	
		f (mm/min)	210	225	280	320	350	450	450	450	455	455	455	405	
N	71-73	v _c (m/min)	190	190	190	195	190	195	190	190	185	190	185		
		n	30100	20020	15260	12320	10165	7700	6020	5040	4200	3780	3360	2940	
		f _z	0.006	0.01	0.013	0.019	0.023	0.034	0.044	0.061	0.073	0.07	0.079	0.09	
		f (mm/min)	390	390	390	460	460	530	530	615	615	530	530	530	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \varnothing}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \varnothing}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

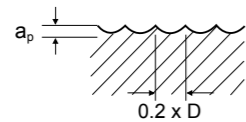


307303, 308303 (3 Flute, Ball Nose)

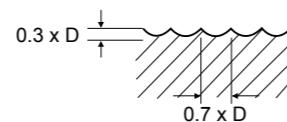


MATERIAL GROUP	HRc		Size (mm)										
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0	
P	< 30	11	v_c (m/min)	83	86	94	105	118	132	144	158	172	171
		12	n	88500	68800	6000	5580	4690	4190	3830	3140	2730	2180
			f_z	0.019	0.026	0.033	0.043	0.068	0.089	0.112	0.137	0.15	0.15
			f (mm/min)	500	545	600	770	960	1125	1290	1290	1230	980
	30-40	13	v_c (m/min)	62	69	75	86	95	105	116	124	135	135
		14	n	6580	5500	4770	4540	3770	3350	3080	2460	2150	1720
			f_z	0.017	0.0024	0.03	0.046	0.06	0.077	0.089	0.108	0.119	0.11
			f (mm/min)	340	390	430	630	680	770	820	800	770	570
K	31-33	v_c (m/min)	51	50	50	49	48	50	51	50	51	50	
		n	5420	3960	3190	2620	1920	1580	1350	1000	810	640	
		f_z	0.012	0.021	0.03	0.039	0.068	0.082	0.096	0.133	0.158	0.151	
		f (mm/min)	195	250	290	310	390	390	390	400	360	290	
N	71-73	v_c (m/min)	149	149	146	149	153	149	149	149	143	142	
		n	15770	11850	9310	7920	6080	4730	3960	2960	2270	1810	
		f_z	0.007	0.01	0.015	0.017	0.026	0.033	0.046	0.053	0.069	0.07	
		f (mm/min)	350	350	410	410	470	470	545	470	470	380	

STEEL
 a_p : $\phi 3.0\text{mm} - \phi 6.0\text{mm} = 0.2 \times D$
 a_p : $\phi 8.0\text{mm} - \phi 25.0\text{mm} = 0.3 \times D$



CAST IRON, ALUMINIUM



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

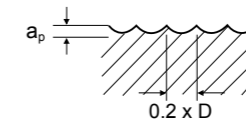


307323, 308323 (3 Flute, Ball Nose, TiAlN)

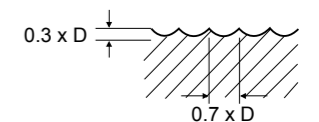


MATERIAL GROUP	HRc		Size (mm)										
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0	
P	< 30	11	v_c (m/min)	108	112	123	137	153	171	188	206	223	223
		12	n	11500	8950	7800	7250	6100	5450	4990	4090	3550	2840
			f_z	0.019	0.026	0.033	0.046	0.068	0.089	0.112	0.136	0.15	0.15
			f (mm/min)	650	710	780	995	1245	1460	1670	1670	1600	1280
	30-40	13	v_c (m/min)	81	90	97	111	123	137	151	161	176	176
		14	n	8550	7150	6200	5900	4900	4350	4000	3200	2800	2240
			f_z	0.017	0.024	0.03	0.046	0.061	0.076	0.089	0.108	0.118	0.110
			f (mm/min)	255	320	370	405	510	510	510	525	470	370
K	31-33	v_c (m/min)	66	65	65	64	63	64	66	65	66	65	
		n	7050	5150	4150	3400	2500	2050	1750	1300	1050	830	
		f_z	0.012	0.021	0.06	0.04	0.068	0.083	0.097	0.135	0.149	0.149	
		f (mm/min)	255	320	370	405	510	510	510	525	470	370	
N	71-73	v_c (m/min)	193	194	190	194	199	193	194	194	185	185	
		n	20500	15400	12100	10300	7900	6150	5150	3850	2950	2360	
		f_z	0.007	0.01	0.015	0.017	0.026	0.033	0.046	0.053	0.069	0.069	
		f (mm/min)	450	450	535	535	615	615	710	615	615	490	

STEEL
 a_p : $\phi 3.0\text{mm} - \phi 6.0\text{mm} = 0.2 \times D$
 a_p : $\phi 8.0\text{mm} - \phi 25.0\text{mm} = 0.3 \times D$



CAST IRON, ALUMINIUM



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

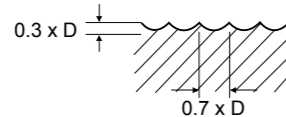
K30 CARBIDE CUTTING CONDITION



315303, 316303 (4 Flute, Ball Nose)



MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	
P	< 30	11	v_c (m/min)	35	35	35	35	30	30	30	35	35	35	35	30
		12	n	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
		f_z	0.007	0.011	0.014	0.019	0.022	0.028	0.035	0.037	0.043	0.05	0.056	0.065	
	30-40	13	f (mm/min)	140	150	150	160	150	140	140	130	130	130	130	130
		14	v_c (m/min)	30	25	25	25	25	30	25	30	25	25	25	25
		n	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430	
K	31-33	f_z	0.004	0.006	0.008	0.01	0.012	0.016	0.02	0.024	0.028	0.032	0.036	0.041	
		f (mm/min)	70	70	70	70	70	70	70	70	70	70	70	70	
		v_c (m/min)	45	45	45	45	45	45	45	45	45	45	45	45	
		n	7300	4900	3600	2900	2400	1800	1430	1200	1000	920	810	730	
N	71-73	f_z	0.008	0.012	0.021	0.03	0.04	0.067	0.084	0.1	0.123	0.133	0.151	0.151	
		f (mm/min)	230	240	300	350	380	480	480	480	490	490	490	440	
		v_c (m/min)	135	135	135	140	135	140	135	135	130	135	135	130	
		n	21500	14300	10900	8800	7260	5500	4300	3600	3000	2700	2400	2100	
		f_z	0.005	0.007	0.01	0.014	0.017	0.026	0.033	0.046	0.055	0.053	0.059	0.068	
		f (mm/min)	420	420	420	500	500	570	570	660	660	570	570	570	
		n	21500	14300	10900	8800	7260	5500	4300	3600	3000	2700	2400	2100	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

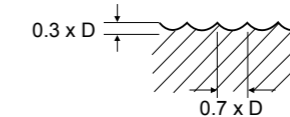
K30 CARBIDE CUTTING CONDITION



315323, 316323 (4 Flute, Ball Nose, TiAlN)



MATERIAL GROUP	HRc		Size (mm)												
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	
P	< 30	11	v_c (m/min)	45	45	45	45	45	45	45	45	45	45	45	45
		12	n	7280	4900	3640	2940	2380	1780	1400	1220	1050	910	810	700
		f_z	0.007	0.011	0.014	0.019	0.022	0.027	0.035	0.037	0.043	0.049	0.056	0.064	
	30-40	13	f (mm/min)	195	210	210	225	210	195	195	180	180	180	180	180
		14	v_c (m/min)	40	40	35	35	40	40	40	40	40	40	40	40
		n	6160	4060	2940	2380	2000	1540	1220	1020	870	755	670	600	
K	31-33	f_z	0.004	0.006	0.009	0.011	0.013	0.016	0.02	0.025	0.029	0.033	0.037	0.042	
		f (mm/min)	100	100	100	100	100	100	100	100	100	100	100	100	
		v_c (m/min)	65	65	65	65	65	65	65	65	65	65	65	65	
		n	10220	6860	5040	4060	33360	2520	2000	1680	1400	1290	1135	1020	
N	71-73	f_z	0.008	0.012	0.021	0.03	0.039	0.066	0.084	0.1	0.122	0.133	0.151	0.151	
		f (mm/min)	320	335	420	490	530	670	670	670	685	685	685	615	
		v_c (m/min)	190	190	190	195	190	195	190	190	185	190	190	185	
		n	30100	20020	15260	12320	10165	7700	6020	5040	4200	3780	3360	2940	
		f_z	0.005	0.007	0.01	0.014	0.017	0.026	0.033	0.046	0.055	0.053	0.06	0.068	
		f (mm/min)	590	590	590	700	700	800	800	925	925	800	800	800	
		n	30100	20020	15260	12320	10165	7700	6020	5040	4200	3780	3360	2940	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

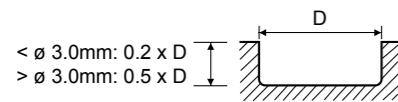


120323, 121323 (2 Flute, Corner Radius)

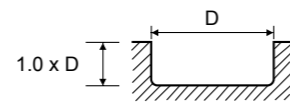


MATERIAL GROUP	HRc		Size (mm)									
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0		
P	< 30	11	v_c (m/min)	50	55	65	70	70	70	70	70	
		12	n	7850	6100	5150	4300	3800	2850	2200	1850	
			f_z	0.01	0.015	0.025	0.031	0.039	0.057	0.064	0.065	
			f (mm/min)	160	180	255	270	300	325	280	240	
	30-45	13	v_c (m/min)	30	35	40	40	45	45	40	45	
		14	n	5150	3800	3150	2550	2300	1700	1350	1150	
			f_z	0.01	0.016	0.025	0.031	0.041	0.05	0.05	0.048	
			f (mm/min)	100	120	155	160	190	170	135	110	
M		21	v_c (m/min)	25	30	35	35	35	35	35		
		22	n	4300	3150	2650	2150	1950	1450	1150	950	
			f_z	0.009	0.016	0.025	0.031	0.04	0.053	0.059	0.058	
			f (mm/min)	80	100	130	135	155	155	135	110	
K		31	v_c (m/min)	60	55	60	55	55	55	60	55	
		32	n	9350	6050	4600	3650	2950	2200	1850	1450	
		33	f_z	0.012	0.018	0.024	0.03	0.043	0.063	0.077	0.102	
			f (mm/min)	220	220	220	220	255	275	285	295	
N		61	v_c (m/min)	105	105	110	105	105	110	105	105	
		62	n	16500	1000	8800	6800	5700	4400	3400	2850	
		63	f_z	0.01	0.015	0.019	0.025	0.033	0.043	0.055	0.066	
			f (mm/min)	340	340	340	340	375	375	375	375	
	71		71	v_c (m/min)	140	145	140	145	145	145	145	140
			72	n	22000	15400	11000	9150	7600	5700	4600	3750
			73	f_z	0.01	0.015	0.021	0.025	0.032	0.043	0.053	0.065
				f (mm/min)	460	460	460	460	485	485	485	485

STEEL, STAINLESS STEEL



CAST IRON, COPPER, ALUMINIUM



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

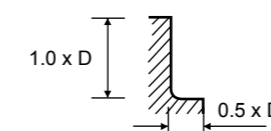


140323, 142323 (4 Flute, Corner Radius)

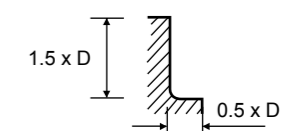


MATERIAL GROUP	HRc		Size (mm)									
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0		
P	< 30	11	v_c (m/min)	60	70	80	85	90	90	85	90	
		12	n	9850	7600	6450	5350	4750	3550	2750	2350	
			f_z	0.006	0.009	0.019	0.024	0.029	0.043	0.047	0.047	
			f (mm/min)	240	270	480	510	560	605	520	440	
	30-45		13	v_c (m/min)	40	45	50	50	55	55	55	55
			14	n	6450	4750	3950	3200	2850	2150	1700	1450
				f_z	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037
				f (mm/min)	145	170	300	305	350	325	255	215
M		21	v_c (m/min)	35	35	40	40	45	45	45	45	
		22	n	5350	3950	3300	2700	2400	1800	1450	1150	
			f_z	0.006	0.009	0.018	0.024	0.029	0.042	0.044	0.045	
			f (mm/min)	120	145	240	255	280	300	255	205	
K		31	v_c (m/min)	60	55	60	55	55	55	60	55	
		32	n	9350	6050	4600	3650	2950	2200	1850	1450	
		33	f_z	0.017	0.026	0.035	0.044	0.065	0.093	0.116	0.155	
			f (mm/min)	640	640	640	640	770	815	860	900	
N		61	v_c (m/min)	105	105	110	105	105	110	105	105	
		62	n	16500	11000	8800	6800	5700	4400	3400	2850	
		63	f_z	0.016	0.024	0.029	0.038	0.048	0.063	0.081	0.096	
			f (mm/min)	1035	1035	1035	1035	1100	1100	1100	1100	
	71		71	v_c (m/min)	140	145	140	145	145	145	145	140
			72	n	22000	15400	11000	9150	7600	5700	4600	3750
			73	f_z	0.015	0.021	0.03	0.036	0.047	0.063	0.078	0.095
				f (mm/min)	1320	1320	1320	1320	1430	1430	1430	1430

STEEL, STAINLESS STEEL



CAST IRON, COPPER, ALUMINIUM



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION



197303 (2 Flute Drill Mill)

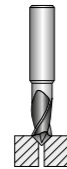


199323 (4 Flute Chamfer Mill)



CHAMFERING

MATERIAL GROUP	HRc		Size (mm)										
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0		
P	< 30	11	v _c (m/min)	35	40	40	40	40	40	30	45		
		12		n	3500	3000	2400	2000	1540	1300	1100	950	750
				f _z	0.023	0.027	0.035	0.043	0.058	0.073	0.091	0.105	0.140
				f (mm/min)	160	160	170	170	180	190	200	200	210
	30-40	13	v _c (m/min)	30	30	30	30	30	35	35	20	40	
		14		n	2000	2500	2000	1600	1200	1100	900	700	600
				f _z	0.023	0.028	0.035	0.044	0.06	0.066	0.083	0.114	0.133
				f (mm/min)	140	140	140	140	145	145	150	160	160
M	21	v _c (m/min)	25	25	30	25	25	25	30	15	35		
			22	n	2400	2000	1760	1400	1000	870	730	550	530
				f _z	0.021	0.025	0.03	0.038	0.55	0.063	0.079	0.109	0.123
				f (mm/min)	100	100	105	105	110	110	115	120	130
N	71	v _c (m/min)	105	115	110	105	110	125	130	85	140		
			72	n	11000	9000	6900	5600	4400	4000	3500	2750	2200
			73	f _z	0.025	0.032	0.045	0.057	0.075	0.085	0.1	0.135	0.175
				f (mm/min)	550	580	620	640	660	680	700	740	770
S	41	v _c (m/min)	25	25	30	25	25	25	30	15	35		
			42	n	2400	2000	1760	1400	1000	870	730	550	530
			43	f _z	0.021	0.025	0.03	0.038	0.55	0.063	0.079	0.109	0.123
				f (mm/min)	100	100	105	105	110	110	115	120	130



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION



197303 (2 Flute Drill Mill)



CHAMFERING & PROFILING

MATERIAL GROUP	HRc		Size (mm)										
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0		
P	< 30	11	v _c (m/min)	35	40	40	40	40	40	45	45		
		12		n	3900	3200	2500	2000	1540	1300	1100	900	700
				f _z	0.008	0.01	0.013	0.018	0.024	0.031	0.041	0.05	0.064
				f (mm/min)	65	65	65	70	75	80	90	90	90
	30-40	13	v _c (m/min)	30	35	35	35	35	40	40	40	40	
		14		n	3300	2800	2200	1800	1300	1200	1000	770	600
				f _z	0.008	0.009	0.013	0.017	0.025	0.027	0.035	0.045	0.058
				f (mm/min)	50	50	55	60	65	65	70	70	70
M	21	v _c (m/min)	25	25	30	25	30	30	30	35	30		
			22	n	2400	2000	1760	1400	1100	1000	840	660	440
				f _z	0.008	0.01	0.013	0.018	0.025	0.028	0.036	0.045	0.068
				f (mm/min)	40	40	45	50	55	55	60	60	60
N	71	v _c (m/min)	130	150	150	145	145	160	165	165	165		
			72	n	14000	12000	9500	7700	5800	5100	4400	3300	2640
			73	f _z	0.008	0.01	0.013	0.019	0.03	0.037	0.045	0.05	0.064
				f (mm/min)	230	240	250	300	350	280	400	330	340
S	41	v _c (m/min)	25	25	30	25	30	30	30	35	30		
			42	n	2400	2000	1760	1400	1100	1000	840	660	440
			43	f _z	0.008	0.01	0.013	0.018	0.025	0.028	0.036	0.045	0.068
				f (mm/min)	40	40	45	50	55	55	60	60	60



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

K30 CARBIDE CUTTING CONDITION

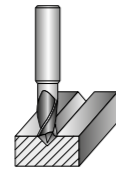


197303 (2 Flute Drill Mill)



V-GROOVING

MATERIAL GROUP	HRc		Size (mm)									
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	
P	< 30	v _c (m/min)	40	40	40	40	40	40	40	40	45	45
		n	4000	3300	2500	2000	1540	1300	1000	900	700	
		f _z	0.004	0.005	0.006	0.008	0.011	0.013	0.02	0.022	0.029	
	30-40	f (mm/min)	30	30	30	30	35	35	40	40	40	
		v _c (m/min)	30	35	35	35	35	40	40	40	40	
		n	3300	2800	2200	1800	1300	1200	1000	770	600	
M	21-22	f _z	0.004	0.004	0.006	0.008	0.013	0.015	0.018	0.023	0.029	
		f (mm/min)	25	25	25	30	35	35	35	35	35	
		v _c (m/min)	25	25	30	25	30	30	20	35	30	
		n	2400	2000	1760	1400	1100	1000	840	660	440	
N	71-73	f _z	0.004	0.005	0.006	0.007	0.009	0.01	0.012	0.019	0.028	
		f (mm/min)	20	20	20	20	20	20	20	25	25	
		v _c (m/min)	130	150	150	145	145	155	165	165	165	
		n	14000	11800	9500	7700	5800	5000	4400	3300	2600	
S	41-43	f _z	0.008	0.01	0.013	0.016	0.022	0.026	0.03	0.041	0.052	
		f (mm/min)	220	230	240	250	260	260	260	270	270	
		v _c (m/min)	25	25	30	25	30	30	20	35	30	
		n	2400	2000	1760	1400	1100	1000	840	660	440	
S	41-43	f _z	0.004	0.005	0.006	0.007	0.009	0.01	0.012	0.019	0.028	
		f (mm/min)	20	20	20	20	20	20	20	25	25	
		v _c (m/min)	25	25	30	25	30	30	20	35	30	
		n	2400	2000	1760	1400	1100	1000	840	660	440	



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \times 1000}{\pi \times \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \times \pi \times \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.



SUPERIOR PERFORMANCE



PM75E MULTIPLE HELIX



Multiple helix geometry for improved stability and reduced chatter giving better workpiece finishes.

Premium HSS-PM base designed for extended tool life across a wide range of material groups.

Unequal indexed flutes for reduced vibration and increased chip flow.

Centre cutting, can be used for plunging.

IDEAL FOR MATERIAL GROUPS



HSS PM FLATTED SHANK END MILLS



HSS PM milling cutters for general use on a variety of materials



www.europatool.co.uk

●: Excellent ○: Good

P				H		M			K				S					N								O																							
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84																			
																														Code	Item	Description	Page No.																
● ● ● ●						● ●			● ● ● ● ○ ○																					128128		Short Length ø3.0mm - 10.0mm	P.66																
● ● ● ●						● ●			● ● ● ● ○ ○																					129128		Long Length ø5.0mm - 8.0mm	P.67																
● ● ● ●						● ●			● ● ● ● ○ ○																																								
● ● ● ●						● ●			● ● ● ● ○ ○																																								

3 FLUTE THROWAWAY END MILLS

4 FLUTE END MILLS

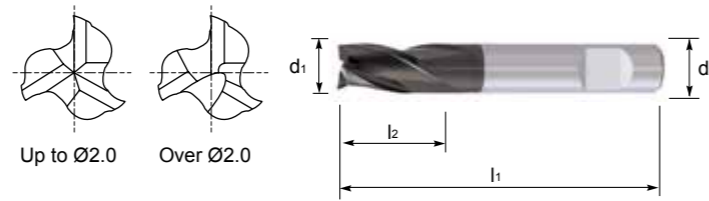
ROUGHING END MILLS

3 FLUTE THROWAWAY SHORT



Series No. 128128

▶ cutting conditions : p.70-71



ASP60 powder metallurgy substrate
Unique VX high performance coating
DIN standard shanks

Mill Dia. (d ₁)	Shank Dia. (d ₂)	Length of Cut l ₂	Overall Length l ₁	EUROPA CODE
1.0	6	2.0	34	1281280100
1.5		3.0	34	1281280150
2.0		4.0	35	1281280200
2.5		5.0	36	1281280250
3.0		5.0	36	1281280300
3.5		6.0	37	1281280350
4.0		7.0	38	1281280400
4.5		7.0	38	1281280450
5.0		8.0	39	1281280500
5.5		8.0	39	1281280550
6.0	8	8.0	39	1281280600
6.5		10.0	42	1281280650
7.0		10.0	42	1281280700
7.5		10.0	42	1281280750
8.0	10	11.0	43	1281280800
8.5		11.0	48	1281280850
9.0		11.0	48	1281280900
9.5		11.0	48	1281280950
10.0	12	13.0	50	1281281000
12.0		16.0	58	1281281200

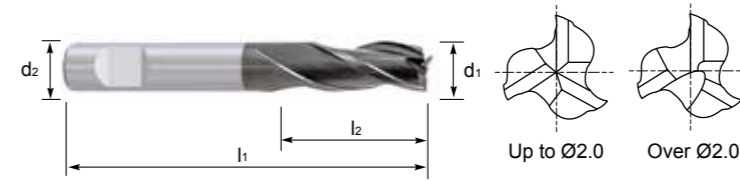
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	●	●	○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●	●									

3 FLUTE THROWAWAY LONG



Series No. 129128

▶ cutting conditions : p.70-71



ASP60 powder metallurgy substrate
Unique VX high performance coating
DIN standard shanks

Mill Dia. (d ₁)	Shank Dia. (d ₂)	Length of Cut l ₂	Overall Length l ₁	EUROPA CODE
1.5	6	4.0	35	1291280150
2.0		7.0	38	1291280200
2.5		8.0	39	1291280250
3.0		8.0	39	1291280300
3.5		10.0	41	1291280350
4.0		11.0	42	1291280400
4.5		11.0	42	1291280450
5.0		13.0	44	1291280500
5.5		13.0	44	1291280550
6.0		13.0	44	1291280600
6.5	8	16.0	48	1291280650
8.0		19.0	51	1291280800
8.5	10	19.0	56	1291280850
10.0		22.0	59	1291281000

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	●	●	○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●	●									

4 FLUTE MULTIPLE HELIX



Series No. PM75E

▶ cutting conditions : p.72

Specially designed to reduce vibration and improve workpiece finish.
Excellent performance in unstable conditions.



Mill Dia. (d ₁)	Shank Dia. (d ₂)	Length of Cut l ₂	Overall Length l ₁	EUROPA CODE
3.0	6	8.0	52	PM75E0300
4.0		11.0	55	PM75E0400
5.0		13.0	57	PM75E0500
6.0		13.0	57	PM75E0600
8.0	8	19.0	69	PM75E0800
10.0	10	22.0	72	PM75E1000
12.0	12	26.0	83	PM75E1200
14.0		26.0	83	PM75E1400
16.0	16	32.0	92	PM75E1600
18.0		32.0	92	PM75E1800
20.0		38.0	104	PM75E2000
25.0	25	45.0	121	PM75E2500

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	●	●									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●	●	○	○							

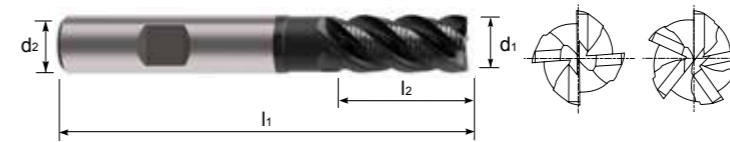
ROUGHING MULTIPLE HELIX



Series No. PM75S

▶ cutting conditions : p.73

Specially designed to reduce vibration and improve workpiece finish.
Excellent performance in unstable conditions.



Mill Dia. (d ₁)	Corner Radius	Shank Dia. (d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flutes z	EUROPA CODE
6.0	0.5	6	13.0	57	4	PM75S0600
8.0	0.5	10	19.0	69	4	PM75S0800
10.0	0.5		22.0	72	4	PM75S1000
12.0	0.5	12	26.0	83	4	PM75S1200
14.0	1.0		26.0	83	5	PM75S1400
16.0	1.0	16	32.0	92	5	PM75S1600
18.0	1.0		32.0	92	5	PM75S1800
20.0	1.0		38.0	104	5	PM75S2000
25.0	1.0	25	45.0	121	5	PM75S2500

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	●	●									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●	●	○	○							

PM CUTTING CONDITION

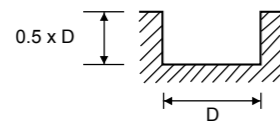


128128, 129128 (3 Flute Throwaway)



SLOTTING

MATERIAL GROUP	HRc		Size (mm)									
			1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	
P	< 30	11	v_c (m/min)	30	36	38	45	49	52	54	54	54
			n	9550	5730	4000	3580	3120	2750	2150	1720	1430
		12	f_z	0.002	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052
			f (mm/min)	57	70	85	95	110	170	185	225	220
	30-40	13	v_c (m/min)	20	23	25	29	32	33	35	35	35
			n	6360	3660	2650	2300	2030	1750	1390	1115	925
		14	f_z	0.001	0.003	0.005	0.009	0.012	0.021	0.028	0.039	0.047
			f (mm/min)	15	30	40	60	70	110	115	125	130
M	21	v_c (m/min)	12	16	22	25	27	27	28	29	30	
		n	3820	2545	2335	1990	1720	1430	1110	920	795	
		f_z	0.003	0.005	0.008	0.012	0.014	0.023	0.031	0.044	0.052	
		f (mm/min)	30	35	55	70	70	95	100	120	120	
K	31	v_c (m/min)	30	36	38	45	49	52	54	54	54	
		n	9550	5730	4000	3580	3120	2750	2150	1720	1430	
		f_z	0.002	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052	
		f (mm/min)	57	70	85	95	110	170	185	225	220	
S	41	v_c (m/min)	12	16	22	25	27	27	28	29	30	
		n	3820	2545	2335	1990	1720	1430	1110	920	795	
		f_z	0.003	0.005	0.008	0.012	0.014	0.023	0.031	0.044	0.052	
		f (mm/min)	30	35	55	70	70	95	100	120	120	



► The feed rate for long length tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PM CUTTING CONDITION

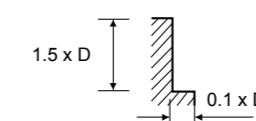


128128, 129128 (3 Flute Throwaway)



SIDE CUTTING

MATERIAL GROUP	HRc		Size (mm)								
			1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	
P	< 30	11	v_c (m/min)	39	41	43	53	55	59	60	60
			n	8280	6525	4565	4220	3500	3130	2385	1910
		12	f_z	0.003	0.004	0.008	0.011	0.014	0.023	0.033	0.043
			f (mm/min)	75	75	110	135	145	215	235	245
	30-40	13	v_c (m/min)	25	29	31	35	38	41	44	44
			n	5300	4615	3290	2785	2420	2175	1750	1400
		14	f_z	0.003	0.004	0.007	0.01	0.014	0.025	0.036	0.05
			f (mm/min)	45	55	65	80	100	160	185	210
M	21	v_c (m/min)	17	20	27	32	35	36	37	37	
		n	3600	3180	2865	2545	2225	1910	1470	1175	
		f_z	0.004	0.006	0.01	0.013	0.015	0.022	0.036	0.047	
		f (mm/min)	40	55	85	95	100	125	155	165	
K	31	v_c (m/min)	39	41	43	53	55	59	60	60	
		n	8280	6525	4565	4220	3500	3130	2385	1910	
		f_z	0.003	0.004	0.007	0.01	0.015	0.025	0.033	0.043	
		f (mm/min)	75	75	110	135	145	215	235	245	
S	41	v_c (m/min)	17	20	27	32	35	36	37	37	
		n	3600	3180	2865	2545	2225	1910	1470	1175	
		f_z	0.004	0.006	0.01	0.013	0.015	0.022	0.036	0.047	
		f (mm/min)	40	55	85	95	100	125	155	165	



► The feed rate for long length tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut


To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

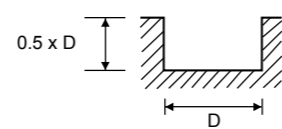
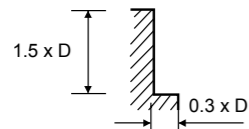
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PM CUTTING CONDITION



PM75E (4 Flute End Mill) 

MATERIAL GROUP	HRc		Size (mm)										
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0		
P	< 20	11	v_c (m/min)	70	70	77	77	77	77	77	77	77	
		12		n	3715	2785	2450	2040	1750	1530	1360	1225	980
				f_z	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				f (mm/min)	238	312	383	384	343	325	322	319	247
	20-35	13	v_c (m/min)	44	44	49	49	49	49	49	49	49	
		14		n	2335	1750	1560	1300	1115	975	865	780	620
				f_z	0.016	0.028	0.038	0.047	0.05	0.052	0.058	0.066	0.065
				f (mm/min)	149	196	237	244	223	203	201	206	162
M	21	v_c (m/min)	48	48	48	48	48	48	48	48	48		
			22	n	2545	1910	1525	1270	1090	955	850	760	610
				f_z	0.018	0.029	0.048	0.056	0.06	0.063	0.081	0.077	0.078
				f (mm/min)	183	222	294	285	262	241	275	235	191
K	31	v_c (m/min)	45	55	50	50	50	55	55	55	50		
			32	n	2385	2185	1590	1325	1135	1095	970	875	635
				f_z	0.018	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				f (mm/min)	172	245	242	249	227	228	230	231	166
S	51	v_c (m/min)	15	15	18	18	18	18	18	18	18		
			52	n	795	595	570	475	405	355	315	285	230
				f_z	0.016	0.024	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				f (mm/min)	50	57	89	90	80	76	75	75	58



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut


To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

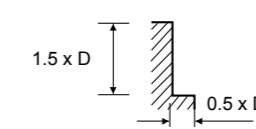
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PM CUTTING CONDITION



PM75S (4 & 5 Flute Roughing) 

MATERIAL GROUP	HRc		Size (mm)										
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0		
P	< 30	11	v_c (m/min)	60	69	68	65	66	69	72	68	68	
		12		n	3185	2745	2165	1725	1500	1370	1270	1080	865
				f_z	0.021	0.03	0.056	0.069	0.063	0.069	0.074	0.087	0.106
				f (mm/min)	268	330	485	476	473	474	470	470	459
	30-40	13	v_c (m/min)	43	51	47	49	48	48	50	48	47	
		14		n	2280	2030	1495	1300	1090	955	885	760	600
				f_z	0.018	0.028	0.046	0.063	0.061	0.069	0.086	0.086	0.107
				f (mm/min)	164	227	275	328	333	330	380	329	320
M	21	v_c (m/min)	39	43	43	43	44	43	45	44	44		
			22	n	2070	1710	1365	1140	1000	855	795	700	560
				f_z	0.019	0.03	0.045	0.064	0.059	0.069	0.075	0.084	0.104
				f (mm/min)	157	205	246	292	295	295	299	294	290
K	31	v_c (m/min)	40	50	45	45	45	50	50	50	45		
			32	n	2120	1990	1430	1190	1020	995	885	795	570
				f_z	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.088
				f (mm/min)	170	239	304	330	322	343	274	287	252
S	41	v_c (m/min)	12	12	15	15	15	15	15	15	15		
			42	n	635	475	475	395	340	300	265	235	190
				f_z	0.018	0.028	0.042	0.061	0.055	0.066	0.06	0.069	0.082
				f (mm/min)	46	54	80	97	94	90	80	82	78



v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

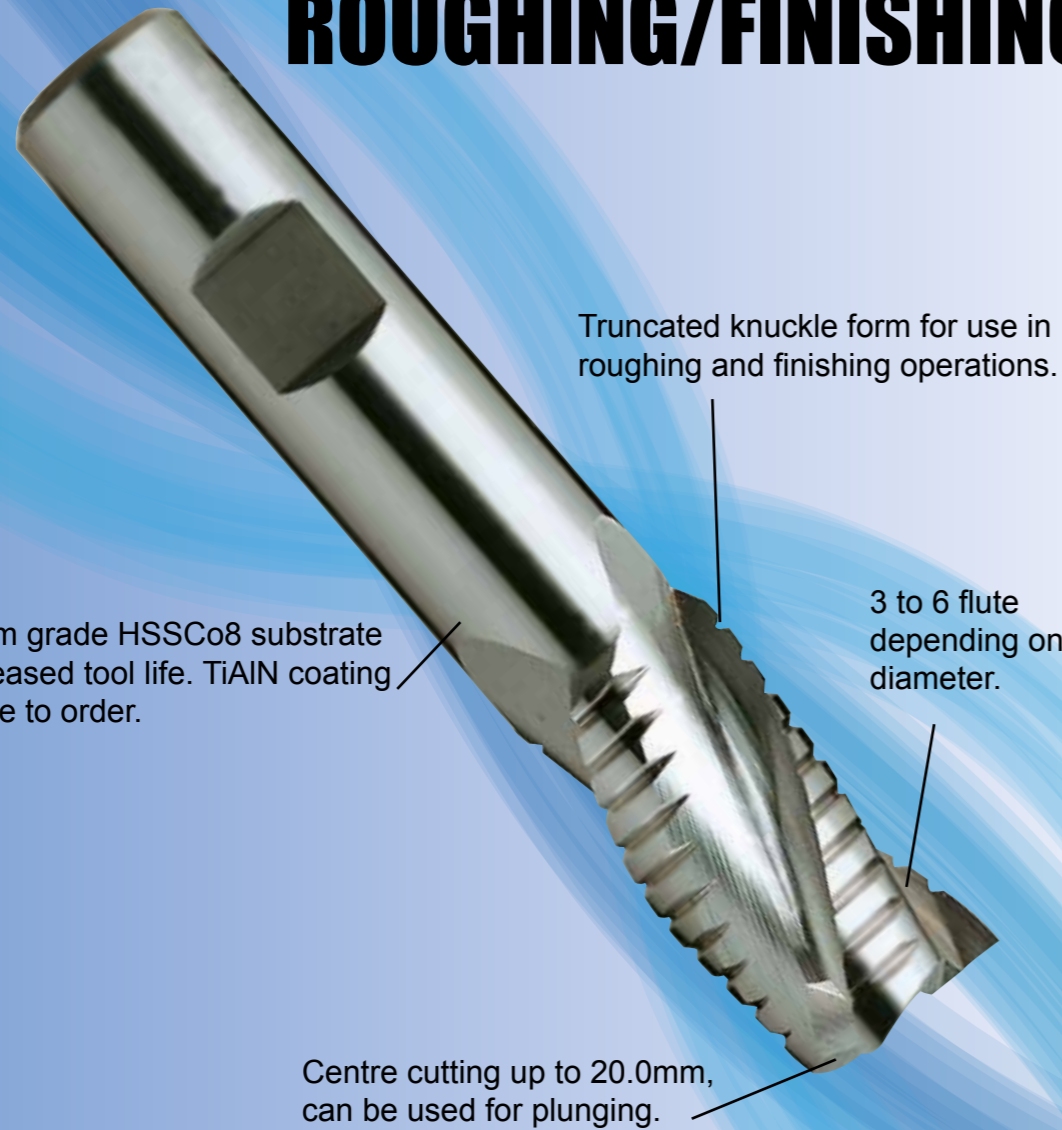
To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SUPERIOR PERFORMANCE



COARSE PITCH ROUGHING/FINISHING



IDEAL FOR MATERIAL GROUPS



HSSCo FLATTED SHANK END MILLS
























8% Cobalt milling cutters for general use on a variety of materials

















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●: Excellent ○: Good

P				H		M			K				S					N				O																																					
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84		Code	Item	Description	Page No.																								
																												1-FLUTE END MILLS																															
																													135316		Short Length Router ø3.0mm - 10.0mm	P.96																											
																													136316		Long Length Router ø5.0mm - 8.0mm	P.97																											
																												2-FLUTE END MILLS																															
●	●	●	●																				○	○	○							100102		Short Length DIN327 ø1.0mm - 32.0mm	P.80-81																								
●	●	●	●																				○	○	○							101102		Long Length DIN844 ø2.0mm - 25.0mm	P.82																								
●	●	●	●																				○	○	○							102102		Extra Long Length DIN844 ø3.0mm - 25.0mm	P.83																								
●	●	●	●																				○	○	○							112102		Short Length DIN327 Ball Nose ø3.0mm - 25.0mm	P.89																								
●	●	●	●																				○	○	○							114102		Long Length DIN844 Ball Nose ø3.0mm - 25.0mm	P.90																								
																															Short Length DIN844 42° Helix ø2.0mm - 25.0mm	P.98																											
																												3-FLUTE END MILLS																															
●	●	●	●																				○	○	○							103102		Stub Length DIN327 ø2.0mm - 25.0mm	P.84																								
●	●	●	●																				○	○	○							104102		Short Length DIN844 ø1.5mm - 30.0mm	P.85																								
●	●	●	●																				○	○	○							105102		Long Length DIN844 ø3.0mm - 25.0mm	P.86																								
●	●	●	●																				○	○	○							128102		Short Length DIN Throwaway ø1.0mm - 20.0mm	P.94																								
●	●	●	●																				○	○	○							129102		Long Length DIN Throwaway ø1.5mm - 10.0mm	P.95																								
●	●	●	●																				○	○	○							328102 (24M)		Short Length BS Throwaway ø1.0mm - 10.0mm	P.113																								
●	●	●	●																				○	○	○							329102 (24L)		Long Length BS Throwaway ø1.5mm - 10.0mm	P.114																								
●	●	●	●																				○	○	○							334102 (24N)		Long Length BS Throwaway B/N ø2.0mm - 6.0mm	P.115																								
																												MULTI-FLUTE END MILLS																															
●	●	●	●																				○	○	○							107102		Short Length DIN844 ø2.0mm - 32.0mm	P.87																								
●	●	●	●																				○	○	○							108102		Long Length DIN844 ø3.0mm - 25.0mm	P.88																								
●	●	●	●																				○	○	○							115102		Short Length DIN1889 Ball Nose ø6.0mm - 25.0mm	P.91																								
●	●	●	●																				○	○	○							116102		Long Length DIN1889 Ball Nose ø10.0mm - 25.0mm	P.92																								
●	●	●	●																				○	○	○							132102		Short Length DIN844 50° Helix ø2.0mm - 30.0mm	P.93																								

CONTINUED OVERLEAF

●: Excellent ○: Good

P				H		M			K				S					N							O				ROUGHING END MILLS					
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84	Code	Item	Description	Page No.
●	●	●	●																				○	○	○						133102		Short Length Coarse 3 Flute DIN844 ø10.0mm - 40.0mm	P.101
●	●	●	●																				○	○	○						134102		Long Length Coarse 3 Flute DIN844 ø10.0mm - 40.0mm	P.102
●	●	●	●																				●	●	●						124102		Short Length Coarse Alu 3 Flute DIN844 37° ø6.0mm - 30.0mm	P.103
●	●	●	●																				●	●	●						125102		Long Length Coarse Alu 3 Flute DIN844 37° ø10.0mm - 30.0mm	P.104
●	●	●	●																				○	○	○						118102		Short Length Coarse Multi Flute DIN844 ø6.0mm - 50.0mm	P.99
●	●	●	●																				○	○	○						119102		Long Length Coarse Multi Flute DIN844 ø6.0mm - 40.0mm	P.100
●	●	●	●																				○	○	○						127102		Short Length Coarse Multi Flute DIN844 B/N ø8.0mm - 40.0mm	P.105
●	●	●	●																				○	○	○						121102		Short Length Fine Multi Flute DIN844 ø6.0mm - 32.0mm	P.106
●	●	●	●																				○	○	○						122102		Long Length Fine Multi Flute DIN844 ø6.0mm - 40.0mm	P.107
●	●	●	●																				○	○	○						121113		Short Length Fine Multi Flute DIN844 PM ø6.0mm - 30.0mm	P.108
																												ROUGHING & FINISHING END MILLS						
●	●	●	●																				○	○	○						138102		Short Length Coarse 3 Flute DIN844 ø6.0mm - 40.0mm	P.111
●	●	●	●																				○	○	○						139102		Long Length Coarse 3 Flute DIN844 ø6.0mm - 40.0mm	P.112
●	●	●	●																				○	○	○						126102		Short Length Coarse Multi Flute DIN844 ø6.0mm - 40.0mm	P.109
●	●	●	●																				○	○	○						137102		Long Length Coarse Multi Flute DIN844 ø6.0mm - 32.0mm	P.110
																														Cutting Data	P.117			

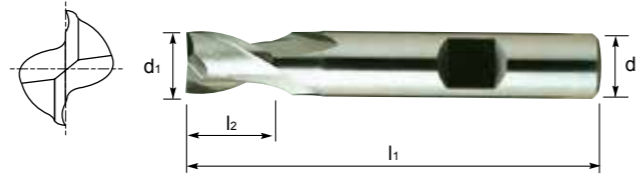
► For material group examples, refer to page 2
 ► For full material group tables, refer to pages 444-449

2 FLUTE, SHORT LENGTH



Series No. 100102

▶ cutting conditions : p.122-123



TWO FLUTE END MILLS

Short Length, 2 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
1.0	6.0	2.5	47.0	1001020100	1001210100
1.5		3.0		1001020150	1001210150
2.0		4.0	48.0	1001020200	1001210200
2.5		5.0		1001020250	1001210250
2.8		5.0	49.0	1001020280	1001210280
3.0		5.0		1001020300	1001210300
3.5		6.0	50.0	1001020350	1001210350
3.8		7.0	51.0	1001020380	1001210380
4.0		7.0		1001020400	1001210400
4.5		7.0	52.0	1001020450	1001210450
4.8		8.0		1001020480	1001210480
5.0		8.0	52.0	1001020500	1001210500
5.5		8.0		1001020550	1001210550
5.75		8.0	60.0	1001020575	1001210575
6.0		8.0		1001020600	1001210600
6.5	10.0	10.0	63.0	1001020650	1001210650
6.75		10.0		1001020675	1001210675
7.0		10.0	61.0	1001020700	1001210700
7.5		10.0		1001020750	1001210750
7.75		11.0	61.0	1001020775	1001210775
8.0		11.0		1001020800	1001210800
8.5		11.0	61.0	1001020850	1001210850
8.7		11.0		1001020870	1001210870
9.0		11.0	63.0	1001020900	1001210900
9.5		11.0		1001020950	1001210950
10.0	12.0	13.0	63.0	1001021000	1001211000
11.0		13.0	70.0	1001021100	1001211100

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

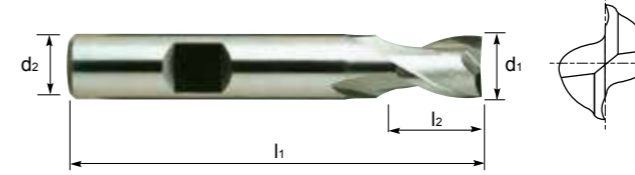
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

2 FLUTE, SHORT LENGTH



Series No. 100102

▶ cutting conditions : p.122-123



TWO FLUTE END MILLS

Short Length, 2 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
8.0	8.0	11.0	55.0	1001029002	1001219002
12.0	12.0	16.0	73.0	1001021200	1001211200
13.0		16.0		1001021300	1001211300
14.0		16.0		1001021400	1001211400
15.0		16.0		1001021500	1001211500
15.7	16.0	19.0	79.0	1001021570	1001211570
16.0		19.0		1001021600	1001211600
17.0		19.0		1001021700	1001211700
17.7		19.0		1001021770	1001211770
18.0		19.0		1001021800	1001211800
19.0		19.0		1001021900	1001211900
20.0	20.0	22.0	88.0	1001022000	1001212000
22.0		22.0		1001022200	1001212200
24.0	25.0	26.0	102.0	1001022400	1001212400
25.0		26.0		1001022500	1001212500
26.0		26.0		1001022600	1001212600
28.0		26.0		1001022800	1001212800
30.0		26.0		1001023000	1001213000
32.0		32.0		32.0	112.0

▶ Sizes above 25mm available while stocks last

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

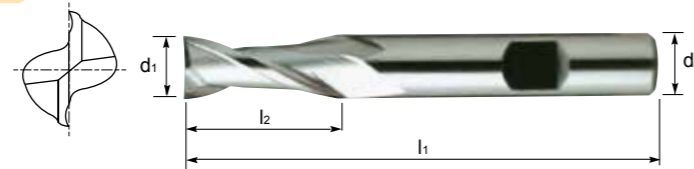
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

2 FLUTE, LONG LENGTH



Series No. 101102

▶ cutting conditions : p.122-123



TWO FLUTE END MILLS

Long Length, 2 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8	
2.0	6.0	7.0	51.0	1011020200	1011210200	
3.0		8.0	52.0	1011020300	1011210300	
4.0		11.0	55.0	1011020400	1011210400	
5.0		13.0	13.0	57.0	1011020500	1011210500
6.0			13.0		1011020600	1011210600
7.0	10.0	16.0	66.0	1011020700	1011210700	
8.0		19.0	69.0	1011020800	1011210800	
10.0		22.0	72.0	1011021000	1011211000	
12.0	12.0	26.0	83.0	1011021200	1011211200	
14.0		26.0		1011021400	1011211400	
16.0	16.0	32.0	92.0	1011021600	1011211600	
18.0		32.0		1011021800	1011211800	
20.0	20.0	38.0	104.0	1011022000	1011212000	
22.0		38.0		1011022200	1011212200	
25.0		45.0		121.0	1011022500	1011212500

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

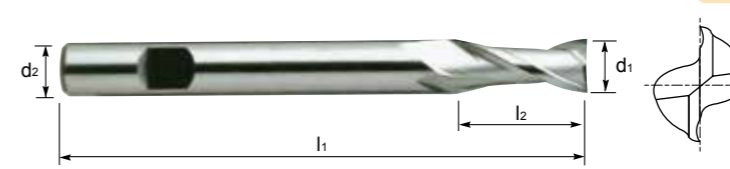
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

2 FLUTE, EXTRA LONG LENGTH



Series No. 102102

▶ cutting conditions : p.122-123



TWO FLUTE END MILLS

Extra Long Length, 2 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8		
3.0	6.0	8.0	56.0	1021020300	1021210300		
3.5		10.0	59.0	1021020350	1021210350		
4.0		11.0	11.0	63.0	1021020400	1021210400	
4.5			11.0		1021020450	1021210450	
5.0		13.0	13.0	68.0	1021020500	1021210500	
5.5	13.0		1021020550		1021210550		
6.0	13.0		1021020600		1021210600		
6.5	10.0	16.0	80.0	1021020650	1021210650		
7.0		16.0		1021020700	1021210700		
8.0		19.0		88.0	1021020800	1021210800	
8.5					19.0	1021020850	1021210850
9.0	19.0	88.0	88.0	1021020900	1021210900		
10.0				22.0	95.0	1021021000	1021211000
12.0						22.0	1021021200
14.0	12.0	26.0	110.0	1021021400	1021211400		
16.0		26.0		1021021600	1021211600		
18.0	16.0	32.0	123.0	1021021800	1021211800		
20.0		32.0		1021022000	1021212000		
22.0	20.0	38.0	141.0	1021022200	1021212200		
25.0		38.0		1021022500	1021212500		

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

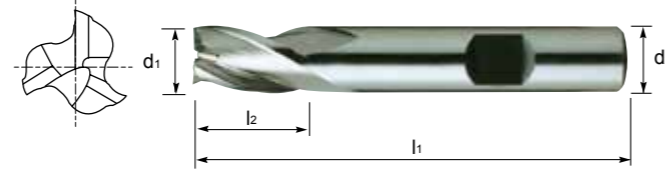
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

3 FLUTE, STUB LENGTH



Series No. 103102

▶ cutting conditions : p.124-127



THREE FLUTE END MILLS

Stub Length, 3 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAlN HSS Co8
2.0	6.0	4.0	48.0	1031020200	1031210200
3.0		5.0	49.0	1031020300	1031210300
4.0		7.0	51.0	1031020400	1031210400
5.0		8.0	52.0	1031020500	1031210500
6.0		8.0		1031020600	1031210600
7.0	10.0	10.0	60.0	1031020700	1031210700
8.0		11.0	61.0	1031020800	1031210800
10.0		13.0	63.0	1031021000	1031211000
12.0	12.0	16.0	73.0	1031021200	1031211200
14.0		16.0		1031021400	1031211400
16.0	16.0	19.0	79.0	1031021600	1031211600
18.0		19.0		1031021800	1031211800
20.0	20.0	22.0	88.0	1031022000	1031212000
22.0		22.0		1031022200	1031212200
25.0	25.0	26.0	102.0	1031022500	1031212500

▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

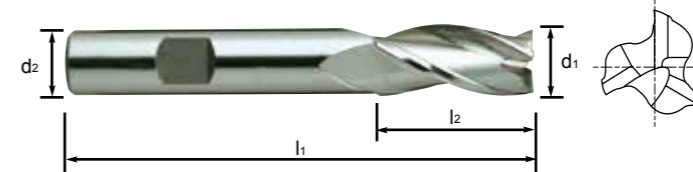
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

3 FLUTE, SHORT LENGTH



Series No. 104102

▶ cutting conditions : p.124-127



THREE FLUTE END MILLS

Short Length, 3 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAlN HSS Co8
1.5	6.0	7.0	51.0	1041020150	1041210150
2.0		7.0		1041020200	1041210200
2.5		8.0	52.0	1041020250	1041210250
3.0		8.0		1041020300	1041210300
3.5		10.0	54.0	1041020350	1041210350
4.0	10.0	11.0	55.0	1041020400	1041210400
4.5		11.0		1041020450	1041210450
5.0		13.0	57.0	1041020500	1041210500
5.5	13.0	1041020550		1041210550	
6.0	13.0	1041020600		1041210600	
6.5	10.0	16.0	66.0	1041020650	1041210650
7.0		16.0		1041020700	1041210700
7.5		16.0	69.0	1041020750	1041210750
8.0		19.0		1041020800	1041210800
8.5		19.0		1041020850	1041210850
9.0	12.0	19.0	72.0	1041020900	1041210900
10.0		22.0		1041021000	1041211000
12.0		26.0	83.0	1041021200	1041211200
14.0	26.0	1041021400		1041211400	
16.0	16.0	32.0	92.0	1041021600	1041211600
18.0		32.0		1041021800	1041211800
20.0	20.0	38.0	104.0	1041022000	1041212000
22.0		38.0		1041022200	1041212200
25.0	25.0	45.0	121.0	1041022500	1041212500
28.0		45.0		1041022800	1041212800
30.0		45.0		1041023000	1041213000

▶ Sizes above 25mm available while stocks last

▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

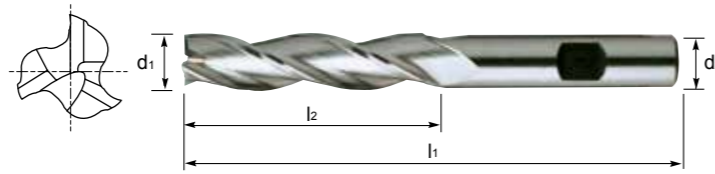
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

3 FLUTE, LONG LENGTH



Series No. 105102

▶ cutting conditions : p.124-127



THREE FLUTE END MILLS Long Length, 3 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
3.0	6.0	12.0	56.0	1051020300	1051210300
4.0		19.0	63.0	1051020400	1051210400
5.0		24.0	68.0	1051020500	1051210500
6.0		24.0		1051020600	1051210600
7.0	10.0	30.0	80.0	1051020700	1051210700
8.0		38.0	88.0	1051020800	1051210800
9.0		38.0		1051020900	1051210900
10.0		45.0	95.0	1051021000	1051211000
12.0	12.0	53.0	110.0	1051021200	1051211200
14.0		53.0		1051021400	1051211400
16.0	16.0	63.0	123.0	1051021600	1051211600
18.0		63.0		1051021800	1051211800
20.0	20.0	75.0	141.0	1051022000	1051212000
22.0		75.0		1051022200	1051212200
25.0		90.0	166.0	1051022500	1051212500

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

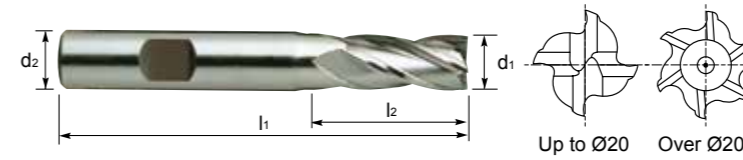
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

4&6 FLUTE, SHORT LENGTH



Series No. 107102

▶ cutting conditions : p.128-129



MULTI FLUTE END MILLS Short Length, 4 & 6 Flute, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAIN HSS Co8	
2.0	6.0	7.0	51.0	4	1071020200	1071210200	
2.5		8.0	52.0	4	1071020250	1071210250	
3.0		8.0		4	1071020300	1071210300	
3.5		10.0	10.0	54.0	4	1071020350	1071210350
4.0		11.0	55.0	4	1071020400	1071210400	
5.0		13.0	57.0	4	1071020500	1071210500	
6.0	13.0	4		1071020600	1071210600		
7.0	10.0	16.0	66.0	4	1071020700	1071210700	
8.0		19.0	69.0	4	1071020800	1071210800	
9.0		19.0		4	1071020900	1071210900	
10.0		22.0	72.0	4	1071021000	1071211000	
11.0	12.0	22.0	79.0	4	1071021100	1071211100	
12.0		26.0	83.0	4	1071021200	1071211200	
13.0		26.0		4	1071021300	1071211300	
14.0		26.0	4	1071021400	1071211400		
16.0	16.0	32.0	92.0	4	1071021600	1071211600	
18.0		32.0		4	1071021800	1071211800	
20.0	20.0	38.0	104.0	4	1071022000	1071212000	
22.0		38.0		6	1071022200	1071212200	
25.0	25.0	45.0	121.0	6	1071022500	1071212500	
28.0		45.0		6	1071022800	1071212800	
30.0		45.0		6	1071023000	1071213000	
32.0		53.0		6	1071023200	1071213200	

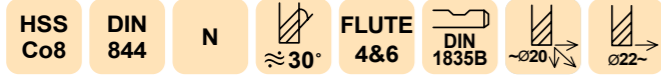
▶ Sizes above 25mm available while stocks last

▶ TiAIN Coating to Order

TOLERANCE

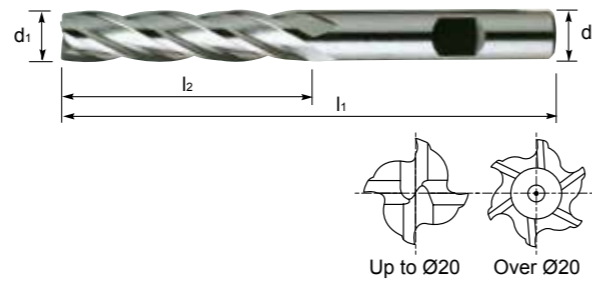
MILL DIA.	+0.040 -0
SHANK DIA.	h6

4&6 FLUTE, LONG LENGTH



Series No. 108102

▶ cutting conditions : p.128-129



MULTI FLUTE END MILLS

Long Length, 4 & 6 Flute, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAIN HSS Co8
3.0	6.0	12.0	56.0	4	1081020300	1081210300
3.5		15.0	59.0	4	1081020350	1081210350
4.0		19.0	63.0	4	1081020400	1081210400
4.5		19.0		4	1081020450	1081210450
5.0		24.0	68.0	4	1081020500	1081210500
6.0		24.0		4	1081020600	1081210600
7.0	10.0	30.0	80.0	4	1081020700	1081210700
8.0		38.0	88.0	4	1081020800	1081210800
9.0		38.0		4	1081020900	1081210900
10.0		45.0	95.0	4	1081021000	1081211000
11.0	12.0	45.0	102.0	4	1081021100	1081211100
12.0		53.0	110.0	4	1081021200	1081211200
14.0		53.0		4	1081021400	1081211400
16.0	16.0	63.0	123.0	4	1081021600	1081211600
18.0		63.0		4	1081021800	1081211800
20.0	20.0	75.0	141.0	4	1081022000	1081212000
22.0		75.0		6	1081022200	1081212200
24.0	25.0	90.0	166.0	6	1081022400	1081212400
25.0		90.0		6	1081022500	1081212500

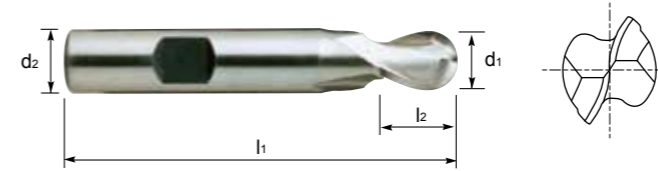
TOLERANCE		
MILL DIA.	Ø2.0~Ø6.0	+0.040 -0
	Ø6.5~	+0.050 -0
SHANK DIA.	h6	

2 FLUTE, SHORT LENGTH, BALL NOSE



Series No. 112102

▶ cutting conditions : p.118



R : ± 0.02mm

BALL END MILLS

Short Length, 2 Flute, Ball End, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
3.0	6.0	5.0	49.0	1121020300	1121210300
3.5		6.0	50.0	1121020350	1121210350
4.0		7.0	51.0	1121020400	1121210400
4.5		7.0		1121020450	1121210450
5.0		8.0	52.0	1121020500	1121210500
5.5		8.0		1121020550	1121210550
6.0	10.0	8.0	1121020600	1121210600	
7.0		10.0	60.0	1121020700	1121210700
8.0		11.0	61.0	1121020800	1121210800
9.0		11.0		1121020900	1121210900
10.0	12.0	13.0	63.0	1121021000	1121211000
12.0		16.0	73.0	1121021200	1121211200
13.0		16.0		1121021300	1121211300
14.0	16.0	16.0	79.0	1121021400	1121211400
15.0		16.0		1121021500	1121211500
16.0	16.0	19.0	79.0	1121021600	1121211600
17.0		19.0		1121021700	1121211700
18.0		19.0		1121021800	1121211800
19.0		19.0		1121021900	1121211900
20.0	20.0	22.0	88.0	1121022000	1121212000
22.0		22.0		1121022200	1121212200
24.0	25.0	26.0	102.0	1121022400	1121212400
25.0		26.0		1121022500	1121212500

▶ TiAIN Coating to Order

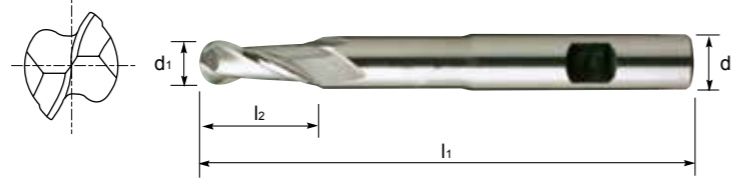
TOLERANCE	
MILL DIA.	+0 -0.030
SHANK DIA.	h6

2 FLUTE, LONG LENGTH, BALL NOSE



Series No. 114102

▶ cutting conditions : p.118



R : ± 0.02mm

BALL END MILLS

Extra Long Length, 2 Flute, Ball End, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8	
3.0	6.0	8.0	56.0	1141020300	1141210300	
4.0		11.0	63.0	1141020400	1141210400	
5.0		13.0	68.0	68.0	1141020500	1141210500
6.0		13.0			1141020600	1141210600
8.0	10.0	19.0	88.0	1141020800	1141210800	
10.0		22.0	95.0	1141021000	1141211000	
12.0	12.0	26.0	110.0	1141021200	1141211200	
13.0		26.0		1141021300	1141211300	
14.0		26.0		1141021400	1141211400	
15.0		26.0		1141021500	1141211500	
16.0	16.0	32.0	123.0	1141021600	1141211600	
18.0		32.0		1141021800	1141211800	
20.0	20.0	38.0	141.0	1141022000	1141212000	
22.0		38.0		1141022200	1141212200	
25.0		45.0		166.0	1141022500	1141212500

▶ TiAIN Coating to Order

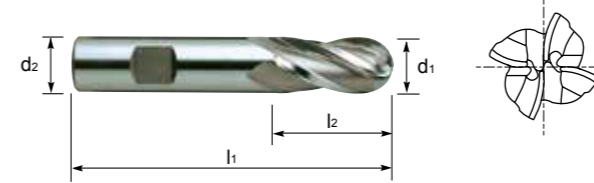
TOLERANCE	
MILL DIA.	+0 -0.030
SHANK DIA.	h6

4&6 FLUTE, SHORT LENGTH, BALL NOSE



Series No. 115102

▶ cutting conditions : p.119



R : ± 0.02mm

BALL END MILLS

Short Length, Multi Flute, Ball End, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAIN HSS Co8
6.0	6.0	13.0	57.0	4	1151020600	1151210600
8.0	10.0	19.0	69.0	4	1151020800	1151210800
10.0		22.0	72.0	4	1151021000	1151211000
12.0	12.0	26.0	83.0	4	1151021200	1151211200
16.0	16.0	32.0	92.0	4	1151021600	1151211600
20.0	20.0	38.0	104.0	4	1151022000	1151212000
25.0	25.0	45.0	121.0	6	1151022500	1151212500

▶ TiAIN Coating to Order

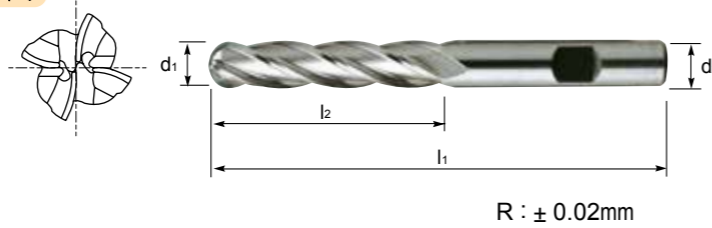
TOLERANCE	
MILL DIA.	+0 -0.030
SHANK DIA.	h6

4&6 FLUTE, LONG LENGTH, BALL NOSE



Series No. 116102

▶ cutting conditions : p.119



BALL END MILLS
Long Length, Multi Flute, Ball End, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAlN HSS Co8
10.0	10.0	45.0	95.0	4	1161021000	1161211000
12.0	12.0	53.0	110.0	4	1161021200	1161211200
16.0	16.0	63.0	123.0	4	1161021600	1161211600
20.0	20.0	75.0	141.0	4	1161022000	1161212000
25.0	25.0	90.0	166.0	6	1161022500	1161212500

▶ TiAlN Coating to Order

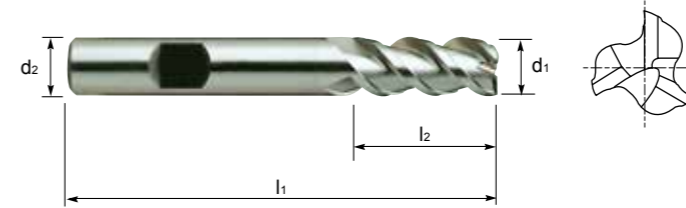
TOLERANCE	
MILL DIA.	+0 -0.030
SHANK DIA.	h6

MULTI FLUTE, SHORT LENGTH, 50° HELIX



Series No. 132102

▶ cutting conditions : p.120



END MILLS HIGH HELIX
Multi-Flute, High Helical 50°, Centre Cutting, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAlN HSS Co8
2.0	6.0	7.0	51.0	2	1321020200	1321210200
3.0		8.0	52.0	2	1321020300	1321210300
4.0		11.0	55.0	2	1321020400	1321210400
5.0		13.0	57.0	2	1321020500	1321210500
6.0		13.0		3	1321020600	1321210600
7.0	10.0	16.0	66.0	3	1321020700	1321210700
8.0		19.0	69.0	3	1321020800	1321210800
9.0		19.0		3	1321020900	1321210900
10.0	12.0	22.0	72.0	3	1321021000	1321211000
12.0		26.0	83.0	3	1321021200	1321211200
14.0		26.0		3	1321021400	1321211400
15.0		26.0		3	1321021500	1321211500
16.0	16.0	32.0	92.0	3	1321021600	1321211600
18.0		32.0		3	1321021800	1321211800
20.0		38.0		104.0	3	1321022000
25.0	25.0	45.0	121.0	4	1321022500	1321212500
30.0		45.0		4	1321023000	1321213000

▶ Sizes above 25mm available while stocks last
▶ TiAlN Coating to Order

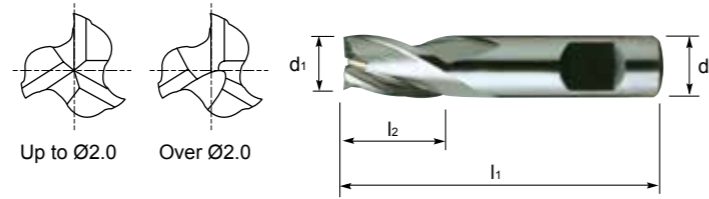
TOLERANCE		
MILL DIA.	Ø2.0~Ø6.0	+0.040 -0
	Ø4.0~Ø6.0	+0.048 -0
	Ø7.0~Ø10.0	+0.058 -0
	Ø10.5~Ø18.0	+0.070 -0
	Ø18.5~Ø30.0	+0.084 -0
SHANK DIA.	h6	

3 FLUTE, SHORT LENGTH, THROW AWAY, DIN STD



Series No. 128102

▶ cutting conditions : p.124-127



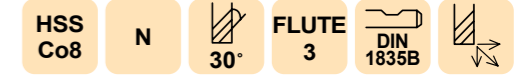
THREE FLUTE THROW AWAY END MILLS
Short Length, 3 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
1.0	6.0	2.0	34.0	1281020100	1281210100
1.5		3.0		1281020150	1281210150
1.8		3.0		1281020180	1281210180
2.0		4.0	35.0	1281020200	1281210200
2.3		4.0		1281020230	1281210230
2.5		5.0	36.0	1281020250	1281210250
2.8		5.0		1281020280	1281210280
3.0		5.0	37.0	1281020300	1281210300
3.3		6.0		1281020330	1281210330
3.5		6.0	38.0	1281020350	1281210350
3.8		7.0		1281020380	1281210380
4.0		7.0	39.0	1281020400	1281210400
4.3		7.0		1281020430	1281210430
4.5		7.0	40.0	1281020450	1281210450
4.8		8.0		1281020480	1281210480
5.0		8.0	41.0	1281020500	1281210500
5.5	8.0	1281020550		1281210550	
5.75	8.0	42.0	1281020575	1281210575	
6.0	8.0		1281020600	1281210600	
6.5	8.0	10.0	43.0	1281020650	1281210650
7.0		10.0		1281020700	1281210700
7.5		10.0		1281020750	1281210750
8.0	10.0	11.0	44.0	1281020800	1281210800
8.5		11.0		1281020850	1281210850
9.0		11.0		1281020900	1281210900
9.5		11.0		1281020950	1281210950
10.0	13.0	50.0	1281021000	1281211000	
12.0	12.0	16.0	58.0	1281021200	1281211200
16.0	16.0	19.0	64.0	1281021600	1281211600
20.0	20.0	22.0	78.0	1281022000	1281212000

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

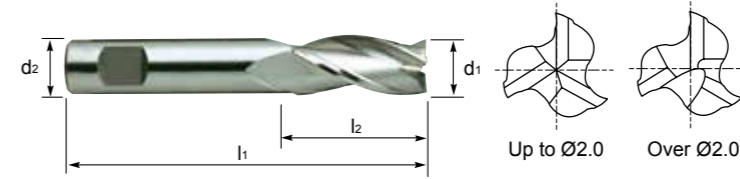
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

3 FLUTE, LONG LENGTH, THROW AWAY, DIN STD



Series No. 129102

▶ cutting conditions : p.124-127



THREE FLUTE THROW AWAY END MILLS
Long Length, 3 Flute, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
1.5	6.0	4.0	35.0	1291020150	1291210150
2.0		7.0	38.0	1291020200	1291210200
2.5		8.0	39.0	1291020250	1291210250
3.0		8.0		1291020300	1291210300
3.5		10.0	41.0	1291020350	1291210350
4.0		11.0	42.0	1291020400	1291210400
4.5		11.0		1291020450	1291210450
5.0		13.0	44.0	1291020500	1291210500
5.5		13.0		1291020550	1291210550
6.0		13.0	48.0	1291020600	1291210600
6.5	16.0	1291020650		1291210650	
7.0	16.0	1291020700		1291210700	
7.5	16.0	1291020750		1291210750	
8.0	8.0	19.0	51.0	1291020800	1291210800
8.5		19.0	56.0	1291020850	1291210850
9.0		19.0		1291020900	1291210900
10.0	10.0	22.0	59.0	1291021000	1291211000

Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

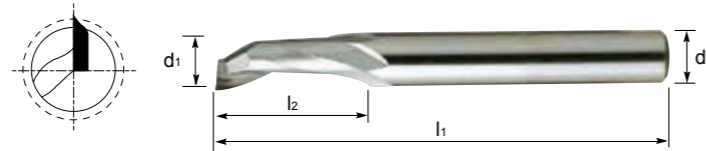
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

ALUMINIUM ROUTER



Series No. 135316

▶ cutting conditions : p.120



ONE FLUTE END MILLS

Short Length, 1 Flute, with Plain Shank for Aluminium Machining

Mill Dia. js14(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co5	TiAIN HSS Co5
3.0	8.0	12.0	60.0	1353160300	1353270300
4.0		12.0		1353160400	1353270400
5.0		14.0		1353160500	1353270500
6.0		14.0		1353160600	1353270600
8.0		14.0		1353160800	1353270800
10.0		14.0		1353161000	1353271000

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

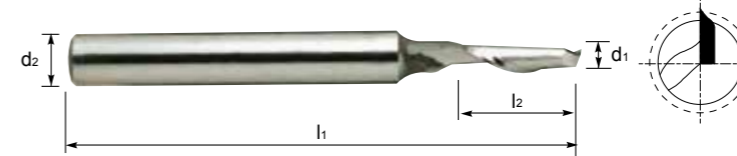
Toleranzwerte in μm / Tolerance range in μm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js14	± 125	± 150	± 180	± 215	± 260	± 310
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

ALUMINIUM ROUTER



Series No. 136316

▶ cutting conditions : p.120



ONE FLUTE END MILLS

Short Length, 1 Flute, with Plain Shank for Aluminium Machining

Mill Dia. js14(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co5	TiAIN HSS Co5
5.0	8.0	18.0	80.0	1363160500	1363270500
5.0		40.0	100.0	1363169001	1363279001
8.0		14.0	120.0	1363160800	1363270800

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

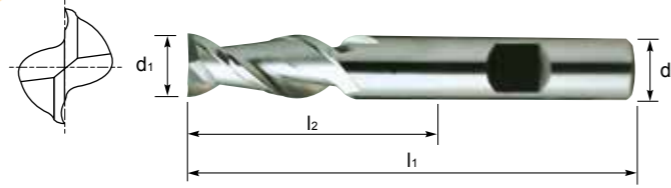
Toleranzwerte in μm / Tolerance range in μm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js14	± 125	± 150	± 180	± 215	± 260	± 310
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

2 FLUTE, SHORT LENGTH, 42° HELIX for ALUMINIUM



Series No. 131102

▶ cutting conditions : p.121



END MILLS FOR ALUMINIUM

Short Length, 2 Flute, Helix 42°, Centre Cutting, with Flatted Shank

Mill Dia. e8(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8	
2.0	6.0	7.0	51.0	1311020200	1311210200	
2.5		8.0	52.0	1311020250	1311210250	
3.0		8.0		1311020300	1311210300	
3.5		10.0	54.0	1311020350	1311210350	
4.0		11.0	55.0	1311020400	1311210400	
4.5		11.0		1311020450	1311210450	
5.0		13.0	57.0	1311020500	1311210500	
5.5		13.0		1311020550	1311210550	
6.0		13.0		1311020600	1311210600	
6.5		10.0	16.0	66.0	1311020650	1311210650
7.0	16.0		1311020700		1311210700	
7.5	16.0		1311020750		1311210750	
8.0	19.0		69.0	1311020800	1311210800	
8.5	19.0			1311020850	1311210850	
9.0	19.0			1311020900	1311210900	
10.0	22.0		72.0	1311021000	1311211000	
11.0	12.0		22.0	79.0	1311021100	1311211100
12.0			26.0	83.0	1311021200	1311211200
13.0			26.0		1311021300	1311211300
14.0		26.0	1311021400		1311211400	
15.0		26.0	1311021500		1311211500	
16.0		16.0	32.0	92.0	1311021600	1311211600
17.0	32.0		1311021700		1311211700	
18.0	32.0		1311021800		1311211800	
19.0	32.0		1311021900		1311211900	
20.0	20.0		38.0		104.0	1311022000
21.0		38.0	1311022100	1311212100		
22.0		38.0	1311022200	1311212200		
23.0		38.0	1311022300	1311212300		
24.0		25.0	45.0	121.0		1311022400
25.0	45.0		1311022500		1311212500	

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

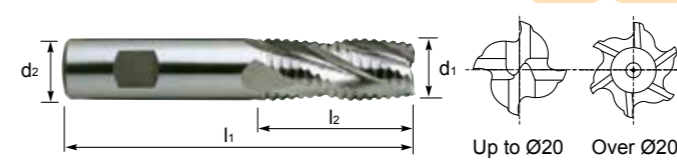
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	— 14	— 20	— 25	— 32	— 40	— 50
	— 28	— 38	— 47	— 59	— 73	— 89
h6	0	0	0	0	0	0
	— 6	— 8	— 9	— 11	— 13	— 16

MULTI FLUTE, SHORT LENGTH, COARSE PITCH ROUGHING



Series No. 118102

▶ cutting conditions : p.130-131



ROUGHING END MILLS

Short Length, Multi-Flute, Coarse Pitch, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAIN HSS Co8		
6.0	6.0	13.0	57.0	3	1181020600	1181210600		
7.0		10.0	16.0	66.0	3	1181020700	1181210700	
8.0			19.0	69.0	3	1181020800	1181210800	
9.0	19.0		3		1181020900	1181210900		
10.0	22.0		72.0	4	1181021000	1181211000		
11.0	12.0		22.0	79.0	4	1181021100	1181211100	
12.0		26.0	83.0		4	1181021200	1181211200	
13.0		26.0			4	1181021300	1181211300	
14.0		26.0			4	1181021400	1181211400	
15.0		26.0			4	1181021500	1181211500	
16.0		16.0	32.0		92.0	4	1181021600	1181211600
17.0	32.0		4	1181021700		1181211700		
18.0	32.0		4	1181021800		1181211800		
19.0	32.0		4	1181021900		1181211900		
20.0	20.0		38.0	98.0		4	1181029001	1181219001
20.0		38.0	104.0		4	1181022000	1181212000	
22.0		38.0			5	1181022200	1181212200	
22.0		25.0	38.0		114.0	5	1181029002	1181219002
24.0			45.0			121.0	5	1181022400
25.0	45.0		5	1181022500			1181212500	
26.0	45.0		6	1181022600		1181212600		
28.0	45.0		6	1181022800		1181212800		
30.0	32.0		45.0	133.0		6	1181023000	1181213000
32.0			53.0			6	1181023200	1181213200
35.0		53.0	6		1181023500	1181213500		
36.0		53.0	6		1181023600	1181213600		
38.0		40.0	63.0		155.0	6	1181023800	1181213800
38.0	63.0		6	1181029003		1181219003		
40.0	63.0		6	1181024000		1181214000		
40.0	63.0		6	1181029004		1181219004		
50.0	50.0		75.0	177.0		6	1181025000	1181215000

▶ Sizes above 25mm available while stocks last

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

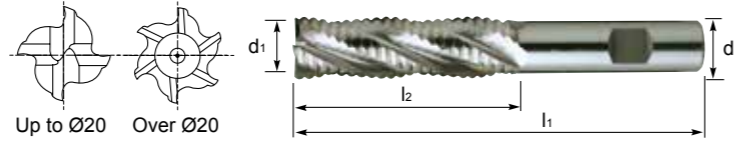
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0	0	0	0	0	0
	— 6	— 8	— 9	— 11	— 13	— 16

MULTI FLUTE, LONG LENGTH, COARSE PITCH ROUGHING



Series No. 119102

▶ cutting conditions : p.130-131



ROUGHING END MILLS

Long Length, Multi-Flute, Coarse Pitch, Round Profile, with Flatted Shank

Mill Dia. d ₁	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No.of Flute	HSS Co8	TiAlN HSS Co8
6.0	6.0	24.0	68.0	3	1191020600	1191210600
7.0	10.0	30.0	80.0	3	1191020700	1191210700
8.0		38.0	88.0	3	1191020800	1191210800
9.0		38.0		3	1191020900	1191210900
10.0	12.0	45.0	95.0	4	1191021000	1191211000
11.0		45.0	102.0	4	1191021100	1191211100
12.0		53.0	110.0	4	1191021200	1191211200
13.0		53.0		4	1191021300	1191211300
14.0	53.0	4		1191021400	1191211400	
15.0	16.0	53.0	123.0	4	1191021500	1191211500
16.0		63.0		4	1191021600	1191211600
17.0		63.0		4	1191021700	1191211700
18.0		63.0		4	1191021800	1191211800
19.0	20.0	63.0	135.0	4	1191021900	1191211900
20.0		75.0		4	1191029001	1191219001
20.0	20.0	75.0	141.0	4	1191022000	1191212000
22.0		75.0	5	1191022200	1191212200	
22.0	25.0	75.0	151.0	5	1191029002	1191219002
24.0		90.0	166.0	5	1191022400	1191212400
25.0		90.0		5	1191022500	1191212500
26.0		90.0		6	1191022600	1191212600
28.0		90.0		6	1191022800	1191212800
30.0		90.0		6	1191023000	1191213000
32.0	32.0	106.0		186.0	6	1191023200
35.0		106.0	6		1191023500	1191213500
36.0		106.0	6		1191023600	1191213600
38.0		125.0	6		1191023800	1191213800
38.0	40.0	125.0	217.0	6	1191029003	1191219003
40.0	32.0	125.0		6	1191024000	1191214000
40.0	40.0	125.0		6	1191029004	1191219004

▶ Sizes above 25mm available while stocks last
▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

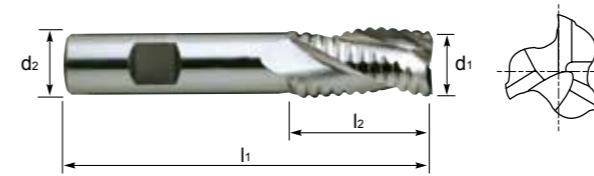
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

3 FLUTE, SHORT LENGTH, COARSE PITCH ROUGHING



Series No. 133102

▶ cutting conditions : p.130-131



ROUGHING END MILLS

Short Length, 3 Flute, Coarse Pitch, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAlN HSS Co8
10.0	10.0	22.0	72.0	1331021000	1331211000
12.0	12.0	26.0	83.0	1331021200	1331211200
14.0		26.0		1331021400	1331211400
16.0	16.0	32.0	92.0	1331021600	1331211600
18.0		32.0		1331021800	1331211800
20.0	20.0	38.0	104.0	1331022000	1331212000
22.0		38.0		1331022200	1331212200
25.0	25.0	45.0	121.0	1331022500	1331212500
28.0		45.0		1331022800	1331212800
30.0		45.0		1331023000	1331213000
32.0	32.0	53.0	133.0	1331023200	1331213200
36.0		53.0		1331023600	1331213600
40.0		63.0		155.0	1331024000

▶ Sizes above 25mm available while stocks last
▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

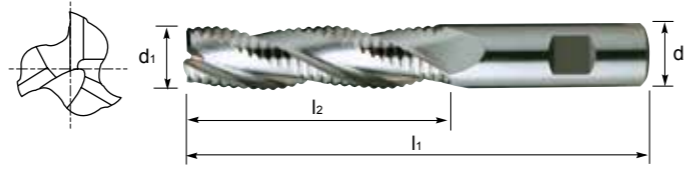
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

3 FLUTE, LONG LENGTH, COARSE PITCH ROUGHING



Series No. 134102

▶ cutting conditions : p.130-131



ROUGHING END MILLS

Long Length, 3 Flute, Coarse Pitch, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
10.0	10.0	45.0	95.0	1341021000	1341211000
12.0	12.0	53.0	110.0	1341021200	1341211200
14.0		53.0		1341021400	1341211400
16.0	16.0	63.0	123.0	1341021600	1341211600
18.0		63.0		1341021800	1341211800
20.0	20.0	75.0	141.0	1341022000	1341212000
22.0		75.0		1341022200	1341212200
25.0	25.0	90.0	166.0	1341022500	1341212500
28.0		90.0		1341022800	1341212800
30.0		90.0		1341023000	1341213000
36.0	32.0	106.0	186.0	1341023600	1341213600
40.0		125.0		1341024000	1341214000

- ▶ Sizes above 25mm available while stocks last
- ▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

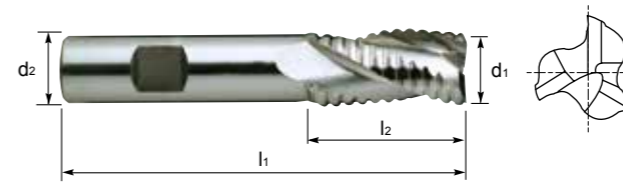
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

3 FLUTE, SHORT LENGTH, 37° HELIX, COARSE PITCH



Series No. 124102

▶ cutting conditions : p.130-131



ROUGHING END MILLS FOR ALUMINIUM

Short Length, 3 Flute, Coarse Pitch, Helix 37°, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
6.0	6.0	13.0	57.0	1241020600	1241210600
8.0	10.0	19.0	69.0	1241020800	1241210800
10.0		22.0		1241021000	1241211000
12.0	12.0	26.0	83.0	1241021200	1241211200
14.0		26.0		1241021400	1241211400
16.0	16.0	32.0	92.0	1241021600	1241211600
18.0		32.0		1241021800	1241211800
20.0	20.0	38.0	104.0	1241022000	1241212000
22.0		38.0		1241022200	1241212200
25.0	25.0	45.0	121.0	1241022500	1241212500
30.0		45.0		1241023000	1241213000

- ▶ Sizes above 25mm available while stocks last
- ▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

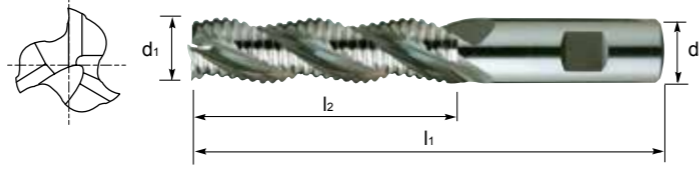
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

3 FLUTE, LONG LENGTH, 37° HELIX, COARSE PITCH



Series No. 125102

▶ cutting conditions : p.130-131



ROUGHING END MILLS FOR ALUMINIUM

Long Length, 3 Flute, Coarse Pitch, Helix 37°, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
10.0	10.0	45.0	95.0	1251021000	1251211000
12.0	12.0	53.0	110.0	1251021200	1251211200
14.0		53.0		1251021400	1251211400
16.0	16.0	63.0	123.0	1251021600	1251211600
18.0		63.0		1251021800	1251211800
20.0	20.0	75.0	141.0	1251022000	1251212000
22.0		75.0		1251022200	1251212200
25.0	25.0	90.0	166.0	1251022500	1251212500
30.0		90.0		1251023000	1251213000

▶ Sizes above 25mm available while stocks last

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

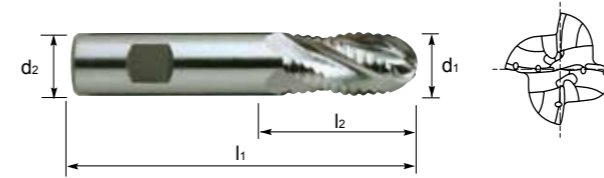
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

3&4 FLUTE, SHORT LENGTH, BALL NOSE, COARSE PITCH



Series No. 127102

▶ cutting conditions : p.133



R : ± 0.02mm

ROUGHING DIE-SINKING CUTTERS

Short Length, Multi-Flute Coarse Pitch, Round Profile, Ball End Centre Cutting, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No.of Flute	HSS Co8	TiAIN HSS Co8
8.0	10.0	19.0	69.0	3	1271020800	1271210800
10.0		22.0	72.0	3	1271021000	1271211000
12.0	12.0	26.0	83.0	4	1271021200	1271211200
16.0	16.0	32.0	92.0	4	1271021600	1271211600
20.0	20.0	38.0	104.0	4	1271022000	1271212000
25.0	25.0	45.0	121.0	4	1271022500	1271212500
32.0	32.0	53.0	133.0	4	1271023200	1271213200
40.0		63.0	155.0	4	1271024000	1271214000

▶ Sizes above 25mm available while stocks last

▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

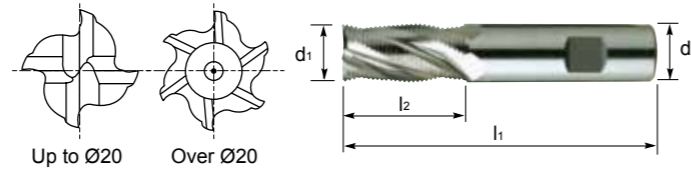
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

MULTI FLUTE, SHORT LENGTH, FINE PITCH ROUGHING



Series No. 121102

▶ cutting conditions : p.130-131



FINE PITCH ROUGHING END MILLS

Short Length, Multi-Flute, Fine Pitch, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAlN HSS Co8
6.0	6.0	13.0	57.0	3	1211020600	1211210600
8.0	10.0	19.0	69.0	3	1211020800	1211210800
10.0		22.0	72.0	4	1211021000	1211211000
12.0	12.0	26.0	83.0	4	1211021200	1211211200
14.0		26.0		4	1211021400	1211211400
16.0	16.0	32.0	92.0	4	1211021600	1211211600
18.0		32.0		4	1211021800	1211211800
20.0	20.0	38.0	104.0	4	1211022000	1211212000
25.0	25.0	45.0	121.0	5	1211022500	1211212500
30.0		45.0		6	1211023000	1211213000
32.0	32.0	53.0	133.0	6	1211023200	1211213200

- ▶ Sizes above 25mm available while stocks last
- ▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161

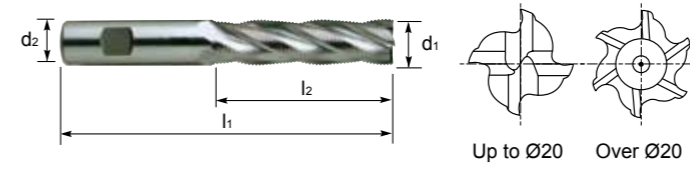
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

MULTI FLUTE, LONG LENGTH, FINE PITCH ROUGHING



Series No. 122102

▶ cutting conditions : p.130-131



FINE PITCH ROUGHING END MILLS

Long Length, Multi-Flute, Fine Pitch, Round Profile, with Flatted Shank

Mill Dia. js12(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAlN HSS Co8
6.0	6.0	24.0	68.0	3	1221020600	1221210600
7.0	10.0	30.0	80.0	3	1221020700	1221210700
8.0		38.0	88.0	3	1221020800	1221210800
9.0		38.0		3	1221020900	1221210900
10.0	12.0	45.0	95.0	4	1221021000	1221211000
11.0		45.0	102.0	4	1221021100	1221211100
12.0		53.0		4	1221021200	1221211200
13.0		16.0	53.0	110.0	4	1221021300
14.0	53.0		4		1221021400	1221211400
15.0	53.0		4		1221021500	1221211500
16.0	20.0	63.0	123.0	4	1221021600	1221211600
17.0		63.0		4	1221021700	1221211700
18.0		63.0		4	1221021800	1221211800
19.0		63.0		4	1221021900	1221211900
20.0	25.0	75.0	141.0	4	1221022000	1221212000
22.0		75.0		5	1221022200	1221212200
24.0	32.0	90.0	166.0	5	1221022400	1221212400
25.0		90.0		5	1221022500	1221212500
26.0		90.0		6	1221022600	1221212600
28.0		90.0		6	1221022800	1221212800
30.0	40.0	90.0	186.0	6	1221023000	1221213000
32.0		106.0		6	1221023200	1221213200
35.0		106.0		6	1221023500	1221213500
36.0	32.0	106.0	217.0	6	1221023600	1221213600
38.0		125.0		6	1221023800	1221213800
38.0	40.0	125.0	217.0	6	1221029001	1221219001
40.0		125.0		6	1221024000	1221214000
40.0	40.0	125.0	217.0	6	1221029002	1221219002

- ▶ Sizes above 25mm available while stocks last
- ▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161

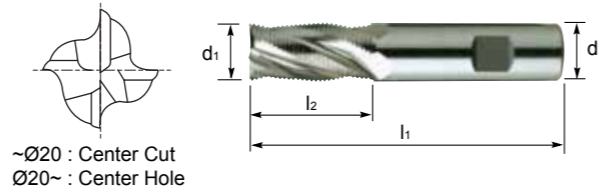
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

MULTI FLUTE, SHORT LENGTH, FINE PITCH ROUGHING



Series No. 121113

▶ cutting conditions : p.132



FINE PITCH ROUGHING END MILLS

Short Length, Multi-Flute, Centre Cutting, 1 Tooth Over Centre, Fine Pitch, Round Profile with Flatted Shank

Mill Dia. js12(d1)	Shank Dia. h6(d2)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	ASP-60	TiAlN ASP-60	
6.0	6.0	13.0	57.0	4	1211130600	1211220600	
7.0		16.0	66.0	4	1211130700	1211220700	
8.0		10.0	19.0	69.0	4	1211130800	1211220800
9.0			19.0		5	1211130900	1211220900
10.0	12.0	22.0	72.0	5	1211131000	1211221000	
11.0		26.0	79.0	5	1211131100	1211221100	
12.0				5	1211131200	1211221200	
13.0		26.0	83.0	5	1211131300	1211221300	
14.0	5			1211131400	1211221400		
15.0	5			1211131500	1211221500		
16.0	16.0	32.0	92.0	5	1211131600	1211221600	
18.0		32.0		5	1211131800	1211221800	
20.0	20.0	38.0	104.0	5	1211132000	1211222000	
22.0		38.0		5	1211132200	1211222200	
25.0	25.0	45.0	121.0	6	1211132500	1211222500	
30.0		45.0		6	1211133000	1211223000	

▶ Sizes above 25mm available while stocks last
▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

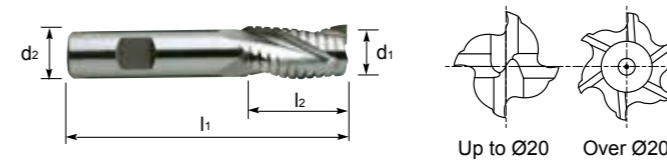
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

MULTI FLUTE, SHORT LENGTH, ROUGHING & FINISHING



Series No. 126102

▶ cutting conditions : p.134-135



ROUGHING-FINISHING END MILLS

Short Length, Multi-Flute, Rough-Finishing Profile, with Flatted Shank

Mill Dia. k10(d1)	Shank Dia. h6(d2)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAlN HSS Co8	
6.0	6.0	13.0	57.0	3	1261020600	1261210600	
7.0		10.0	16.0	66.0	3	1261020700	1261210700
8.0			4		1261020800	1261210800	
9.0		19.0	4	1261020900	1261210900		
10.0	12.0	22.0	72.0	4	1261021000	1261211000	
11.0		26.0	79.0	4	1261021100	1261211100	
12.0				4	1261021200	1261211200	
13.0		26.0	83.0	4	1261021300	1261211300	
14.0	4			1261021400	1261211400		
16.0	16.0			32.0	92.0	4	1261021600
18.0		32.0	4	1261021800		1261211800	
20.0	20.0	38.0	104.0	4	1261022000	1261212000	
22.0		38.0		5	1261022200	1261212200	
25.0	25.0	45.0	121.0	5	1261022500	1261212500	
28.0		45.0		5	1261022800	1261212800	
30.0		45.0		5	1261023000	1261213000	
32.0		32.0		53.0	133.0	5	1261023200
36.0	53.0		6	1261023600		1261213600	
40.0	63.0		6	1261024000		1261214000	

▶ Sizes above 25mm available while stocks last
▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161 Toleranzen nach DIN 7160 & 7161

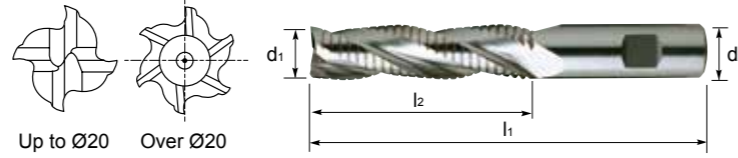
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
k10	+ 40 0	+ 48 0	+ 58 0	+ 70 0	+ 84 0	+ 100 0
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

MULTI FLUTE, LONG LENGTH, ROUGHING & FINISHING



Series No. 137102

▶ cutting conditions : p.134-135



ROUGHING-FINISHING END MILLS

Long Length, Multi-Flute, Rough-Finishing Profile, with Flatted Shank

Mill Dia. k10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	No. of Flute	HSS Co8	TiAlN HSS Co8
6.0	6.0	24.0	68.0	3	1371020600	1371210600
8.0	10.0	38.0	88.0	4	1371020800	1371210800
10.0		45.0	95.0	4	1371021000	1371211000
12.0	12.0	53.0	110.0	4	1371021200	1371211200
14.0		53.0		4	1371021400	1371211400
16.0	16.0	63.0	123.0	4	1371021600	1371211600
18.0		63.0		4	1371021800	1371211800
20.0	20.0	75.0	141.0	4	1371022000	1371212000
22.0		75.0		5	1371022200	1371212200
25.0	25.0	90.0	166.0	5	1371022500	1371212500
30.0		90.0		5	1371023000	1371213000
32.0	32.0	106.0	186.0	5	1371023200	1371213200

▶ Sizes above 25mm available while stocks last

▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

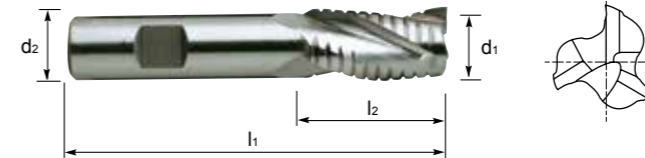
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
k10	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

3 FLUTE, SHORT LENGTH, ROUGHING & FINISHING



Series No. 138102

▶ cutting conditions : p.134-135



ROUGHING-FINISHING END MILLS

Short Length, 3 Flute, Rough-Finishing Profile, with Flatted Shank

Mill Dia. k10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAlN HSS Co8
6.0	6.0	13.0	57.0	1381020600	1381210600
8.0	10.0	19.0	69.0	1381020800	1381210800
10.0		22.0	72.0	1381021000	1381211000
12.0	12.0	26.0	83.0	1381021200	1381211200
14.0		26.0		1381021400	1381211400
16.0	16.0	32.0	92.0	1381021600	1381211600
18.0		32.0		1381021800	1381211800
20.0	20.0	38.0	104.0	1381022000	1381212000
22.0		38.0		1381022200	1381212200
25.0	25.0	45.0	121.0	1381022500	1381212500
28.0		45.0		1381022800	1381212800
30.0	25.0	45.0	121.0	1381023000	1381213000
32.0		53.0		1381023200	1381213200
36.0	32.0	53.0	133.0	1381023600	1381213600
40.0		63.0		155.0	1381024000

▶ Sizes above 25mm available while stocks last

▶ TiAlN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

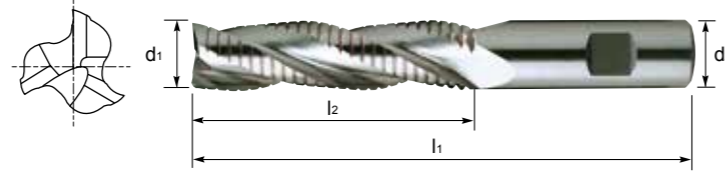
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
k10	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0
h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16

3 FLUTE, LONG LENGTH, ROUGHING & FINISHING



Series No. 139102

▶ cutting conditions : p.134-135



ROUGHING-FINISHING END MILLS

Long Length, 3 Flute, Rough-Finishing Profile, with Flatted Shank

Mill Dia. k10(d ₁)	Shank Dia. h6(d ₂)	Length of Cut l ₂	Overall Length l ₁	HSS Co8	TiAIN HSS Co8
6.0	6.0	24.0	68.0	1391020600	1391210600
8.0	10.0	38.0	88.0	1391020800	1391210800
10.0		45.0	95.0	1391021000	1391211000
12.0	12.0	53.0	110.0	1391021200	1391211200
14.0		53.0		1391021400	1391211400
16.0	16.0	63.0	123.0	1391021600	1391211600
18.0		63.0		1391021800	1391211800
20.0	20.0	75.0	141.0	1391022000	1391212000
22.0		75.0		1391022200	1391212200
25.0	25.0	90.0	166.0	1391022500	1391212500
28.0		90.0		1391022800	1391212800
30.0		90.0		1391023000	1391213000
36.0	32.0	106.0	186.0	1391023600	1391213600
40.0		125.0	217.0	1391024000	1391214000

- ▶ Sizes above 25mm available while stocks last
- ▶ TiAIN Coating to Order

Tolerances according to DIN 7160 & 7161

Toleranzen nach DIN 7160 & 7161

Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
k10	+ 40 0	+ 48 0	+ 58 0	+ 70 0	+ 84 0	+ 100 0
h6	0 - 6	0 - 8	0 - 9	0 - 11	0 - 13	0 - 16

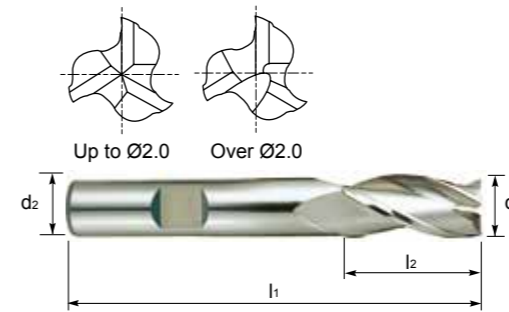
3 FLUTE, SHORT SERIES, THROW AWAY, BS STD



Series No. 328102

Clarkson No. 24M

▶ cutting conditions : p.124-127



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code	Clarkson Code
				HSS Co8	HSS Co8
1.0	6	2	24.5	3281020100	24M02
1.5	6	2.5	24.5	3281020150	24M03
2.0	6	3	25.5	3281020200	24M04
2.5	6	4	26	3281020250	24M05
2.8	6	4.5	28	3281020280	24M28
3.0	6	4.5	28	3281020300	24M06
3.5	6	5.5	30	3281020350	24M07
3.8	6	6.5	32.5	3281020380	24M38
4.0	6	6.5	32.5	3281020400	24M08
4.5	6	7.5	36	3281020450	24M09
4.8	6	7.5	36	3281020480	24M48
5.0	6	7.5	36	3281020500	24M10
5.5	6	7.5	36	3281020550	24M11
5.75	6	9.5	36	3281020575	24M57
6.0	6	9.5	36	3281020600	24M12
7.0	10	10.5	46	3281020700	24M14B
8.0	10	11	47.5	3281020800	24M16B
9.0	10	13	51	3281020900	24M18B
10.0	10	13	51.5	3281021000	24M20B

Imperial sizes also available while stocks last.
Contact sales office for dimensions.
Please check stock before ordering.

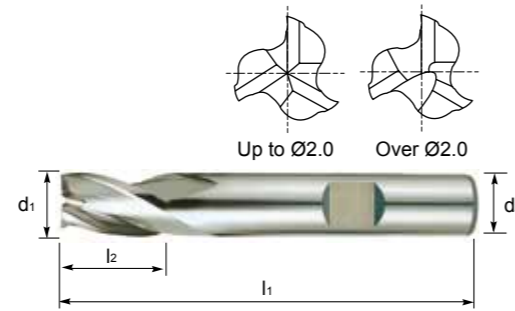
3 FLUTE, LONG SERIES, THROW AWAY, BS STD



Series No. 329102

Clarkson No. 24L

▶ cutting conditions : p.124-127



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code	Clarkson Code
				HSS Co8	HSS Co8
1.5	6	4	28	3291020150	24L03
2.0	6	4.5	29	3291020200	24L04
2.5	6	6.5	32	3291020250	24L05
3.0	6	7.5	34	3291020300	24L06
3.5	6	8.5	36.5	3291020350	24L07
4.0	6	9.5	39	3291020400	24L08
4.5	6	11	42	3291020450	24L09
5.0	6	12.5	44.5	3291020500	24L10
5.5	6	14.5	46	3291020550	24L11
6.0	6	16	44.5	3291020600	24L12
8.0	10	19	55.5	3291020800	24L16B
10.0	10	22.5	61	3291021000	24L20B

Imperial sizes also available while stocks last.
Contact sales office for dimensions.
Please check stock before ordering.

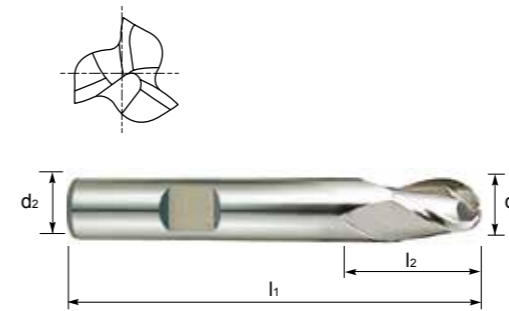
3 FLUTE, LONG SERIES, BALL NOSE THROWAWAY, BS STD



Series No. 334102

Clarkson No. 24N

▶ cutting conditions : p.124-127



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code	Clarkson Code
				HSS Co8	HSS Co8
2.0	6	4.5	29	3341020200	24N04
2.5	6	4.5	35	3341020250	24N05
3.0	6	7.5	34	3341020300	24N06
4.0	6	9.5	39	3341020400	24N08
5.0	6	12.5	44.5	3341020500	24N10
6.0	6	16	44.5	3341020600	24N12

Imperial sizes also available while stocks last.
Contact sales office for dimensions.
Please check stock before ordering.



HSSCo FLATTED SHANK CUTTING DATA

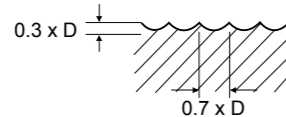
FLATTED SHANK CUTTING CONDITION



112102, 114102 (2 Flute, Ball Nose)



MATERIAL GROUP	HRc		Size (mm)									
			3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30	30
		12	n	3400	2400	1700	1200	1000	800	600	500	400
			f_z	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088
			f (mm/min)	70	80	90	105	120	105	100	85	70
	20-30	11	v_c (m/min)	20	20	20	20	20	15	20	20	15
		12	n	2000	1400	1000	700	560	450	350	300	220
			f_z	0.008	0.013	0.026	0.036	0.054	0.061	0.079	0.083	0.091
			f (mm/min)	30	35	45	50	60	55	55	50	40
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15	15
		14	n	1400	1000	700	500	400	320	250	200	160
			f_z	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094
			f (mm/min)	20	25	25	30	35	35	35	35	30
N	71-73	v_c (m/min)	105	100	105	100	100	95	100	100	100	
		n	11000	8000	5600	4000	3200	2500	2000	1600	1300	
		f_z	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.088	0.096	
		f (mm/min)	230	260	280	350	360	340	300	280	250	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

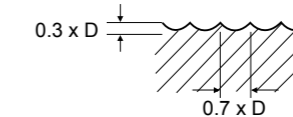
FLATTED SHANK CUTTING CONDITION



115102, 116102 (Multiflute, Ball Nose)



MATERIAL GROUP	HRc		Size (mm)							
			6.0	8.0	10.0	12.0	16.0	20.0	25.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30
		12	n	1700	1200	1000	800	600	500	400
			f_z	0.026	0.044	0.06	0.067	0.083	0.087	0.088
			f (mm/min)	135	160	180	160	150	130	105
	20-30	11	v_c (m/min)	20	20	20	15	20	20	15
		12	n	1000	700	560	450	350	300	220
			f_z	0.023	0.036	0.054	0.059	0.076	0.083	0.091
			f (mm/min)	70	75	90	80	80	75	60
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15
		14	n	700	500	400	320	250	200	160
			f_z	0.019	0.03	0.042	0.052	0.067	0.083	0.094
			f (mm/min)	40	45	50	50	50	50	45
N	71-73	v_c (m/min)	105	100	100	95	100	100	100	
		n	5600	4000	3200	2500	2000	1600	1300	
		f_z	0.025	0.044	0.056	0.068	0.075	0.088	0.097	
		f (mm/min)	420	530	540	510	450	420	380	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

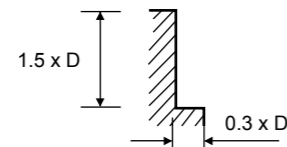
FLATTED SHANK CUTTING CONDITION



132102 (Multiflute, 50° Helix)



MATERIAL GROUP	HRc		Size (mm)													
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0	30.0		
P	< 20	11	v_c (m/min)	30	35	30	30	35	30	30	35	30	35	35		
			n	5000	3500	2500	2000	1800	1200	1000	900	600	500	450	350	
		12	f_z	0.004	0.007	0.012	0.019	0.016	0.026	0.032	0.041	0.053	0.063	0.047	0.046	
			f (mm/min)	35	50	60	75	85	95	95	110	95	95	85	85	
		20-30	11	v_c (m/min)	30	30	25	30	25	25	30	25	25	30	25	25
				n	4500	2800	2000	1800	1300	1000	900	700	500	450	350	280
	12		f_z	0.003	0.006	0.01	0.015	0.014	0.022	0.026	0.033	0.043	0.048	0.039	0.04	
			f (mm/min)	25	35	40	55	55	65	70	70	65	65	55	45	
	30-40		13	v_c (m/min)	15	15	15	15	15	15	15	15	15	15	15	15
				n	2500	1800	1200	1000	900	600	500	450	300	250	200	180
		14	f_z	0.002	0.006	0.01	0.015	0.013	0.022	0.027	0.033	0.044	0.053	0.038	0.035	
			f (mm/min)	10	20	25	30	35	40	40	45	40	40	30	25	

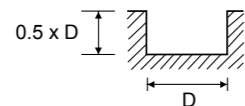


- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

135316, 136316 (1 Flute Aluminium Router)



MATERIAL GROUP	HRc		Size (mm)					
			3.0	4.0	5.0	6.0	8.0	10.0
N	71 72 73	v_c (m/min)	188	226	220	207	214	220
		n	20000	18000	14000	11000	85000	7000
		f_z	0.055	0.053	0.054	0.055	0.053	0.054
		f (mm/min)	1100	950	750	600	450	380



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

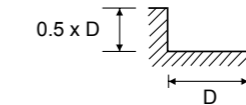
FLATTED SHANK CUTTING CONDITION



131102 (3 Flute Aluminium Roughing)

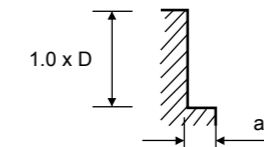


MATERIAL GROUP	HRc		Size (mm)								
			3.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	71 72 73	v_c (m/min)	75	130	150	155	190	155	175	130	145
		n	8000	7000	6000	5000	5000	3500	3500	2300	2300
		f_z	0.035	0.05	0.071	0.12	0.12	0.177	0.177	0.283	0.283
		f (mm/min)	560	700	850	1200	1200	1240	1240	1300	1300



MATERIAL GROUP	HRc		Size (mm)								
			3.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	71 72 73	v_c (m/min)	75	130	150	155	190	155	175	130	145
		n	8000	7000	6000	5000	5000	3500	3500	2300	2300
		f_z	0.046	0.064	0.092	0.15	0.15	0.229	0.229	0.37	0.37
		f (mm/min)	730	900	1100	1500	1500	1600	1600	1700	1700

$a_e : \phi 3.0\text{mm} - \phi 10.0\text{mm} = 0.25 \times D$
 $a_e : \phi 12.0\text{mm} - \phi 20.0\text{mm} = 0.5 \times D$



- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

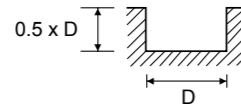
FLATTED SHANK CUTTING CONDITION



100102, 101102, 102102 (2 Flute)



MATERIAL GROUP	HRc		Size (mm)									
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30	30
		12	n	4500	3200	2200	1800	1600	1100	900	800	700
			f_z	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063	0.064
			f (mm/min)	30	45	55	70	80	90	90	100	90
		11	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	4000	2500	1800	1600	1200	900	800	630	560
		f_z	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063	0.071	
		f (mm/min)	30	40	45	60	60	70	80	80	80	
	13	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	
	14		n	2200	1600	1100	900	800	560	450	400	350
			f_z	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063	0.071
			f (mm/min)	15	20	30	35	40	45	45	50	50
N	71-73	v_c (m/min)	75	105	100	100	105	100	95	95	95	
		n	12000	11000	8000	6300	5600	4000	3100	2500	2200	
		f_z	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076	0.08	
		f (mm/min)	160	250	290	310	310	390	400	380	350	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

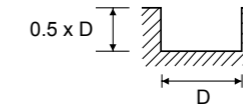
FLATTED SHANK CUTTING CONDITION



100102, 101102, 102102 (2 Flute)



MATERIAL GROUP	HRc		Size (mm)									
			16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0		
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30	
		12	n	560	500	450	450	400	350	310	280	
			f_z	0.08	0.09	0.1	0.1	0.1	0.1	0.097	0.098	
			f (mm/min)	90	90	90	90	80	70	60	55	
		11	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	450	400	400	350	310	280	250	220	
		f_z	0.078	0.088	0.088	0.1	0.097	0.098	0.1	0.102		
		f (mm/min)	70	70	70	70	60	55	50	45		
	13	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	
	14		n	280	250	220	220	180	160	160	140	
			f_z	0.08	0.09	0.102	0.102	0.097	0.094	0.094	0.107	
			f (mm/min)	45	45	45	45	35	30	30	30	
N	71-73	v_c (m/min)	100	100	100	95	95	95	105	100		
		n	2000	1800	1600	1400	1200	1100	1100	1000		
		f_z	0.088	0.097	0.1	0.107	0.117	0.123	0.123	0.12		
		f (mm/min)	350	350	320	300	280	270	270	240		



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

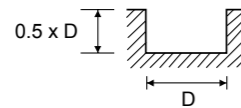


103102, 104102, 105102, 128102, 129102, 328102, 329102, 334102 (3 Flute)



SLOTING

MATERIAL GROUP	HRc		Size (mm)								
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30	30
		n	4500	3200	2200	1800	1600	1100	900	800	800
		f _z	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033	0.033
		f (mm/min)	25	35	45	55	65	70	70	80	80
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25	25
		n	4000	2500	1800	1600	1200	900	800	630	630
		f _z	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029	0.029
		f (mm/min)	20	25	30	40	40	50	55	55	55
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15	15
		n	2200	1600	1100	900	800	560	450	400	400
		f _z	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029	0.029
		f (mm/min)	10	15	20	20	25	30	30	35	35
N	71-73	v _c (m/min)	75	105	100	100	105	100	95	95	95
		n	12000	11000	8000	6300	5600	4000	3100	2500	2500
		f _z	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035	0.035
		f (mm/min)	110	170	200	210	210	260	270	260	260



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

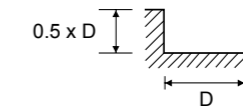


103102, 104102, 105102, 128102, 129102, 328102, 329102, 334102 (3 Flute)



SLOTING

MATERIAL GROUP	HRc		Size (mm)								
			14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30	30
		n	700	560	500	450	450	400	350	310	310
		f _z	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054	0.054
		f (mm/min)	70	70	70	70	70	65	55	50	50
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25	25
		n	560	450	400	400	350	310	280	250	250
		f _z	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04	0.04
		f (mm/min)	55	50	50	50	50	40	35	30	30
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15	15
		n	350	280	250	220	220	180	160	160	160
		f _z	0.033	0.036	0.04	0.045	0.045	0.37	0.042	0.042	0.042
		f (mm/min)	35	30	30	30	30	20	20	20	20
N	71-73	v _c (m/min)	95	100	100	100	95	95	95	105	105
		n	2200	2000	1800	1600	1400	1200	1100	1100	1100
		f _z	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	0.055
		f (mm/min)	240	240	240	220	200	190	180	180	180



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

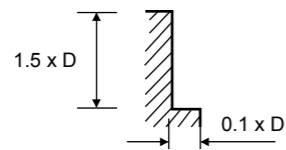


103102, 104102, 105102, 128102, 129102, 328102, 329102, 334102 (3 Flute)



PROFILING

MATERIAL GROUP	HRc		Size (mm)								
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30	30
		n	4500	3200	2200	1800	1600	1100	900	800	800
		f _z	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056	0.056
		f (mm/min)	40	60	75	95	110	120	120	135	135
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25	25
		n	4000	2500	1800	1600	1200	900	800	630	630
		f _z	0.003	0.006	0.00-	0.014	0.018	0.03	0.038	0.048	0.048
		f (mm/min)	35	45	50	65	65	80	90	90	90
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15	15
		n	2200	1600	1100	900	800	560	450	400	400
		f _z	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046	0.046
		f (mm/min)	15	20	30	35	45	50	50	55	55
N	71-73	v _c (m/min)	75	105	100	100	105	100	95	95	95
		n	12000	11000	8000	6300	5600	4000	3100	2500	2500
		f _z	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057	0.057
		f (mm/min)	180	280	330	350	350	440	450	430	430



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

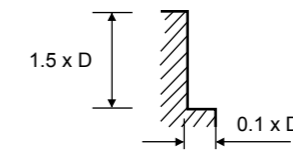


103102, 104102, 105102, 128102, 129102, 328102, 329102, 334102 (3 Flute)



PROFILING

MATERIAL GROUP	HRc		Size (mm)								
			14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30	30
		n	700	560	500	450	450	400	350	310	310
		f _z	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086	0.086
		f (mm/min)	120	120	120	120	120	110	95	80	80
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25	25
		n	560	450	400	400	350	310	280	250	250
		f _z	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073	0.073
		f (mm/min)	90	80	80	80	80	65	60	55	55
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15	15
		n	350	280	250	220	220	180	160	160	160
		f _z	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063	0.063
		f (mm/min)	55	50	50	50	50	35	30	30	30
N	71-73	v _c (m/min)	95	100	100	100	95	95	95	105	105
		n	2200	2000	1800	1600	1400	1200	1100	1100	1100
		f _z	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091	0.091
		f (mm/min)	400	400	400	360	340	320	300	300	300



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

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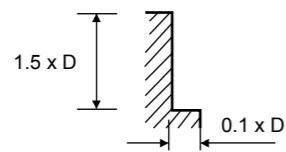
FLATTED SHANK CUTTING CONDITION



107102, 108102 (4 Flute)



MATERIAL GROUP	HRc		Size (mm)									
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30	30
		12	n	4500	3200	2200	1800	1600	1100	900	800	700
			f_z	0.003	0.006	0.011	0.017	0.023	0.036	0.044	0.056	0.057
			f (mm/min)	55	80	100	125	145	160	160	180	160
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25	25
		12	n	4000	2500	1800	1600	1200	900	800	630	560
			f_z	0.003	0.006	0.009	0.014	0.019	0.029	0.038	0.048	0.054
			f (mm/min)	45	60	65	90	90	105	120	120	120
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15	15
		14	n	2200	1600	1100	900	800	560	450	400	350
			f_z	0.002	0.005	0.01	0.014	0.019	0.029	0.036	0.047	0.054
			f (mm/min)	20	30	45	50	60	65	65	75	75
N	71-73	v_c (m/min)	75	105	100	100	105	100	95	95	95	
		n	12000	11000	8000	6300	5600	4000	3100	2500	2200	
		f_z	0.005	0.009	0.014	0.019	0.021	0.036	0.048	0.057	0.06	
		f (mm/min)	240	380	440	470	470	580	600	570	530	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \phi}{1000}$$

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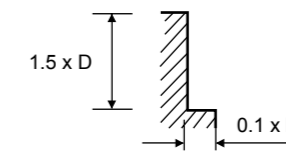
FLATTED SHANK CUTTING CONDITION



107102, 108102 (4 Flute)



MATERIAL GROUP	HRc		Size (mm)								
			16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	560	500	450	450	400	350	310	310
			f_z	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.09
			f (mm/min)	160	160	160	160	145	125	110	100
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	20
		12	n	450	400	400	350	310	280	250	220
			f_z	0.058	0.066	0.066	0.05	0.048	0.048	0.05	0.049
			f (mm/min)	105	105	105	105	90	80	75	65
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	280	250	220	220	180	160	160	140
			f_z	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054
			f (mm/min)	65	65	65	65	50	45	45	45
N	71-73	v_c (m/min)	100	100	100	95	95	95	105	100	
		n	2000	1800	1600	1400	1200	1100	1100	1000	
		f_z	0.066	0.074	0.075	0.054	0.058	0.061	0.061	0.06	
		f (mm/min)	100	100	100	95	95	95	105	100	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

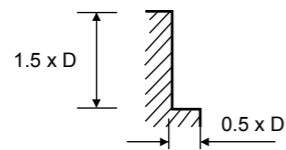
FLATTED SHANK CUTTING CONDITION



118102, 119102, 121102, 122102, 124102, 125102, 133102, 134102 (Multiflute Roughing)



MATERIAL GROUP	HRc		Size (mm)							
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30
		n	1600	1100	900	800	700	560	500	450
		f _z	0.013	0.023	0.033	0.044	0.05	0.063	0.07	0.078
		f (mm/min)	60	75	120	140	140	140	140	140
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25
		n	1200	900	800	630	560	450	400	400
		f _z	0.015	0.024	0.034	0.044	0.049	0.061	0.069	0.069
		f (mm/min)	55	65	110	110	110	110	110	110
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15
		n	800	560	450	400	350	280	250	220
		f _z	0.013	0.021	0.033	0.044	0.05	0.063	0.07	0.08
		f (mm/min)	30	35	60	70	70	70	70	70
N	71-73	v _c (m/min)	85	80	80	75	80	80	80	75
		n	4500	3100	2500	2000	1800	1600	1400	1200
		f _z	0.015	0.025	0.035	0.05	0.058	0.07	0.084	0.104
		f (mm/min)	200	230	350	400	420	450	470	500



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

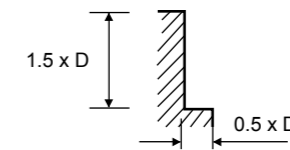
FLATTED SHANK CUTTING CONDITION



118102, 119102, 121102, 122102, 124102, 125102, 133102, 134102 (Multiflute Roughing)



MATERIAL GROUP	HRc		Size (mm)							
			22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30
		n	450	400	350	310	280	250	220	180
		f _z	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
		f (mm/min)	170	170	160	160	160	160	150	170
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25
		n	350	310	280	250	220	200	180	160
		f _z	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
		f (mm/min)	140	140	130	130	130	130	120	140
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15
		n	220	180	160	160	140	120	110	90
		f _z	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
		f (mm/min)	85	85	85	85	85	85	80	80
N	71-73	v _c (m/min)	75	80	80	85	80	80	80	80
		n	1100	1000	900	900	800	700	630	500
		f _z	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
		f (mm/min)	470	450	510	530	500	470	450	370



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

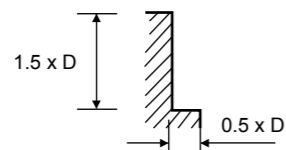
FLATTED SHANK CUTTING CONDITION



121113 (Multiflute Roughing ASP60)



MATERIAL GROUP	HRc		Size (mm)												
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30	30	30	30	30	30
		n	1600	1100	900	800	700	560	500	450	450	400	350	310	
		f _z	0.013	0.023	0.033	0.044	0.05	0.063	0.07	0.078	0.076	0.085	0.076	0.086	
		f (mm/min)	60	75	120	140	140	140	140	140	170	170	160	160	
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25	25	25	25	25	
		n	1200	900	800	630	560	450	400	400	350	310	280	250	
		f _z	0.015	0.024	0.034	0.044	0.049	0.061	0.069	0.069	0.08	0.09	0.077	0.087	
		f (mm/min)	55	65	110	110	110	110	110	110	140	140	130	130	
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15	15	15	15	15	
		n	800	560	450	400	350	280	250	220	220	180	160	160	
		f _z	0.013	0.021	0.033	0.044	0.05	0.063	0.07	0.08	0.077	0.096	0.089	0.089	
		f (mm/min)	30	35	60	70	70	70	70	70	85	85	85	85	
N	71 72 73	v _c (m/min)	85	80	80	75	80	80	80	75	75	80	80	85	
		n	4500	3100	2500	2000	1800	1600	1400	1200	1100	1000	900	900	
		f _z	0.015	0.025	0.035	0.05	0.058	0.07	0.084	0.104	0.085	0.09	0.094	0.098	
		f (mm/min)	200	230	350	400	420	450	470	500	470	450	510	530	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

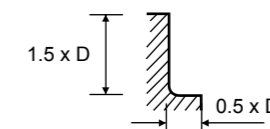
FLATTED SHANK CUTTING CONDITION



127102 (3&4 Flute Roughing, Ball Nose)



MATERIAL GROUP	HRc		Size (mm)							
			8.0	10.0	12.0	16.0	20.0	25.0	32.0	40.0
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30
		n	1100	900	800	560	450	400	280	220
		f _z	0.023	0.044	0.044	0.063	0.078	0.105	0.143	0.17
		f (mm/min)	75	120	140	140	140	170	160	150
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25
		n	900	800	630	450	400	310	220	180
		f _z	0.024	0.046	0.044	0.061	0.069	0.113	0.148	0.167
		f (mm/min)	65	110	110	110	110	140	130	120
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15
		n	560	450	400	280	220	180	140	110
		f _z	0.021	0.044	0.044	0.063	0.08	0.118	0.152	0.182
		f (mm/min)	35	60	70	70	70	85	85	80
N	71 72 73	v _c (m/min)	80	80	75	80	75	80	80	80
		n	3100	2500	2000	1600	1200	1000	800	630
		f _z	0.025	0.033	0.05	0.07	0.104	0.113	0.156	0.179
		f (mm/min)	230	250	400	450	500	450	500	450



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

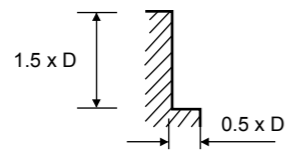
FLATTED SHANK CUTTING CONDITION



126102, 137102, 138102, 139102 (Multiflute Roughing & Finishing)



MATERIAL GROUP	HRc		Size (mm)							
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30
		n	1600	1100	900	800	700	560	500	450
		f _z	0.01	0.014	0.026	0.034	0.039	0.049	0.055	0.061
		f (mm/min)	50	60	95	110	110	110	110	110
	20-30	v _c (m/min)	25	25	25	25	25	25	25	25
		n	1200	900	800	630	560	450	400	400
		f _z	0.013	0.014	0.028	0.036	0.04	0.05	0.056	0.056
		f (mm/min)	45	50	90	90	90	90	90	90
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15
		n	800	560	450	400	350	280	250	220
		f _z	0.01	0.013	0.028	0.034	0.039	0.049	0.055	0.063
		f (mm/min)	25	30	50	55	55	55	55	55
N	71 72 73	v _c (m/min)	85	80	80	80	80	80	80	80
		n	4500	3100	2500	2000	1800	1600	1400	1200
		f _z	0.012	0.015	0.028	0.04	0.047	0.056	0.068	0.083
		f (mm/min)	160	185	280	320	340	360	380	400



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

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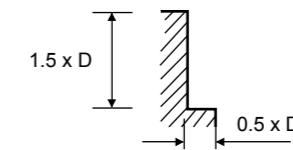
FLATTED SHANK CUTTING CONDITION



126102, 137102, 138102, 139102 (Multiflute Roughing & Finishing)



MATERIAL GROUP	HRc		Size (mm)						
			22.0	25.0	28.0	30.0	32.0	36.0	40.0
P	< 20	v _c (m/min)	30	30	30	30	30	30	30
		n	450	400	350	310	280	250	220
		f _z	0.06	0.068	0.074	0.084	0.093	0.087	0.091
		f (mm/min)	135	135	130	130	130	130	120
	20-30	v _c (m/min)	25	25	25	25	25	25	25
		n	350	310	280	250	220	200	180
		f _z	0.063	0.071	0.075	0.084	0.095	0.088	0.088
		f (mm/min)	350	310	280	250	220	200	180
	30-40	v _c (m/min)	15	15	15	15	15	15	15
		n	220	180	160	160	140	120	110
		f _z	0.064	0.078	0.088	0.088	0.1	0.097	0.098
		f (mm/min)	70	70	70	70	70	70	65
N	71 72 73	v _c (m/min)	80	80	80	85	80	80	80
		n	1100	1000	900	900	800	700	630
		f _z	0.069	0.072	0.091	0.093	0.1	0.09	0.095
		f (mm/min)	380	360	410	420	400	380	360



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ The speeds and feeds for TiAlN coated tools can be increased by up to 30%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

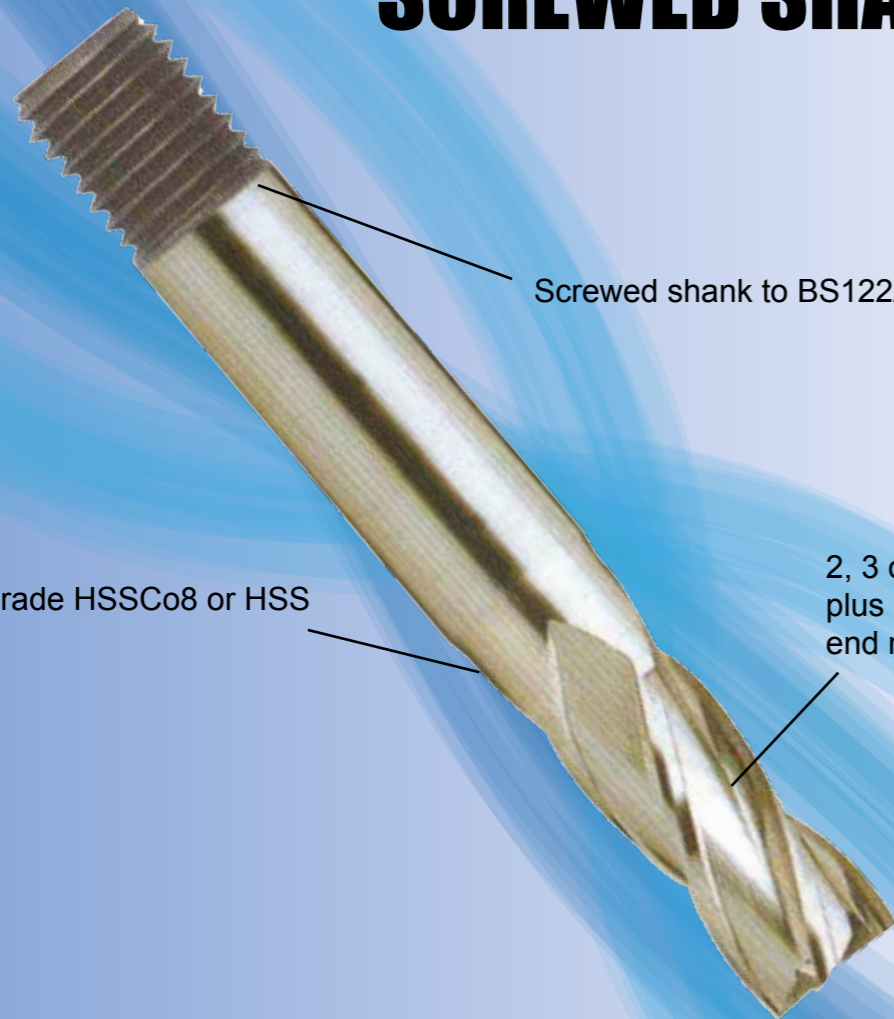
To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SUPERIOR PERFORMANCE



END MILLS SCREWED SHANK



Screwed shank to BS122/4

Premium grade HSSCo8 or HSS substrate.

2, 3 or Multi flute, plus roughing end mills.

Multi flute end mills are centre cutting up to 20mm.

IDEAL FOR MATERIAL GROUPS



HSSCo & HSS SCREWED SHANK







8% Cobalt and HSS milling cutters for general use on a variety of materials











APPLICATION GUIDE

INDEX

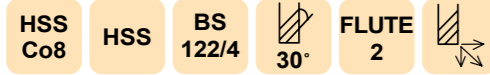
●: Excellent ○: Good

P				H		M			K				S				N				O				2-FLUTE END MILLS										
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84	Europa Code	Clarkson Code	Item	Description	Page No.
○	○	○	○																				○	○	○									Standard Length HSSCo & HSS \varnothing 1.5mm - 50.0mm	P.140-141
○	○	○	○																				○	○	○									Long Series HSSCo & HSS \varnothing 2.0mm - 50.0mm	P.142-143
○	○	○	○																				○	○	○									Standard Length HSSCo & HSS B/N \varnothing 2.0mm - 30.0mm	P.150
○	○	○	○																				○	○	○									Long Series HSSCo & HSS B/N \varnothing 3.0mm - 25.0mm	P.151

																					3-FLUTE END MILLS														
○	○	○	○																				○	○	○									Standard Length HSSCo \varnothing 3.0mm - 50.0mm	P.144
○	○	○	○																				○	○	○									Long Series HSSCo \varnothing 3.0mm - 50.0mm	P.145
																							○	○	○									Standard Length Alu Roughing Coarse \varnothing 6.0mm - 30.0mm	P.155

																					MULTI-FLUTE END MILLS														
○	○	○	○																				○	○	○									Standard Length HSSCo & HSS \varnothing 2.0mm - 50.0mm	P.146-147
○	○	○	○																				○	○	○									Long Series HSSCo & HSS \varnothing 3.0mm - 50.0mm	P.148-149
○	○	○	○																				○	○	○									Standard Length Roughing Coarse \varnothing 6.0mm - 50.0mm	P.152
○	○	○	○																				○	○	○									Long Series Roughing Coarse \varnothing 6.0mm - 40.0mm	P.153
○	○	○	○																				○	○	○									Standard Length Roughing Fine \varnothing 6.0mm - 32.0mm	P.154
																																		Cutting Data	P.157

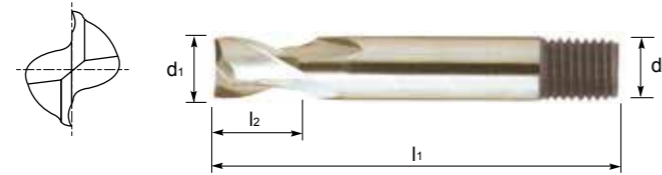
2 FLUTE, STANDARD SERIES



Series No. 301202, 301201

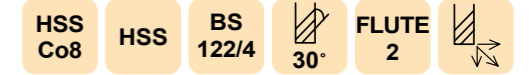
Clarkson No. 10PM/13PM, 10M/13M

► cutting conditions : p.158-159



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code		Clarkson Code	
				HSS Co8	HSS	HSS Co8	HSS
1.5	6	2.5	48.5	3012020150	–	10PM03	–
2.0	6	3	49	3012020200	–	10PM04	–
2.5	6	4.5	51	3012020250	–	10PM05	–
3.0	6	7	51	3012020300	–	10PM06	–
3.5	6	7.5	52.5	3012020350	–	10PM07	–
4.0	6	9.5	52.5	3012020400	–	10PM08	–
4.5	6	9.5	52.5	3012020450	–	10PM09	–
5.0	6	9.5	52.5	3012020500	–	10PM10	–
5.5	6	11	55.5	3012020550	–	10PM11	–
6.0	6	11	56.5	3012020600	–	10PM12	–
6.5	10	11	58.5	3012020650	3012010650	10PM13	10M13
7.0	10	11	58.5	3012020700	3012010700	10PM14	10M14
7.5	10	11	58.5	3012020750	3012010750	10PM15	10M15
8.0	10	12.5	59.5	3012020800	3012010800	10PM16	10M16
8.5	10	14.5	60.5	3012020850	3012010850	10PM17	10M17
9.0	10	14.5	60.5	3012020900	3012010900	10PM18	10M18
9.5	10	14.5	60.5	3012020950	3012010950	–	10M19
10.0	10	14.5	60.5	3012021000	3012011000	10PM20	10M20
10.5	12	17.5	65	3012021050	3012011050	–	10M21
11.0	12	17.5	65	3012021100	3012011100	10PM22	10M22
11.5	12	17.5	65	3012021150	3012011150	–	10M23
12.0	12	19	66.5	3012021200	3012011200	10PM24	10M24
13.0	12	19	66.5	3012021300	3012011300	10PM26	10M26
14.0	12	22	68.5	3012021400	3012011400	10PM28	10M28
15.0	16	22	72	3012021500	3012011500	10PM30	10M30
16.0	16	22	72	3012021600	3012011600	10PM32	10M32
17.0	16	24	72	3012021700	3012011700	10PM34	10M34
18.0	16	24	72	3012021800	3012011800	10PM36	10M36
19.0	16	25.5	77	3012021900	3012011900	10PM38	10M38
20.0	16	25.5	77	3012022000	3012012000	10PM40	10M40

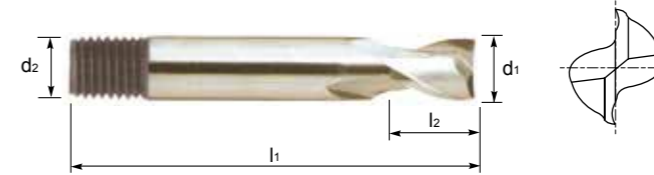
2 FLUTE, STANDARD SERIES



Series No. 301202, 301201

Clarkson No. 10PM/13PM, 10M/13M

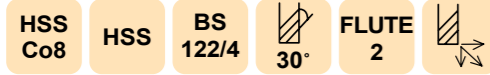
► cutting conditions : p.158-159



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code		Clarkson Code	
				HSS Co8	HSS	HSS Co8	HSS
21.0	25	25.5	98.5	3012022100	3012012100	–	10M42
22.0	25	25.5	100	3012022200	3012012200	10PM44	10M44
23.0	25	25.5	101.5	3012022300	3012012300	–	10M46
24.0	25	25.5	103	3012022400	3012012400	10PM48	10M48
25.0	25	27	95	3012022500	3012012500	10PM50	10M50
26.0	25	27	95	3012022600	3012012600	10PM52	10M52
27.0	25	28.5	93.5	3012022700	3012012700	–	10M54
28.0	25	30	95	3012022800	3012012800	10PM56	10M56
29.0	25	30	93.5	3012022900	3012012900	–	10M58
30.0	25	30	93.5	3012023000	3012013000	10PM60	10M60
32.0	32	35	117.5	3012023200	3012013200	13PM64	13M64
34.0	32	35	119	3012023400	3012013400	–	–
35.0	32	39.5	111	3012023500	3012013500	–	–
36.0	32	39.5	111	3012023600	3012013600	–	–
38.0	32	43	114.5	3012023800	3012013800	13PM76	–
40.0	32	46	117.5	3012024000	3012014000	13PM80	13M80
42.0	32	47.5	117.5	3012024200	3012014200	–	13M84
44.0	32	47.5	119	3012024400	3012014400	–	–
45.0	32	47.5	119	3012024500	3012014500	13PM90	–
50.0	32	51	117.5	3012025000	3012015000	13PM10	13M10

► Sizes above 25mm available while stocks last

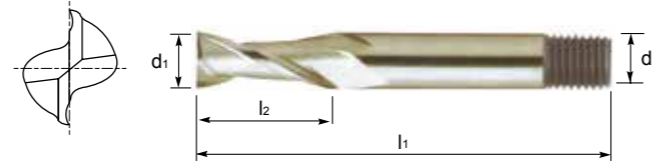
2 FLUTE, LONG SERIES



Series No. 302202, 302201

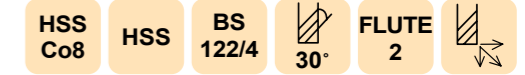
Clarkson No. 11PM, 11M/16M

► cutting conditions : p.158-159



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code		Clarkson Code	
				HSS Co8	HSS	HSS Co8	HSS
2.0	6	3	51	3022020200	–	11PM04	–
2.5	6	6.5	54	3022020250	–	11PM05	–
3.0	6	11	60.5	3022020300	–	11PM06	–
3.5	6	12.5	66.5	3022020350	–	11PM07	–
4.0	6	12.5	66.5	3022020400	–	11PM08	–
4.5	6	12.5	66.5	3022020450	–	11PM09	–
5.0	6	12.5	70	3022020500	–	11PM10	–
5.5	6	16	76	3022020550	–	11PM11	–
6.0	6	16	76	3022020600	–	11PM12	–
6.5	10	16	76	3022020650	3022010650	11PM13	11M13
7.0	10	16	76	3022020700	3022010700	11PM14	11M14
7.5	10	16	76	3022020750	3022010750	11PM15	11M15
8.0	10	19	79.5	3022020800	3022010800	11PM16	11M16
8.5	10	22	82.5	3022020850	3022010850	–	–
9.0	10	22	82.5	3022020900	3022010900	11PM18	11M18
9.5	10	22	82.5	3022020950	3022010950	–	–
10.0	10	22	82.5	3022021000	3022011000	11PM20	11M20
11.0	12	22	89	3022021100	3022011100	–	11M22
12.0	12	25.5	95	3022021200	3022011200	11PM24	11M24
13.0	12	25.5	95	3022021300	3022011300	–	11M26
14.0	12	28.5	101.5	3022021400	3022011400	11PM28	11M28
15.0	16	31.5	108	3022021500	3022011500	–	11M30
16.0	16	31.5	108	3022021600	3022011600	11PM32	11M32
17.0	16	35	114.5	3022021700	3022011700	–	11M34
18.0	16	35	114.5	3022021800	3022011800	11PM36	11M36
19.0	16	38	120.5	3022021900	3022011900	–	11M38
20.0	16	38	120.5	3022022000	3022012000	11PM40	11M40
21.0	25	38	139	3022022100	3022012100	–	–
22.0	25	41.5	140	3022022200	3022012200	11PM44	11M44
24.0	25	41.5	152.5	3022022400	3022012400	11PM48	11M48

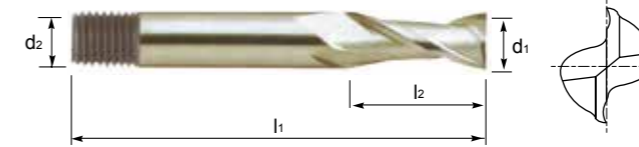
2 FLUTE, LONG SERIES



Series No. 302202, 302201

Clarkson No. 11PM, 11M/16M

► cutting conditions : p.158-159



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code		Clarkson Code	
				HSS Co8	HSS	HSS Co8	HSS
25.0	25	44.5	159	3022022500	3022012500	11PM50	11M50
26.0	25	44.5	159	3022022600	3022012600	–	11M52
27.0	25	44.5	159	3022022700	3022012700	–	11M54
28.0	25	47.5	159	3022022800	3022012800	–	11M56
30.0	25	51	159	3022023000	3022013000	11PM60	11M60
32.0	32	51	159	3022023200	3022013200	–	16M64
34.0	32	51	159	3022023400	3022013400	–	–
35.0	32	54	159	3022023500	3022013500	–	16M70
36.0	32	54	159	3022023600	3022013600	–	16M72
38.0	32	57	159	3022023800	3022013800	–	–
40.0	32	63.5	159	3022024000	3022014000	–	16M80
42.0	32	63.5	159	3022024200	3022014200	–	–
44.0	32	63.5	159	3022024400	3022014400	–	–
45.0	32	63.5	159	3022024500	3022014500	–	16M90
50.0	32	63.5	159	3022025000	3022015000	–	16M10

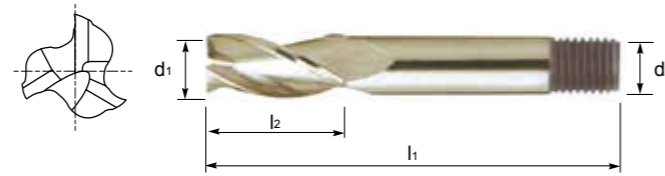
► Sizes above 25mm available while stocks last

3 FLUTE, STANDARD SERIES



Series No. 304202

▶ cutting conditions : p.160-161



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code	Clarkson Code
				HSS Co8	HSS Co8
3.0	6	9.5	54	3042020300	–
3.5	6	12.5	57	3042020350	–
4.0	6	12.5	57	3042020400	–
4.5	6	12.5	57	3042020450	–
5.0	6	16	60.5	3042020500	–
5.5	6	16	60.5	3042020550	–
6.0	6	16	60.5	3042020600	–
8.0	10	18	63.5	3042020800	–
10.0	10	21	66.5	3042021000	–
12.0	12	24	70	3042021200	–
14.0	12	28.5	74.5	3042021400	–
16.0	16	26.5	77	3042021600	–
18.0	16	35	80	3042021800	–
20.0	16	38	83.5	3042022000	–
22.0	25	41.5	98.5	3042022200	–
24.0	25	41.5	98.5	3042022400	–
25.0	25	44.5	101.5	3042022500	–
26.0	25	43	101.5	3042022600	–
28.0	25	46	104.5	3042022800	–
30.0	25	46	104.5	3042023000	–
32.0	32	51	112.5	3042023200	–
35.0	32	54	116	3042023500	–
38.0	32	54	116	3042023800	–
40.0	32	55.5	117.5	3042024000	–
45.0	32	57	119	3042024500	–
50.0	32	65	127	3042025000	–

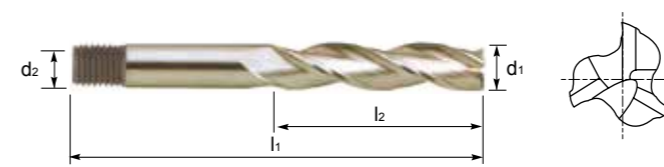
▶ Sizes above 25mm available while stocks last

3 FLUTE, LONG SERIES



Series No. 305202

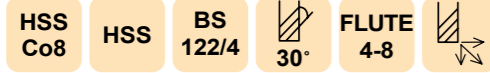
▶ cutting conditions : p.160-161



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code	Clarkson Code
				HSS Co8	HSS Co8
3.0	6	19	63.5	3052020300	–
3.5	6	25.5	70	3052020350	–
4.0	6	25.5	70	3052020400	–
4.5	6	25.5	70	3052020450	–
5.0	6	31.5	76	3052020500	–
5.5	6	31.5	76	3052020550	–
6.0	6	31.5	76	3052020600	–
8.0	10	34	79.5	3052020800	–
10.0	10	37	82.5	3052021000	–
12.0	12	49.5	95	3052021200	–
14.0	12	57	101.5	3052021400	–
16.0	16	58.5	108.5	3052021600	–
18.0	16	70	115	3052021800	–
20.0	16	76	121.5	3052022000	–
22.0	25	85.5	143	3052022200	–
24.0	25	92	149	3052022400	–
25.0	25	100	157	3052022500	–
26.0	25	98.5	157	3052022600	–
28.0	25	98.5	157	3052022800	–
30.0	25	98.5	157	3052023000	–
32.0	32	98.5	163.5	3052023200	–
35.0	32	98.5	163.5	3052023500	–
38.0	32	98.5	163.5	3052023800	–
40.0	32	98.5	163.5	3052024000	–
45.0	32	98.5	163.5	3052024500	–
50.0	32	98.5	163.5	3052025000	–

▶ Sizes above 25mm available while stocks last

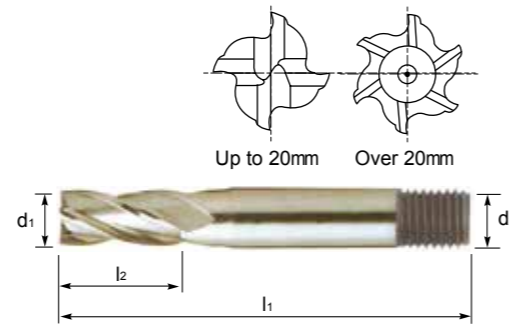
MULTI FLUTE, STANDARD SERIES



Series No. 307202, 307201

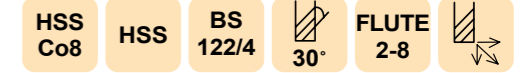
Clarkson No. 01PM/03PM, 01M/03M

▶ cutting conditions : p.162-163



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code		Clarkson Code	
					HSS Co8	HSS	HSS Co8	HSS
2.0	6	4	51	4	3072020200	-	-	-
2.5	6	6.5	51	4	3072020250	-	01PM05	-
3.0	6	9.5	54	4	3072020300	-	01PM06	-
3.5	6	12.5	57	4	3072020350	-	01PM07	-
4.0	6	12.5	57	4	3072020400	-	01PM08	-
4.5	6	12.5	57	4	3072020450	-	01PM09	-
5.0	6	16	60.5	4	3072020500	-	01PM10	-
5.5	6	16	60.5	4	3072020550	-	01PM11	-
6.0	6	16	60.5	4	3072020600	-	01PM12	-
6.5	10	16	60.5	4	3072020650	3072010650	01PM13	01M13
7.0	10	16	60.5	4	3072020700	3072010700	01PM14	01M14
7.5	10	18	63.5	4	3072020750	3072010750	-	-
8.0	10	18	63.5	4	3072020800	3072010800	01PM16	01M16
8.5	10	21	66.5	4	3072020850	3072010850	-	01M17
9.0	10	21	66.5	4	3072020900	3072010900	01PM18	01M18
9.5	10	21	66.5	4	3072020950	3072010950	-	01M19
10.0	10	21	66.5	4	3072021000	3072011000	01PM20	01M20
10.5	12	19	66.5	4	3072021050	3072011050	-	01M21
11.0	12	19	66.5	4	3072021100	3072011100	01PM22	01M22
11.5	12	22.5	70	4	3072021150	3072011150	-	01M23
12.0	12	24	70	4	3072021200	3072011200	01PM24	01M24
13.0	12	24.5	70	4	3072021300	3072011300	01PM26	01M26
14.0	12	28.5	73.5	4	3072021400	3072011400	01PM28	01M28
15.0	16	26.5	77	4	3072021500	3072011500	01PM30	01M30
16.0	16	26.5	80	4	3072021600	3072011600	01PM32	01M32
17.0	16	32	80	4	3072021700	3072011700	01PM34	01M34
18.0	16	35	88	4	3072021800	3072011800	01PM36	01M36
19.0	16	38	83.5	4	3072021900	3072011900	01PM38	01M38
20.0	16	38	83.5	4	3072022000	3072012000	01PM40	01M40

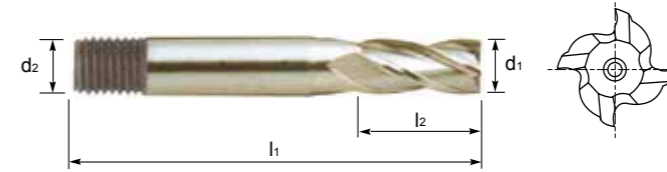
MULTI FLUTE, STANDARD SERIES



Series No. 307202, 307201

Clarkson No. 01PM/03PM, 01M/03M

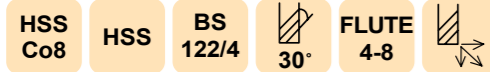
▶ cutting conditions : p.162-163



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code		Clarkson Code	
					HSS Co8	HSS	HSS Co8	HSS
21.0	25	38.5	95	6	3072022100	3072012100	-	01M42
22.0	25	41.5	98.5	6	3072022200	3072012200	01PM44	01M44
23.0	25	41.5	98.5	6	3072022300	3072012300	-	01M46
24.0	25	41.5	98.5	6	3072022400	3072012400	01PM48	01M48
25.0	25	41.5	101.5	6	3072022500	3072012500	01PM50	01M50
26.0	25	43	101.5	6	3072022600	3072012600	01PM52	01M52
27.0	25	44	102	6	3072022700	3072012700	-	01M54
28.0	25	46	104.5	6	3072022800	3072012800	01PM56	01M56
29.0	25	46	105	6	3072022900	3072012900	-	-
30.0	25	46	104.5	6	3072023000	3072013000	01PM60	01M60
32.0	32	51	112.5	6	3072023200	3072013200	03PM64	03M64
33.0	32	51	112.5	6	3072023300	3072013300	-	-
34.0	32	51	112.5	6	3072023400	3072013400	-	-
35.0	32	54	116	6	3072023500	3072013500	03PM70	03M70
36.0	32	54	116	6	3072023600	3072013600	-	03M72
38.0	32	54	116	6	3072023800	3072013800	03PM76	03M76
40.0	32	55.5	117.5	8	3072024000	3072014000	03PM80	03M80
42.0	32	54	116	8	3072024200	3072014200	-	03M84
44.0	32	57	119	8	3072024400	3072014400	-	03M88
45.0	32	57	119	8	3072024500	3072014500	03PM90	03M90
50.0	32	65	127	8	3072025000	3072015000	03PM10	03M10

▶ Sizes above 25mm available while stocks last

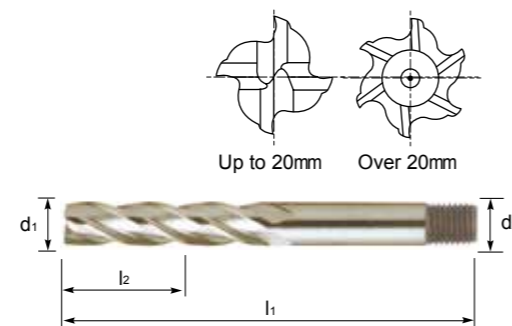
MULTI FLUTE, LONG SERIES



Series No. 308202, 308201

Clarkson No. 02PM/04PM, 02M/04M

► cutting conditions : p.162-163



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code		Clarkson Code	
					HSS Co8	HSS	HSS Co8	HSS
3.0	6	19	63.5	4	3082020300	–	02PM06	–
3.5	6	25.5	70	4	3082020350	–	02PM07	–
4.0	6	25.5	70	4	3082020400	–	02PM08	–
4.5	6	25.5	70	4	3082020450	–	02PM09	–
5.0	6	31.5	76	4	3082020500	–	02PM10	–
5.5	6	31.5	76	4	3082020550	–	02PM11	–
6.0	6	31.5	76	4	3082020600	–	02PM12	–
6.5	10	35	79.5	4	3082020650	3082010650	–	02M13
7.0	10	34	79.5	4	3082020700	3082010700	02PM14	02M14
7.5	10	34	79.5	4	3082020750	3082010750	–	02M15
8.0	10	34	79.5	4	3082020800	3082010800	02PM16	02M16
8.5	10	37	82.5	4	3082020850	3082010850	–	02M17
9.0	10	37	82.5	4	3082020900	3082010900	02PM18	02M18
10.0	10	37	82.5	4	3082021000	3082011000	02PM20	02M20
11.0	12	41.5	89	4	3082021100	3082011100	–	02M22
12.0	12	49.5	95	4	3082021200	3082011200	02PM24	02M24
13.0	12	50	95	4	3082021300	3082011300	–	02M26
14.0	12	57	101.5	4	3082021400	3082011400	02PM28	02M28
15.0	16	58.5	108.5	4	3082021500	3082011500	02PM30	02M30
16.0	16	58.5	108.5	4	3082021600	3082011600	02PM32	02M32
17.0	16	67	115	4	3082021700	3082011700	–	02M34
18.0	16	70	115	4	3082021800	3082011800	02PM36	02M36
19.0	16	76	121.5	4	3082021900	3082011900	–	02M38
20.0	16	76	121.5	4	3082022000	3082012000	02PM40	02M40

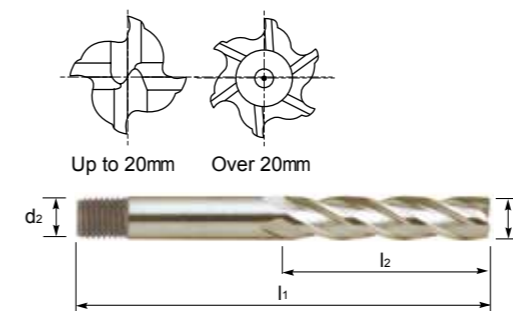
MULTI FLUTE, LONG SERIES



Series No. 308202, 308201

Clarkson No. 02PM/04PM, 02M/04M

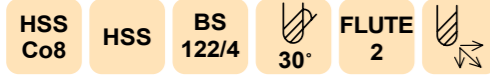
► cutting conditions : p.162-163



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code		Clarkson Code	
					HSS Co8	HSS	HSS Co8	HSS
22.0	25	85.5	143	6	3082022200	3082012200	02PM44	02M44
23.0	25	92	149	6	3082022300	3082012300	–	–
24.0	25	92	149	6	3082022400	3082012400	02PM48	02M48
25.0	25	100	157	6	3082022500	3082012500	02PM50	02M50
26.0	25	98.5	157	6	3082022600	3082012600	02PM52	02M52
28.0	25	98.5	157	6	3082022800	3082012800	02PM56	02M56
29.0	25	98.5	157	6	3082022900	3082012900	–	–
30.0	25	98.5	157	6	3082023000	3082013000	02PM60	02M60
32.0	32	98.5	163.5	6	3082023200	3082013200	04PM64	04M64
34.0	32	98.5	163.5	6	3082023400	3082013400	–	–
35.0	32	98.5	163.5	6	3082023500	3082013500	04PM70	04M70
36.0	32	98.5	163.5	6	3082023600	3082013600	–	–
38.0	32	98.5	163.5	6	3082023800	3082013800	04PM76	04M76
40.0	32	98.5	163.5	8	3082024000	3082014000	04PM80	04M80
42.0	32	98.5	163.5	8	3082024200	3082014200	–	–
44.0	32	98.5	163.5	8	3082024400	3082014400	–	–
45.0	32	98.5	163.5	8	3082024500	3082014500	04PM90	04M90
50.0	32	98.5	163.5	8	3082025000	3082015000	04PM10	–

► Sizes above 25mm available while stocks last

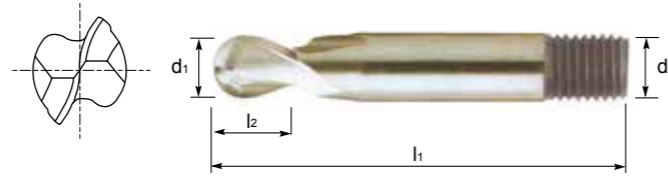
2 FLUTE, STANDARD SERIES, BALL NOSE



Series No. 313202, 313201

Clarkson No. 14M

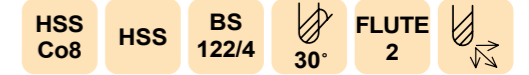
► cutting conditions : p.166



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code		Clarkson Code	
				HSS Co8	HSS	HSS Co8	HSS
2.0	6	3	49	3132020200	–	14M04	–
2.5	6	4.5	51	3132020250	–	14M05	–
3.0	6	7	51	3132020300	–	14M06	–
4.0	6	9.5	52.5	3132020400	–	14M08	–
5.0	6	9.5	52.5	3132020500	–	14M10	–
6.0	6	11	56.5	3132020600	–	14M12	–
7.0	10	11	58.5	3132020700	3132010700	–	14M14
8.0	10	12.5	59.5	3132020800	3132010800	–	14M16
9.0	10	14.5	58.5	3132020900	3132010900	–	14M18
10.0	10	14.5	60.5	3132021000	3132011000	–	14M20
11.0	12	17.5	65	3132021100	3132011100	–	14M22
12.0	12	19	66.5	3132021200	3132011200	–	14M24
13.0	12	19	66.5	3132021300	3132011300	–	14M26
14.0	12	22	68.5	3132021400	3132011400	–	14M28
15.0	16	22	72	3132021500	3132011500	–	14M30
16.0	16	22	72	3132021600	3132011600	–	14M32
17.0	16	24	73	3132021700	3132011700	–	14M34
18.0	16	24	74	3132021800	3132011800	–	14M36
19.0	16	25.5	77	3132021900	3132011900	–	14M38
20.0	16	25.5	77	3132022000	3132012000	–	14M40
22.0	25	25.5	100	3132022200	3132012200	–	14M44
24.0	25	25.5	103	3132022400	3132012400	–	14M48
25.0	25	28.5	97	3132022500	3132012500	–	14M50
26.0	25	28.5	97	3132022600	3132012600	–	14M52
28.0	25	30	95	3132022800	3132012800	–	14M56
30.0	25	30	93.5	3132023000	3132013000	–	14M60

► Sizes above 25mm available while stocks last

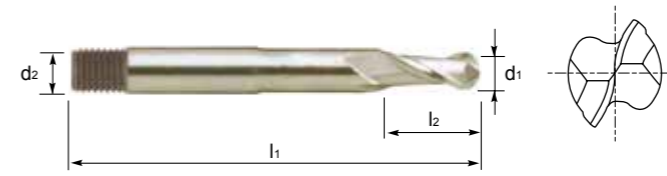
2 FLUTE, LONG SERIES, BALL NOSE



Series No. 314202, 314201

Clarkson No. 27M

► cutting conditions : p.166



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code		Clarkson Code	
				HSS Co8	HSS	HSS Co8	HSS
3.0	6	11	60.5	3142020300	–	27M06	–
4.0	6	12.5	66.5	3142020400	–	27M08	–
5.0	6	12.5	70	3142020500	–	27M10	–
6.0	6	16	76	3142020600	–	27M12	–
7.0	10	16	76	3142020700	3142010700	–	27M14
8.0	10	19	79.5	3142020800	3142010800	–	27M16
9.0	10	22	82.5	3142020900	3142010900	–	27M18
10.0	10	22	82.5	3142021000	3142011000	–	27M20
11.0	12	22	89	3142021100	3142011100	–	27M22
12.0	12	25.5	95	3142021200	3142011200	–	27M24
13.0	12	25.5	95	3142021300	3142011300	–	27M26
14.0	12	28.5	101.5	3142021400	3142011400	–	27M28
15.0	16	31.5	108	3142021500	3142011500	–	27M30
16.0	16	31.5	108	3142021600	3142011600	–	27M32
17.0	16	35	114.5	3142021700	3142011700	–	27M34
18.0	16	35	114.5	3142021800	3142011800	–	27M36
19.0	16	38	120.5	3142021900	3142011900	–	27M38
20.0	16	38	120.5	3142022000	3142012000	–	27M40
25.0	25	44.5	159	3142022500	3142012500	–	27M50

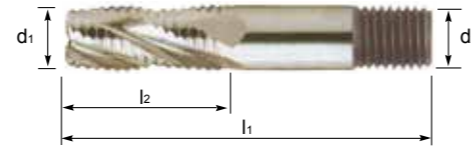
MULTI FLUTE STANDARD LENGTH COARSE PITCH ROUGHING



Series No. 118202

Clarkson No. 776M/777M

► cutting conditions : p.164-165



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code	Clarkson Code
					HSS Co8	HSS Co8
6.0	6	13	57	3	1182020600	776M12G
7.0	10	16	66	3	1182020700	776M14G
8.0	10	19	69	3	1182020800	776M16G
9.0	10	19	69	3	1182020900	776M18G
10.0	10	22	72	4	1182021000	776M20G
11.0	12	22	79	4	1182021100	776M22G
12.0	12	26	83	4	1182021200	776M24G
13.0	12	26	83	4	1182021300	776M26G
14.0	12	26	83	4	1182021400	776M28G
15.0	12	26	83	4	1182021500	776M30G
16.0	16	32	92	4	1182021600	776M32G
17.0	16	32	92	4	1182021700	-
18.0	16	32	92	4	1182021800	776M36G
19.0	16	32	92	4	1182021900	-
20.0	16	38	98	4	1182029001	776M40G
20.0	20	38	104	5	1182022000	-
22.0	20	38	104	5	1182022200	776M44G
22.0	25	38	114	5	1182029002	-
24.0	25	45	121	5	1182022400	776M48G
25.0	25	45	121	5	1182022500	776M50G
26.0	25	45	121	6	1182022600	-
28.0	25	45	121	6	1182022800	776M56G
30.0	25	45	121	6	1182023000	776M60G
32.0	32	53	133	6	1182023200	777M64G
35.0	32	53	133	6	1182023500	777M70G
36.0	32	53	133	6	1182023600	777M72G
38.0	32	63	143	6	1182023800	777M76G
40.0	32	63	143	6	1182024000	777M80G
45.0	32	63	143	6	1182024500	777M90G
50.0	32	75	155	6	1182025000	-

► Sizes above 25mm available while stocks last

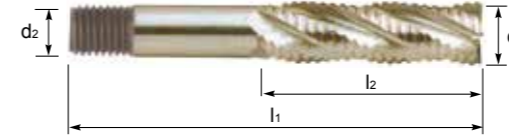
MULTI FLUTE LONG LENGTH COARSE PITCH ROUGHING



Series No. 119202

Clarkson No. 776L/777L

► cutting conditions : p.164-165



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code	Clarkson Code
					HSS Co8	HSS Co8
6.0	6	24	68	3	1192020600	776L12G
7.0	10	30	80	3	1192020700	776L14G
8.0	10	38	88	3	1192020800	776L16G
9.0	10	38	88	3	1192020900	776L18G
10.0	10	45	95	4	1192021000	776L20G
11.0	12	45	102	4	1192021100	776L22G
12.0	12	53	110	4	1192021200	776L24G
13.0	12	53	110	4	1192021300	-
14.0	12	53	110	4	1192021400	776L28G
15.0	12	53	110	4	1192021500	776L30G
16.0	16	63	123	4	1192021600	776L32G
17.0	16	63	123	4	1192021700	-
18.0	16	63	123	4	1192021800	776L36G
19.0	16	63	123	4	1192021900	-
20.0	16	75	135	4	1192029001	776L40G
20.0	20	75	141	4	1192022000	-
22.0	20	75	141	5	1192022200	776L44G
22.0	25	75	151	5	1192029002	-
24.0	25	90	166	5	1192022400	776L48G
25.0	25	90	166	5	1192022500	776L50G
26.0	25	90	166	6	1192022600	-
28.0	25	90	166	6	1192022800	776L56G
30.0	25	90	166	6	1192023000	776L60G
32.0	32	106	186	6	1192023200	777L64G
35.0	32	106	186	6	1192023500	777L70G
36.0	32	106	186	6	1192023600	777L72G
38.0	32	125	205	6	1192023800	777L76G
40.0	32	125	205	6	1192024000	777L80G

► Sizes above 25mm available while stocks last

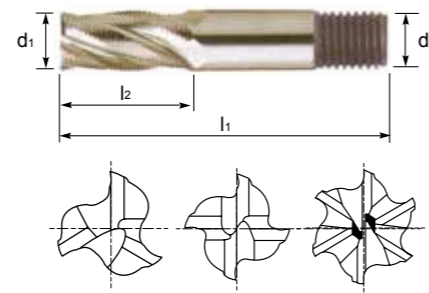
MULTI FLUTE STANDARD LENGTH FINE PITCH ROUGHING



Series No. 121202

Clarkson No. 776M

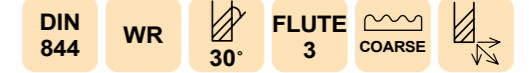
► cutting conditions : p.164-165



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	No. of Flute	Europa Code	Clarkson Code
					ORDER NO.	ORDER NO.
6.0	6	13	57	3	1212020600	776M12FP
8.0	10	19	69	3	1212020800	776M16FP
10.0	10	22	72	4	1212021000	776M20FP
12.0	12	26	83	4	1212021200	776M24FP
14.0	12	26	83	4	1212021400	776M28FP
16.0	16	32	92	4	1212021600	776M32FP
18.0	16	32	92	4	1212021800	776M36FP
20.0	20	38	104	4	1212022000	-
25.0	25	45	121	5	1212022500	776M50FP
30.0	25	45	121	6	1212023000	776M60FP
32.0	25	53	133	6	1212023200	776M64FP

► Sizes above 25mm available while stocks last

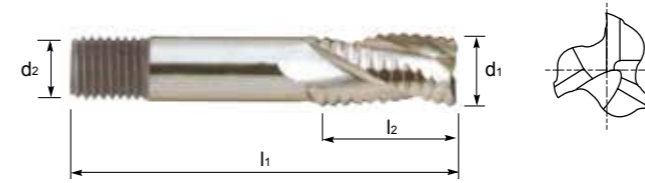
3 FLUTE STANDARD LENGTH COARSE PITCH for ALUMINIUM



Series No. 124202

Clarkson No. 776A

► cutting conditions : p.164-165



Mil Dia. d ₁	Shank Dia. d ₂	Length of Cut l ₂	Overall Length l ₁	Europa Code	Clarkson Code
				HSS Co8	HSS Co8
6.0	6	13	57	1242020600	-
8.0	10	19	69	1242020800	-
10.0	10	22	72	1242021000	776A20G
12.0	12	26	83	1242021200	776A24G
14.0	12	26	83	1242021400	776A28G
16.0	16	32	92	1242021600	776A32G
18.0	16	32	92	1242021800	-
20.0	20	38	104	1242022000	-
22.0	20	38	104	1242022200	-
25.0	25	45	121	1242022500	776A50G
30.0	25	45	121	1242023000	-

Avialable only while stocks last

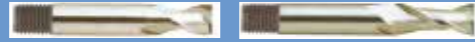


HSSCo & HSS SCREWED SHANK CUTTING DATA

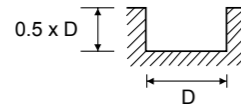
SCREWED SHANK CUTTING CONDITION



301201, 301202, 302201, 302202 (2 Flute)



MATERIAL GROUP	HRc		Size (mm)									
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30	30
		12	n	4500	3200	2200	1800	1600	1100	900	800	700
			f_z	0.003	0.007	0.013	0.019	0.025	0.041	0.05	0.063	0.064
			f (mm/min)	30	45	55	70	80	90	90	100	90
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25	25
		12	n	4000	2500	1800	1600	1200	900	800	630	560
			f_z	0.004	0.008	0.013	0.019	0.025	0.039	0.05	0.063	0.071
			f (mm/min)	30	40	45	60	60	70	80	80	80
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15	15
		14	n	2200	1600	1100	900	800	560	450	400	350
			f_z	0.003	0.006	0.014	0.019	0.025	0.04	0.05	0.063	0.071
			f (mm/min)	15	20	30	35	40	45	45	50	50
N	71-73	v_c (m/min)	75	105	100	100	105	100	95	95	95	
		n	12000	11000	8000	6300	5600	4000	3100	2500	2200	
		f_z	0.007	0.011	0.018	0.025	0.028	0.049	0.065	0.076	0.08	
		f (mm/min)	160	250	290	310	310	390	400	380	350	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

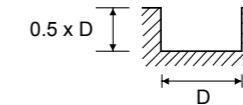
SCREWED SHANK CUTTING CONDITION



301201, 301202, 302201, 302202 (2 Flute)



MATERIAL GROUP	HRc		Size (mm)								
			16.0	18.0	20.0	25.0	30.0	32.0	36.0	40.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	560	500	450	400	310	280	250	224
			f_z	0.08	0.09	0.1	0.1	0.097	0.098	0.1	0.111
			f (mm/min)	90	90	90	80	60	55	50	50
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	450	400	400	310	250	220	200	180
			f_z	0.078	0.088	0.088	0.097	0.1	0.102	0.1	0.111
			f (mm/min)	70	70	70	60	50	45	40	40
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	280	250	220	180	160	140	125	115
			f_z	0.08	0.09	0.102	0.097	0.094	0.107	0.1	0.111
			f (mm/min)	45	45	45	35	30	30	25	25
N	71-73	v_c (m/min)	100	100	100	95	105	100	105	100	
		n	2000	1800	1600	1200	1100	1000	900	800	
		f_z	0.088	0.097	0.1	0.117	0.123	0.12	0.124	0.125	
		f (mm/min)	350	350	320	280	270	240	235	200	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

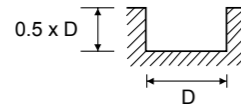
SCREWED SHANK CUTTING CONDITION



304202, 305202 (3 Flute)



MATERIAL GROUP	HRc		Size (mm)								
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	4500	3200	2200	1800	1600	1100	900	800
			f_z	0.002	0.004	0.007	0.01	0.014	0.021	0.026	0.033
			f (mm/min)	25	35	45	55	65	70	70	80
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	4000	2500	1800	1600	1200	900	800	630
			f_z	0.002	0.003	0.006	0.008	0.011	0.019	0.023	0.029
			f (mm/min)	20	25	30	40	40	50	55	55
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	2200	1600	1100	900	800	560	450	400
			f_z	0.002	0.003	0.006	0.007	0.01	0.018	0.022	0.029
			f (mm/min)	10	15	20	20	25	30	30	35
N	71	v_c (m/min)	75	105	100	100	105	100	95	95	
	72	n	12000	11000	8000	6300	5600	4000	3100	2500	
		f_z	0.003	0.005	0.008	0.011	0.013	0.022	0.029	0.035	
	73	f (mm/min)	110	170	200	210	210	260	270	260	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

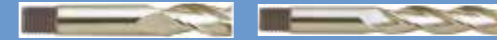
To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

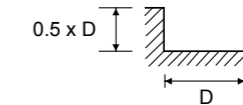
SCREWED SHANK CUTTING CONDITION



304202, 305202 (3 Flute)



MATERIAL GROUP	HRc		Size (mm)								
			14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	700	560	500	450	450	400	350	310
			f_z	0.033	0.042	0.047	0.052	0.052	0.054	0.052	0.054
			f (mm/min)	70	70	70	70	70	65	55	50
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	560	450	400	400	350	310	280	250
			f_z	0.033	0.037	0.042	0.042	0.048	0.043	0.042	0.04
			f (mm/min)	55	50	50	50	50	40	35	30
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	350	280	250	220	220	180	160	160
			f_z	0.033	0.036	0.04	0.045	0.045	0.37	0.042	0.042
			f (mm/min)	35	30	30	30	30	20	20	20
N	71	v_c (m/min)	95	100	100	100	95	95	95	105	
	72	n	2200	2000	1800	1600	1400	1200	1100	1100	
		f_z	0.036	0.04	0.044	0.046	0.048	0.053	0.055	0.055	
	73	f (mm/min)	240	240	240	220	200	190	180	180	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

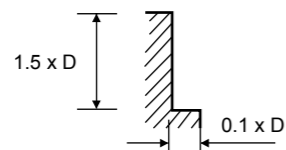
SCREWED SHANK CUTTING CONDITION



307201, 307202, 308201, 308202 (Multilute)



MATERIAL GROUP	HRc		Size (mm)									
			2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30	30
		12	n	4500	3200	2200	1800	1600	1100	900	800	700
			f_z	0.003	0.006	0.011	0.017	0.023	0.036	0.044	0.056	0.057
			f (mm/min)	55	80	100	125	145	160	160	180	160
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25	25
		12	n	4000	2500	1800	1600	1200	900	800	630	560
			f_z	0.003	0.006	0.009	0.014	0.019	0.029	0.038	0.048	0.054
			f (mm/min)	45	60	65	90	90	105	120	120	120
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15	15
		14	n	2200	1600	1100	900	800	560	450	400	350
			f_z	0.002	0.005	0.01	0.014	0.019	0.029	0.036	0.047	0.054
			f (mm/min)	20	30	45	50	60	65	65	75	75
N	71-73	v_c (m/min)	75	105	100	100	105	100	95	95	95	
		n	12000	11000	8000	6300	5600	4000	3100	2500	2200	
		f_z	0.005	0.009	0.014	0.019	0.021	0.036	0.048	0.057	0.06	
		f (mm/min)	240	380	440	470	470	580	600	570	530	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

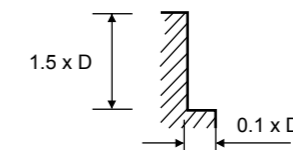
SCREWED SHANK CUTTING CONDITION



307201, 307202, 308201, 308202 (Multilute)



MATERIAL GROUP	HRc		Size (mm)								
			16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	560	500	450	450	400	350	310	310
			f_z	0.071	0.08	0.089	0.059	0.06	0.06	0.059	0.09
			f (mm/min)	160	160	160	160	145	125	110	100
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	20
		12	n	450	400	400	350	310	280	250	220
			f_z	0.058	0.066	0.066	0.05	0.048	0.048	0.05	0.049
			f (mm/min)	105	105	105	105	90	80	75	65
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	280	250	220	220	180	160	160	140
			f_z	0.058	0.065	0.074	0.049	0.046	0.047	0.047	0.054
			f (mm/min)	65	65	65	65	50	45	45	45
N	71-73	v_c (m/min)	100	100	100	95	95	95	105	100	
		n	2000	1800	1600	1400	1200	1100	1100	1000	
		f_z	0.066	0.074	0.075	0.054	0.058	0.061	0.061	0.06	
		f (mm/min)	100	100	100	95	95	95	105	100	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

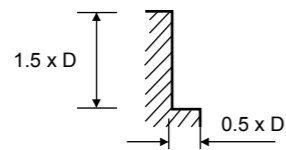
SCREWED SHANK CUTTING CONDITION



118202, 119202, 121202, 124202 (Multiflute Roughing)



MATERIAL GROUP	HRc		Size (mm)								
			6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	1600	1100	900	800	700	560	500	450
			f_z	0.013	0.023	0.033	0.044	0.05	0.063	0.07	0.078
			f (mm/min)	60	75	120	140	140	140	140	140
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	1200	900	800	630	560	450	400	400
			f_z	0.015	0.024	0.034	0.044	0.049	0.061	0.069	0.069
			f (mm/min)	55	65	110	110	110	110	110	110
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	800	560	450	400	350	280	250	220
			f_z	0.013	0.021	0.033	0.044	0.05	0.063	0.07	0.08
			f (mm/min)	30	35	60	70	70	70	70	70
N	71	v_c (m/min)	85	80	80	75	80	80	80	75	
	72	n	4500	3100	2500	2000	1800	1600	1400	1200	
	73	f_z	0.015	0.025	0.035	0.05	0.058	0.07	0.084	0.104	
		f (mm/min)	200	230	350	400	420	450	470	500	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \phi}$

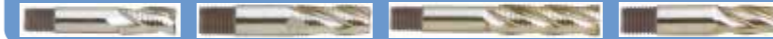
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

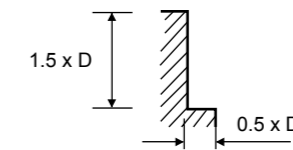
SCREWED SHANK CUTTING CONDITION



118202, 119202, 121202, 124202 (Multiflute Roughing)



MATERIAL GROUP	HRc		Size (mm)								
			22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0	
P	< 20	11	v_c (m/min)	30	30	30	30	30	30	30	30
		12	n	450	400	350	310	280	250	220	180
			f_z	0.076	0.085	0.076	0.086	0.095	0.107	0.114	0.157
			f (mm/min)	170	170	160	160	160	160	150	170
	20-30	11	v_c (m/min)	25	25	25	25	25	25	25	25
		12	n	350	310	280	250	220	200	180	160
			f_z	0.08	0.09	0.077	0.087	0.098	0.108	0.111	0.146
			f (mm/min)	140	140	130	130	130	130	120	140
	30-40	13	v_c (m/min)	15	15	15	15	15	15	15	15
		14	n	220	180	160	160	140	120	110	90
			f_z	0.077	0.094	0.089	0.089	0.101	0.118	0.121	0.148
			f (mm/min)	85	85	85	85	85	85	80	80
N	71	v_c (m/min)	75	80	80	85	80	80	80	80	
	72	n	1100	1000	900	900	800	700	630	500	
	73	f_z	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123	
		f (mm/min)	470	450	510	530	500	470	450	370	



► The feed rate for long and long reach tools should be reduced by up to 50%

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

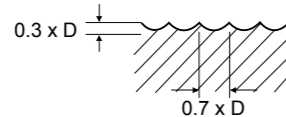
SCREWED SHANK CUTTING CONDITION



313201, 313202, 314201, 314202 (2 Flute, Ball Nose)



MATERIAL GROUP	HRc		Size (mm)									
			3.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0	
P	< 20	v _c (m/min)	30	30	30	30	30	30	30	30	30	30
		n	3400	2400	1700	1200	1000	800	600	500	400	
		f _z	0.01	0.017	0.026	0.044	0.06	0.066	0.083	0.085	0.088	
		f (mm/min)	70	80	90	105	120	105	100	85	70	
	20-30	v _c (m/min)	20	20	20	20	20	15	20	20	15	
		n	2000	1400	1000	700	560	450	350	300	220	
		f _z	0.008	0.013	0.026	0.036	0.054	0.061	0.079	0.083	0.091	
		f (mm/min)	30	35	45	50	60	55	55	50	40	
	30-40	v _c (m/min)	15	15	15	15	15	15	15	15	15	
		n	1400	1000	700	500	400	320	250	200	160	
		f _z	0.007	0.013	0.018	0.03	0.044	0.055	0.07	0.088	0.094	
		f (mm/min)	20	25	25	30	35	35	35	35	30	
N	71 72 73	v _c (m/min)	105	100	105	100	100	95	100	100	100	
		n	11000	8000	5600	4000	3200	2500	2000	1600	1300	
		f _z	0.01	0.016	0.025	0.044	0.056	0.068	0.075	0.088	0.096	
		f (mm/min)	230	260	280	350	360	340	300	280	250	



- ▶ The feed rate for long and long reach tools should be reduced by up to 50%
- ▶ Data shown is for HSSCo tools. Reduce feed rates by up to 20% for HSS tools.

v_c - cutting speed (m/min)
 n - RPM (rev/min)
 f_z - feed rate (mm/tooth)
 f - feed rate (mm/rev)
 z - No. of teeth
 a_p - axial depth of cut
 a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \times 1000}{\pi \times \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \times \pi \times \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

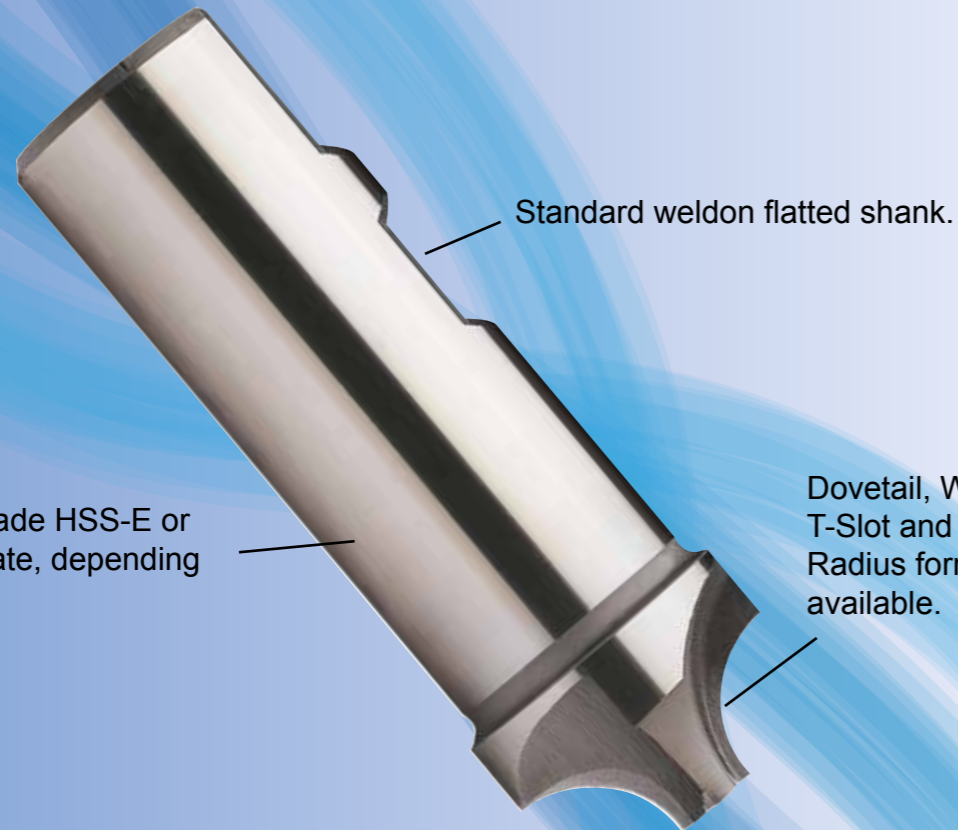


SUPERIOR PERFORMANCE



FORM TOOLS

HSS-E & HSS



Standard weldon flatted shank.

Dovetail, Woodruff,
T-Slot and Corner
Radius forms
available.

Premium grade HSS-E or
HSS substrate, depending
on tool type.

Tools can be coated to extend
tool life if required.

IDEAL FOR MATERIAL GROUPS



APPLICATION

FORM CUTTERS








HSS-E and HSS milling cutters
for varying forms on a variety
of materials

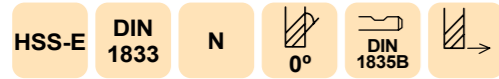


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●: Excellent ○: Good

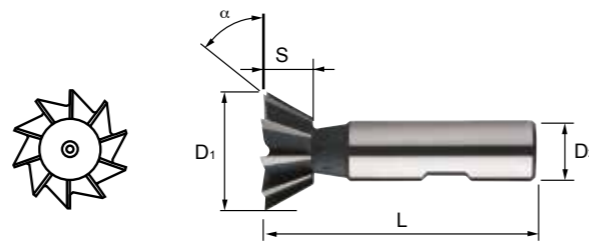
P				H		M			K				S					N							O				APPLICATION FORM CUTTERS							
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84	Europa Code	Clarkson Code	Item	Description	Page No.	
○	○	○	○																				○	○	○										Dovetail Cutter HSS-E ø16.0mm - 50.0mm Flatted Shank	P.172
○	○	○	○																				○	○	○										Inverted Dovetail Cutter HSS-E ø16.0mm - 38.0mm Flatted shank	P.173
○	○	○	○																				○	○	○										Woodruff Cutter HSS-E ø10.5mm - 45.5mm Flatted Shank	P.174
○	○	○	○																				○	○	○										T-Slot Cutter HSS-E ø12.5mm - 60.0mm Flatted Shank	P.175
○	○	○	○																				○	○	○										Corner Rounding Cutter HSSCo8 R1.0mm - R20.0mm Flatted Shank	P.176
																																			Cutting Data	P.177

HSS-E DOVETAIL CUTTERS



Series No. 153116, 154116

▶ cutting conditions : p.178



Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE
						Flatted Shank
16.0	4.0	45°	12	60	6	1531161600
20.0	5.0	45°	12	63	6	1531162000
22.0	6.0	45°	12	67	6	1531162200
25.0	6.3	45°	16	67	8	1531162500
28.0	7.5	45°	16	67	8	1531162800
32.0	8.0	45°	16	71	10	1531163200
38.0	10.0	45°	16	80	12	1531163800

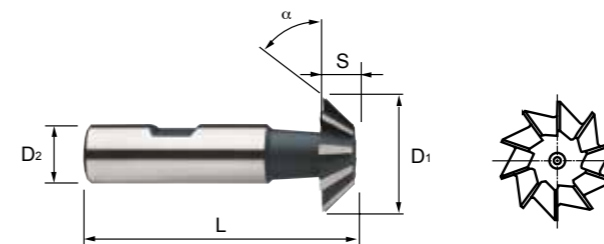
Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE
						Flatted Shank
16.0	6.3	60°	12	60	6	1541161600
20.0	8.0	60°	12	63	6	1541162000
22.0	9.0	60°	12	67	6	1541162200
25.0	10.0	60°	16	67	8	1541162500
28.0	11.0	60°	16	67	8	1541162800
32.0	12.5	60°	16	71	10	1541163200
38.0	16.0	60°	16	80	12	1541163800
40.0	13.0	60°	25	85	12	1541164000
50.0	16.0	60°	25	100	16	1541165000

HSS-E INVERTED DOVETAIL CUTTERS



Series No. 155116, 156116

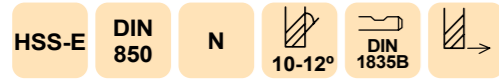
▶ cutting conditions : p.178



Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE
						Flatted Shank
16.0	4.0	45°	12	60	6	1551161600
20.0	5.0	45°	12	63	6	1551162000
22.0	6.0	45°	12	67	6	1551162200
25.0	6.3	45°	16	67	8	1551162500
28.0	7.5	45°	16	67	8	1551162800
32.0	8.0	45°	16	71	10	1551163200
38.0	10.0	45°	16	80	12	1551163800

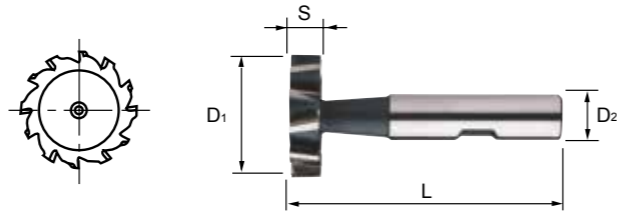
Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE
						Flatted Shank
16.0	6.3	60°	12	60	6	1561161600
20.0	8.0	60°	12	63	6	1561162000
22.0	9.0	60°	12	67	6	1561162200
25.0	10.0	60°	16	67	8	1561162500
28.0	11.0	60°	16	67	8	1561162800
32.0	12.5	60°	16	71	10	1561163200
38.0	16.0	60°	16	80	12	1561163800

HSS-E WOODRUFF KEYSEAT CUTTERS



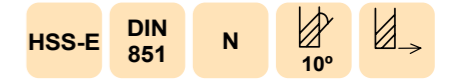
Series No. 158116

▶ cutting conditions : p.178



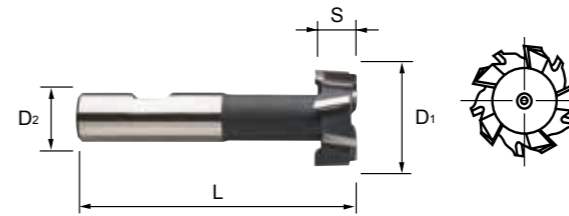
Cutting Diameter	Width	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE
					Flatted Shank
10.5	2.0	6	50	8	1581161050
10.5	2.5	6	50	8	1581161051
10.5	3.0	6	50	8	1581161052
13.5	2.0	10	56	8	1581161350
13.5	2.5	10	56	8	1581161351
13.5	3.0	10	56	8	1581161352
13.5	4.0	10	56	8	1581161353
16.5	2.5	10	56	8	1581161650
16.5	3.0	10	56	8	1581161651
16.5	4.0	10	56	8	1581161652
16.5	5.0	10	56	8	1581161653
19.5	3.0	10	56	8	1581161950
19.5	4.0	10	63	8	1581161951
19.5	5.0	10	63	8	1581161952
19.5	6.0	10	63	8	1581161953
22.5	4.0	10	63	10	1581162250
22.5	5.0	10	63	10	1581162251
22.5	6.0	10	63	10	1581162252
22.5	8.0	10	63	10	1581162253
25.5	5.0	10	63	10	1581162550
25.5	6.0	10	63	10	1581162551
25.5	7.0	10	63	10	1581162552
25.5	8.0	10	63	10	1581162553
28.5	5.0	10	63	10	1581162850
28.5	6.0	10	63	10	1581162851
28.5	7.0	10	63	10	1581162852
28.5	8.0	10	63	10	1581162853
28.5	10.0	12	71	10	1581162854
32.5	5.0	12	71	12	1581163250
32.5	6.0	12	71	12	1581163251
32.5	7.0	12	71	12	1581163252
32.5	8.0	12	71	12	1581163253
32.5	10.0	12	71	12	1581163254
38.5	7.0	12	71	12	1581163850
38.5	8.0	12	71	12	1581163851
38.5	9.0	12	71	12	1581163852
38.5	10.0	12	71	12	1581163853
45.5	10.0	12	71	14	1581164550

HSS-E T-SLOT CUTTERS



Series No. 152116

▶ cutting conditions : p.179



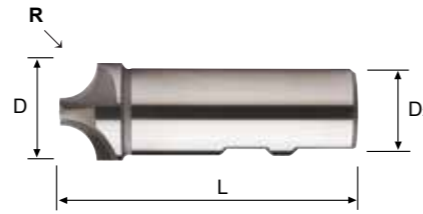
Bolt Size	Cutting Diameter	Width	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE
						Flatted Shank
M6	12.5	6.0	10	57	6	1521161250
M8	16.0	8.0	10	62	6	1521161600
M10	18.0	8.0	12	70	6	1521161800
M10	19.0	9.0	12	71	6	1521161900
M12	21.0	9.0	12	74	6	1521162100
M12	22.0	10.0	12	75	6	1521162200
M14	25.0	11.0	16	82	6	1521162500
M16	28.0	12.0	16	83	6	1521162800
M18	32.0	14.0	16	90	8	1521163200
M20	36.0	16.0	25	103	8	1521163600
M22	40.0	18.0	25	108	8	1521164000

HSS-E 4 FLUTE CORNER ROUNDING CUTTERS



Series No. 159102

© cutting conditions : p.179



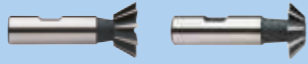
Radius	Outside Diameter	Shank Diameter	Overall Length	EUROPA CODE
				Flatted Shank
R1.0	8.0	10	60	1591020100
R1.5	9.0	10	60	1591020150
R2.0	10.0	10	60	1591020200
R2.5	11.0	10	60	1591020250
R3.0	12.0	12	60	1591020300
R3.5	13.0	12	60	1591020350
R4.0	14.0	12	60	1591020400
R4.5	15.0	12	60	1591020450
R5.0	16.0	12	60	1591020500
R5.5	19.0	16	67	1591020550
R6.0	20.0	16	67	1591020600
R6.5	21.0	16	71	1591020650
R7.0	22.0	16	71	1591020700
R7.5	23.0	16	71	1591020750
R8.0	24.0	16	71	1591020800
R8.5	25.0	25	85	1591020850
R9.0	26.0	25	85	1591020900
R9.5	27.0	25	85	1591020950
R10.0	28.0	25	85	1591021000
R10.5	31.0	25	90	1591021050
R11.0	32.0	25	90	1591021100
R12.0	34.0	25	90	1591021200
R12.5	41.0	25	100	1591021250
R13.0	42.0	25	100	1591021300
R14.0	44.0	25	100	1591021400
R15.0	46.0	25	100	1591021500
R16.0	48.0	25	100	1591021600
R18.0	52.0	32	112	1591021800
R20.0	56.0	32	112	1591022000

APPLICATION FORM CUTTERS CUTTING DATA

APPLICATION FORM CUTTERS CUTTING CONDITION



153116, 154116, 155116, 156116
(Dovetail Cutter)



MATERIAL GROUP	HRc		Size (mm)						
			16.0	20.0	25.0	32.0	40.0	50.0	
P	11 12	< 20	v _c (m/min)	15	15	15	15	15	15
			n	305	255	190	155	125	100
			f _z	0.031	0.036	0.031	0.041	0.043	0.025
			f (mm/min)	57	55	47	64	64	42
	11 12	20-30	v _c (m/min)	10	10	10	10	10	10
			n	215	180	135	100	90	75
			f _z	0.031	0.035	0.028	0.04	0.042	0.03
			f (mm/min)	40	38	30	40	45	36
	13 14	30-40	v _c (m/min)	8	8	8	8	8	8
			n	160	125	100	80	60	50
			f _z	0.021	0.02	0.02	0.02	0.022	0.02
			f (mm/min)	20	15	16	16	16	16
N	71 72 73	v _c (m/min)	95	85	90	90	95	85	
		n	1850	1350	1150	920	765	550	
		f _z	0.03	0.04	0.029	0.041	0.042	0.03	
		f (mm/min)	336	324	270	375	387	265	

158116 (Woodruff Cutter)



MATERIAL GROUP	HRc		Size (mm)								
			10.5	13.5	16.5	19.5	22.5	28.5	32.5	45.5	
P	11 12	< 20	v _c (m/min)	20	20	20	20	20	20	20	20
			n	600	470	380	320	280	220	190	130
			f _z	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
			f (mm/min)	48	38	76	90	112	110	137	127
	11 12	20-30	v _c (m/min)	15	15	15	15	15	15	15	15
			n	480	370	300	260	220	180	155	110
			f _z	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
			f (mm/min)	480	370	300	260	220	180	155	110
	13 14	30-40	v _c (m/min)	10	10	10	10	10	10	10	10
			n	300	230	190	160	140	110	90	70
			f _z	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07
			f (mm/min)	24	18	38	45	56	55	65	69
N	71 72 73	v _c (m/min)	100	100	100	100	100	100	90	100	
		n	3000	2300	1900	1600	1400	1100	900	700	
		f _z	0.01	0.01	0.025	0.035	0.04	0.05	0.06	0.07	
		f (mm/min)	240	184	380	448	560	550	648	686	

APPLICATION FORM CUTTERS CUTTING CONDITION



152116 (T-Slot Cutter)



MATERIAL GROUP	HRc		Size (mm)											
			12.5	16.0	18.0	19.0	21.0	22.0	25.0	28.0	32.0	40.0		
P	11 12	< 20	v _c (m/min)	15	15	15	15	15	15	15	15	15	15	15
			n	380	300	270	250	230	220	190	170	150	120	
			f _z	0.007	0.011	0.012	0.013	0.016	0.019	0.026	0.037	0.035	0.035	
			f (mm/min)	16	19	20	20	22	25	30	38	42	33	
	11 12	20-30	v _c (m/min)	10	10	10	10	10	10	10	10	10	10	
			n	270	210	195	180	160	150	135	120	100	80	
			f _z	0.005	0.007	0.01	0.014	0.017	0.019	0.022	0.028	0.025	0.025	
			f (mm/min)	8	9	12	15	16	17	18	20	20	16	
	N	71 72 73	v _c (m/min)	90	90	95	90	95	90	90	90	90	95	
			n	2350	1830	1680	1540	1430	1330	1170	1040	910	750	
			f _z	0.008	0.013	0.015	0.017	0.019	0.021	0.026	0.034	0.034	0.034	
			f (mm/min)	110	140	150	160	165	170	180	210	250	200	

159102 (Corner Rounding Cutter)



MATERIAL GROUP	HRc		RADIUS (mm)												
			1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	
P	11 12	< 20	v _c (m/min)	15	15	15	15	15	15	15	15	15	15	15	15
			n	600	470	470	390	390	330	260	230	190	155	130	95
			f _z	0.015	0.016	0.016	0.019	0.019	0.023	0.029	0.033	0.039	0.04	0.048	0.053
			f (mm/min)	35	30	30	30	30	30	30	30	30	25	25	20
	11 12	20-30	v _c (m/min)	10	10	10	10	10	10	10	10	10	10	10	10
			n	480	380	380	315	315	270	210	185	155	125	105	75
			f _z	0.018	0.023	0.02	0.024	0.024	0.023	0.03	0.034	0.04	0.05	0.048	0.05
			f (mm/min)	35	35	30	30	30	25	25	25	25	25	20	15
	N	71 72 73	v _c (m/min)	90	80	90	85	90	90	80	90	90	85	85	90
			n	3500	2800	2800	2400	2400	2000	1600	1400	1200	950	800	600
			f _z	0.018	0.021	0.02	0.023	0.022	0.025	0.031	0.034	0.038	0.045	0.05	0.058
			f (mm/min)	245	230	220	220	210	200	200	190	180	170	160	140

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$$

$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SUPERIOR PERFORMANCE



GOLDEX DRILL

HSSCo & HSS



Available in metric or imperial size ranges.

Bright finish body for maximum chip clearance.

TiN coated on working area for longer tool life.

Self-centering split point above 1.6mm for metric drills.

IDEAL FOR MATERIAL GROUPS



HSSCo & HSS

TWIST DRILLS







www.europatool.co.uk






APPLICATION GUIDE

INDEX











●: Excellent ○: Good

P				H		M			K				S					N							O				GOLDEX DRILLS					
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	84	Code	Item	Description	Page No.
○	○	○	○			●	●						○	○									○	○	○						810505		HSS-E Jobber ø1.0mm - 13.0mm	P.184-185
●	●	●	●			○	○		●	●	●		○	○									○	○	○						811505		HSS-E Jobber Worm Pattern ø2.0mm - 13.0mm	P.186-187
●	●	●	●			○	○						○	○									○	○	○						810504		HSS Jobber ø1.0mm - 13.0mm	P.188-189
●	●	●	●			○	○						○	○									○	○	○						820504		HSS Jobber ø3/64" - 1/2"	P.190


HSSCo DRILLS

●	●	○	○			●	●		○	○	○		○	○									○	○	○		○	○			820502		Stub ø1.0mm - 31.0mm	P.192-195
●	●	○	○			●	●		○	○	○		○	○									○	○	○		○	○			820702		Jobber ø1.0mm - 20.0mm	P.196-197
●	●	○	○			●	●		○	○	○		○	○									○	○	○		○	○			820902		Long Series ø2.0mm - 12.0mm	P.198-199
●	●	●	●	○	○				●	●	●	●																			820116		Long Series Worm Pattern ø2.0mm - 13.0mm	P.200
●	●	○	○			○	○		○	○	○		○	○					○	○	○	○	○	○	○		○	○			821402 822402		Spotting Drill 90° & 120°, ø3.0mm - 20.0mm	P.191

HSS DRILLS

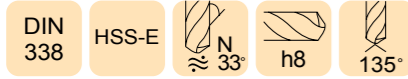
●	●	○	○						○	○	○												○	○	○		○	○			820601		Stub ø1.0mm - 13.0mm	P.202-203
●	●	○	○						○	○	○												○	○	○		○	○			0000 0001		Two Tone Jobber ø2.5mm - 17.5mm, ø3/32" - 9/16"	P.204-207
●	●	○	○						○	○	○												○	○	○		○	○			820801		Jobber ø1.0mm - 20.0mm	P.208-211
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			821901		Blacksmith ø13.0mm - 25.0mm	P.201
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			820901		Long Series ø1.0mm - 20.0mm	P.212-213
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			821001		Extra Long Series ø2.0mm - 13.0mm	P.216
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			0162		Extra Long Series Bright Finish, ø1.4mm - 14.0mm	P.214-215
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			821601		Morse Taper Shank ø13.0mm - 60.0mm	P.218-219
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			810334		Centre Drill Form A, ø0.5mm - 6.3mm	P.220
●	●	○	○			○	○		○	○	○		○	○									○	○	○		○	○			888301		Centre Drill BS1 - BS7, ø1/8" - 3/4"	P.221

DRILL SETS

810504SET 810505SET 820702SET 820801SET 10220025		DRILL SETS	P.217
		Cutting Data	P.223

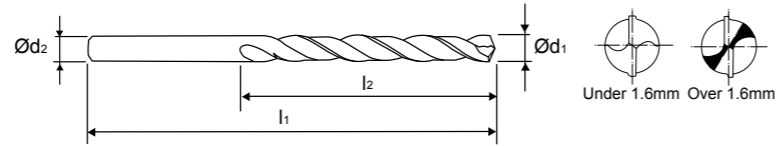
▶ For material group tables, refer to pages 298-303

GOLDEX HSS-E JOBBER DRILL



Series No. 810505

▶ cutting conditions : p.224



Application

Particularly suited to stainless steel and titanium.
Drilling in steel, cast steel - alloyed and non-alloyed, stainless steel, titanium and aluminium.

Advantage

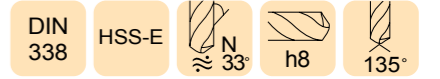
Bright finish body for maximum chip clearance.
Self-centering split point above 1.6mm
TiN coated on working area for longer tool life.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8105050100	1.0	12	34
8105050110	1.1	14	36
8105050120	1.2	16	38
8105050130	1.3	16	38
8105050140	1.4	18	40
8105050150	1.5	18	40
8105050160	1.6	20	43
8105050170	1.7	20	43
8105050180	1.8	22	46
8105050190	1.9	22	46
8105050200	2.0	24	49
8105050210	2.1	24	49
8105050220	2.2	27	53
8105050230	2.3	27	53
8105050240	2.4	30	57
8105050250	2.5	30	57
8105050260	2.6	30	57
8105050270	2.7	33	61
8105050280	2.8	33	61
8105050290	2.9	33	61
8105050300	3.0	33	61
8105050310	3.1	36	65
8105050320	3.2	36	65
8105050330	3.3	36	65
8105050340	3.4	39	70
8105050350	3.5	39	70
8105050360	3.6	39	70
8105050370	3.7	39	70
8105050380	3.8	43	75
8105050390	3.9	43	75
8105050400	4.0	43	75

●: Excellent ○: Good

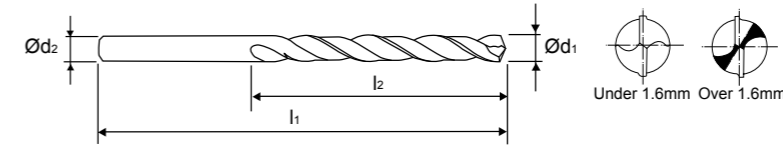
P	H	M	K	S	N	O									
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○	○	●	●	●	●										
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○									○	○	○			

GOLDEX HSS-E JOBBER DRILL



Series No. 810505

▶ cutting conditions : p.224



Application

Particularly suited to stainless steel and titanium.
Drilling in steel, cast steel - alloyed and non-alloyed, stainless steel, titanium and aluminium.

Advantage

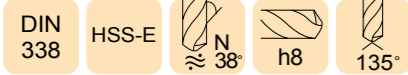
Bright finish body for maximum chip clearance.
Self-centering split point above 1.6mm
TiN coated on working area for longer tool life.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8105050720	7.2	69	109
8105050730	7.3	69	109
8105050740	7.4	69	109
8105050750	7.5	69	109
8105050760	7.6	75	117
8105050770	7.7	75	117
8105050780	7.8	75	117
8105050790	7.9	75	117
8105050800	8.0	75	117
8105050810	8.1	75	117
8105050820	8.2	75	117
8105050830	8.3	75	117
8105050840	8.4	75	117
8105050850	8.5	75	117
8105050860	8.6	81	125
8105050870	8.7	81	125
8105050880	8.8	81	125
8105050890	8.9	81	125
8105050900	9.0	81	125
8105050910	9.1	81	125
8105050920	9.2	81	125
8105050930	9.3	81	125
8105050940	9.4	81	125
8105050950	9.5	81	125
8105050960	9.6	87	133
8105050970	9.7	87	133
8105050980	9.8	87	133
8105050990	9.9	87	133
8105051000	10.0	87	133
8105051010	10.1	87	133

●: Excellent ○: Good

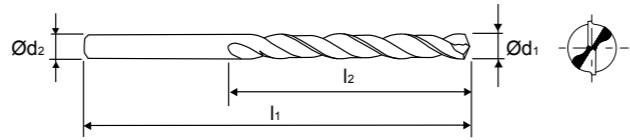
P	H	M	K	S	N	O									
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
○	○		●	●			●	●							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○									○	○	○			

GOLDEX HSS-E JOBBER DRILL WORM PATTERN



Series No. 811505

▶ cutting conditions : p.224



Application

Drilling deep holes in steel, cast iron, stainless steel, titanium and aluminium.

Advantage

Bright finish body and worm pattern for maximum chip clearance.
Self-centering split point.
TiN coated on working area for longer tool life.

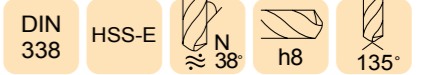
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8115050200	2.0	24	49
8115050210	2.1	24	49
8115050220	2.2	27	53
8115050230	2.3	27	53
8115050240	2.4	30	57
8115050250	2.5	30	57
8115050260	2.6	30	57
8115050270	2.7	33	61
8115050280	2.8	33	61
8115050290	2.9	33	61
8115050300	3.0	33	61
8115050310	3.1	36	65
8115050320	3.2	36	65
8115050330	3.3	36	65
8115050340	3.4	39	70
8115050350	3.5	39	70
8115050360	3.6	39	70
8115050370	3.7	39	70
8115050380	3.8	43	75
8115050390	3.9	43	75
8115050400	4.0	43	75
8115050410	4.1	43	75
8115050420	4.2	43	75
8115050430	4.3	47	80
8115050440	4.4	47	80
8115050450	4.5	47	80
8115050460	4.6	47	80
8115050470	4.7	47	80
8115050480	4.8	52	86

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8115050490	4.9	52	86
8115050500	5.0	52	86
8115050510	5.1	52	86
8115050520	5.2	52	86
8115050530	5.3	52	86
8115050540	5.4	57	93
8115050550	5.5	57	93
8115050560	5.6	57	93
8115050570	5.7	57	93
8115050580	5.8	57	93
8115050590	5.9	57	93
8115050600	6.0	57	93
8115050610	6.1	63	101
8115050620	6.2	63	101
8115050630	6.3	63	101
8115050640	6.4	63	101
8115050650	6.5	63	101
8115050660	6.6	63	101
8115050670	6.7	63	101
8115050680	6.8	69	109
8115050690	6.9	69	109
8115050700	7.0	69	109
8115050710	7.1	69	109
8115050720	7.2	69	109
8115050730	7.3	69	109
8115050740	7.4	69	109
8115050750	7.5	69	109
8115050760	7.6	75	117
8115050770	7.7	75	117

●: Excellent ○: Good

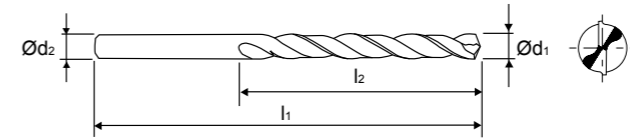
P		H	M		K		S			N				O	
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●	●		○	○	●	●	○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●					●	●	●			

GOLDEX HSS-E JOBBER DRILL WORM PATTERN



Series No. 811505

▶ cutting conditions : p.224



Application

Drilling deep holes in steel, cast iron, stainless steel, titanium and aluminium.

Advantage

Bright finish body and worm pattern for maximum chip clearance.
Self-centering split point.
TiN coated on working area for longer tool life.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8115050780	7.8	75	117
8115050790	7.9	75	117
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8115050810	8.1	75	117
8115050820	8.2	75	117
8115050830	8.3	75	117
8115050840	8.4	75	117
8115050850	8.5	75	117
8115050860	8.6	81	125
8115050870	8.7	81	125
8115050880	8.8	81	125
8115050890	8.9	81	125
8115050900	9.0	81	125
8115050910	9.1	81	125
8115050920	9.2	81	125
8115050930	9.3	81	125
8115050940	9.4	81	125
8115050950	9.5	81	125
8115050960	9.6	87	133
8115050970	9.7	87	133
8115050980	9.8	87	133
8115050990	9.9	87	133
8115051000	10.0	87	133
8115051010	10.1	87	133
8115051020	10.2	87	133
8115051030	10.3	87	133
8115051040	10.4	87	133

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8115051050	10.5	87	133
8115051060	10.6	87	133
8115051070	10.7	94	142
8115051080	10.8	94	142
8115051090	10.9	94	142
8115051100	11.0	94	142
8115051110	11.1	94	142
8115051120	11.2	94	142
8115051130	11.3	94	142
8115051140	11.4	94	142
8115051150	11.5	94	142
8115051160	11.6	94	142
8115051170	11.7	94	142
8115051180	11.8	94	142
8115051190	11.9	101	151
8115051200	12.0	101	151
8115051210	12.1	101	151
8115051220	12.2	101	151
8115051230	12.3	101	151
8115051240	12.4	101	151
8115051250	12.5	101	151
8115051260	12.6	101	151
8115051270	12.7	101	151
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●: Excellent ○: Good

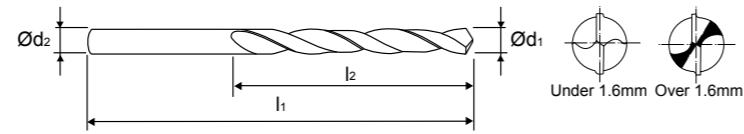
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	●	●	○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●					●	●	●			

GOLDEX HSS JOBBER DRILL



Series No. 810504

► cutting conditions : p.224



Application

Drilling in steel, cast steel - alloyed and non-alloyed, stainless steel, titanium and aluminium.

Advantage

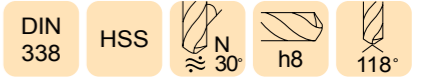
Bright finish body for maximum chip clearance.
Self-centering split point above 1.6mm
TiN coated on working area for longer tool life.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8105040100	1.0	12	34
8105040110	1.1	14	36
8105040120	1.2	16	38
8105040130	1.3	16	38
8105040140	1.4	18	40
8105040150	1.5	18	40
8105040160	1.6	20	43
8105040170	1.7	20	43
8105040180	1.8	22	46
8105040190	1.9	22	46
8105040200	2.0	24	49
8105040210	2.1	24	49
8105040220	2.2	27	53
8105040230	2.3	27	53
8105040240	2.4	30	57
8105040250	2.5	30	57
8105040260	2.6	30	57
8105040270	2.7	33	61
8105040280	2.8	33	61
8105040290	2.9	33	61
8105040300	3.0	33	61
8105040310	3.1	36	65
8105040320	3.2	36	65
8105040330	3.3	36	65
8105040340	3.4	39	70
8105040350	3.5	39	70
8105040360	3.6	39	70
8105040370	3.7	39	70
8105040380	3.8	43	75
8105040390	3.9	43	75
8105040400	4.0	43	75

●: Excellent ○: Good

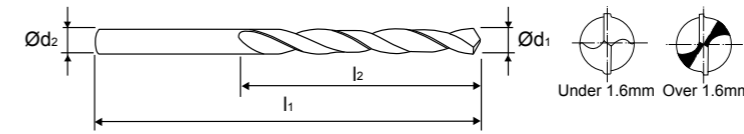
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○			○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●									○	○	○			

GOLDEX HSS JOBBER DRILL



Series No. 810504

► cutting conditions : p.224



Application

Drilling in steel, cast steel - alloyed and non-alloyed, stainless steel, titanium and aluminium.

Advantage

Bright finish body for maximum chip clearance.
Self-centering split point above 1.6mm
TiN coated on working area for longer tool life.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8105040720	7.2	69	109
8105040730	7.3	69	109
8105040740	7.4	69	109
8105040750	7.5	69	109
8105040760	7.6	75	117
8105040770	7.7	75	117
8105040780	7.8	75	117
8105040790	7.9	75	117
8105040800	8.0	75	117
8105040810	8.1	75	117
8105040820	8.2	75	117
8105040830	8.3	75	117
8105040840	8.4	75	117
8105040850	8.5	75	117
8105040860	8.6	81	125
8105040870	8.7	81	125
8105040880	8.8	81	125
8105040890	8.9	81	125
8105040900	9.0	81	125
8105040910	9.1	81	125
8105040920	9.2	81	125
8105040930	9.3	81	125
8105040940	9.4	81	125
8105040950	9.5	81	125
8105040960	9.6	87	133
8105040970	9.7	87	133
8105040980	9.8	87	133
8105040990	9.9	87	133
8105041000	10.0	87	133
8105041010	10.1	87	133

●: Excellent ○: Good

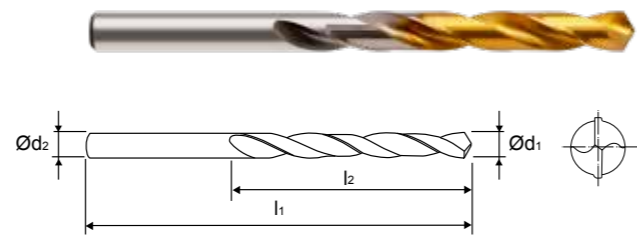
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○			○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●									○	○	○			

GOLDEX HSS JOBBER DRILL



Series No. 820504

► cutting conditions : p.224



Application

Drilling in steel, cast steel - alloyed and non-alloyed, stainless steel, titanium and aluminium.

Advantage

Bright finish body for maximum chip clearance. TIN coated on working area for longer tool life.

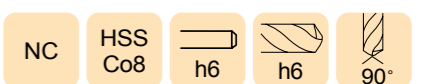
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8205040030	3/64	3/4	1.3/4
8205040040	1/16	7/8	1.7/8
8205040050	5/64	1"	2"
8205040060	3/32	1.1/4	2.1/4
8205040070	7/64	1.1/2	2.5/8
8205040080	1/8	1.5/8	2.3/4
8205040090	9/64	1.3/4	2.7/8
8205040100	5/32	2"	3.1/8
8205040110	11/64	2.1/8	3.1/4
8205040120	3/16	2.5/16	3.1/2
8205040130	13/64	2.7/16	3.5/8
8205040140	7/32	2.1/2	3.3/4
8205040150	15/64	2.5/8	3.7/8
8205040160	1/4	2.3/4	4"
8205040170	17/64	2.7/8	4.1/8

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8205040180	9/32	2.15/16	4.1/4
8205040190	19/64	3.1/16	4.3/8
8205040200	5/16	3.3/16	4.1/2
8205040210	21/64	3.5/16	4.5/8
8205040220	11/32	3.7/16	4.3/4
8205040230	23/64	3.1/2	4.7/8
8205040240	3/8	3.5/8	5"
8205040250	25/64	3.3/4	5.1/8
8205040260	13/32	3.7/8	5.1/4
8205040270	27/64	3.15/16	5.3/8
8205040280	7/16	4.1/16	5.1/2
8205040290	29/64	4.3/16	5.5/8
8205040300	15/32	4.5/16	5.3/4
8205040310	31/64	4.3/8	5.7/8
8205040320	1/2	4.1/2	6"

●: Excellent ○: Good

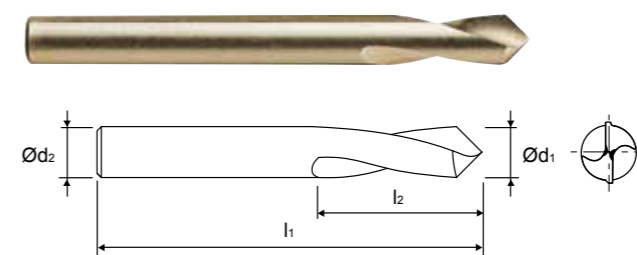
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○			○	○							
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●									○	○	○			

HSSCo SPOTTING DRILL 90°



Series No. 821402

► cutting conditions : p.227

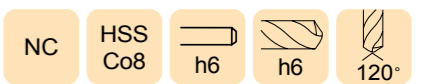


Application :

For more precise centering work on NC/CNC Machines. The large diameter of the tool permits chamfering work after centering continuously.

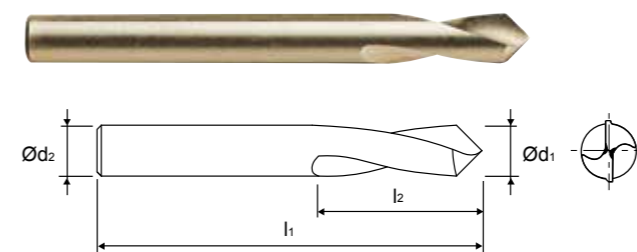
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8214020300	3	12	46
8214020400	4	12	55
8214020500	5	15	60
8214020600	6	20	66
8214020800	8	25	79
8214021000	10	25	89
8214021200	12	30	102
8214021600	16	35	115
8214022000	20	40	131

HSSCo SPOTTING DRILL 120°



Series No. 822402

► cutting conditions : p.227

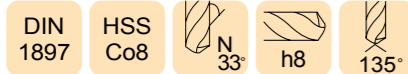


Application :

For more precise centering work on NC/CNC Machines. The large diameter of the tool permits chamfering work after centering continuously.

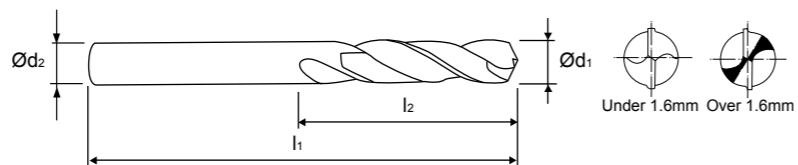
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8224020300	3	12	46
8224020400	4	12	55
8224020500	5	15	60
8224020600	6	20	66
8224020800	8	25	79
8224021000	10	25	89
8224021200	12	30	102
8224021600	16	35	115
8224022000	20	40	131

HSSCo STUB DRILL DIN1897



Series No. 820502

▶ cutting conditions : p.225



Application

Suitable for drilling thin materials with portable electric drills.
Special twist drills for automatic and turret lathes

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁	EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8205020100	1.0	6	26	8205020280	2.8	16	46
8205020110	1.1	7	28	8205020290	2.9	16	46
8205020120	1.2	8	30	8205020300	3.0	16	46
8205020125	1.25	8	30	8205020310	3.1	18	49
8205020130	1.3	8	30	8205020320	3.2	18	49
8205020140	1.4	9	32	8205020325	3.25	18	49
8205020150	1.5	9	32	8205020330	3.3	18	49
8205020160	1.6	10	34	8205020340	3.4	20	52
8205020170	1.7	10	34	8205020350	3.5	20	52
8205020175	1.75	11	36	8205020360	3.6	20	52
8205020180	1.8	11	36	8205020370	3.7	20	52
8205020190	1.9	11	36	8205020375	3.75	20	52
8205020200	2.0	12	38	8205020380	3.8	22	55
8205020210	2.1	12	38	8205020390	3.9	22	55
8205020220	2.2	13	40	8205020400	4.0	22	55
8205020225	2.25	13	40	8205020410	4.1	22	55
8205020230	2.3	13	40	8205020420	4.2	22	55
8205020240	2.4	14	43	8205020425	4.25	22	55
8205020250	2.5	14	43	8205020430	4.3	24	58
8205020260	2.6	14	43	8205020440	4.4	24	58
8205020270	2.7	16	46	8205020450	4.5	24	58
8205020275	2.75	16	46	8205020460	4.6	24	58

●: Excellent ○: Good

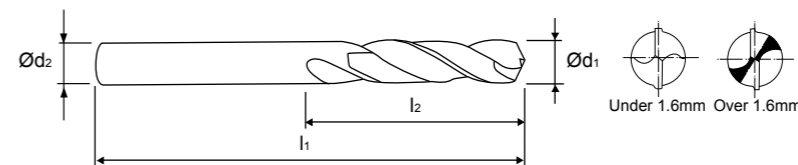
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo STUB DRILL DIN1897



Series No. 820502

▶ cutting conditions : p.225



Application

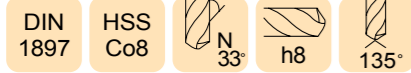
Suitable for drilling thin materials with portable electric drills.
Special twist drills for automatic and turret lathes

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁	EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8205020465	4.65	24	58	8205020630	6.3	31	70
8205020470	4.7	24	58	8205020640	6.4	31	70
8205020475	4.75	24	58	8205020650	6.5	31	70
8205020480	4.8	26	62	8205020660	6.6	31	70
8205020490	4.9	26	62	8205020670	6.7	31	70
8205020500	5.0	26	62	8205020675	6.75	34	74
8205020510	5.1	26	62	8205020680	6.8	34	74
8205020520	5.2	26	62	8205020690	6.9	34	74
8205020525	5.25	26	62	8205020700	7.0	34	74
8205020530	5.3	26	62	8205020710	7.1	34	74
8205020540	5.4	28	66	8205020720	7.2	34	74
8205020550	5.5	28	66	8205020725	7.25	34	74
8205020555	5.55	28	66	8205020730	7.3	34	74
8205020560	5.6	28	66	8205020740	7.4	34	74
8205020570	5.7	28	66	8205020745	7.45	34	74
8205020575	5.75	28	66	8205020750	7.5	34	74
8205020580	5.8	28	66	8205020760	7.6	37	79
8205020590	5.9	28	66	8205020770	7.7	37	79
8205020600	6.0	28	66	8205020775	7.75	37	79
8205020610	6.1	31	70	8205020780	7.8	37	79
8205020620	6.2	31	70	8205020790	7.9	37	79
8205020625	6.25	31	70	8205020800	8.0	37	79

●: Excellent ○: Good

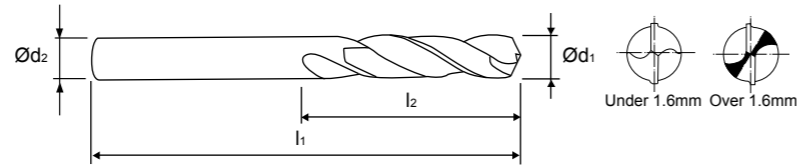
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo STUB DRILL DIN1897



Series No. 820502

▶ cutting conditions : p.225



Application

Suitable for drilling thin materials with portable electric drills.
Special twist drills for automatic and turret lathes

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8205020810	8.1	37	79
8205020820	8.2	37	79
8205020825	8.25	37	79
8205020830	8.3	37	79
8205020840	8.4	37	79
8205020850	8.5	37	79
8205020860	8.6	40	84
8205020870	8.7	40	84
8205020875	8.75	40	84
8205020880	8.8	40	84
8205020890	8.9	40	84
8205020900	9.0	40	84
8205020910	9.1	40	84
8205020920	9.2	40	84
8205020925	9.25	40	84
8205020930	9.3	40	84
8205020935	9.35	40	84
8205020940	9.4	40	84
8205020950	9.5	40	84
8205020960	9.6	43	89
8205020970	9.7	43	89
8205020975	9.75	43	89
8205020980	9.8	43	89
8205020990	9.9	43	89
8205021000	10.0	43	89
8205021020	10.2	43	89
8205021025	10.25	43	89
8205021050	10.5	43	89
8205021075	10.75	47	95
8205021100	11.0	47	95
8205021125	11.25	47	95
8205021150	11.5	47	95
8205021175	11.75	47	95
8205021180	11.8	47	95
8205021200	12.0	51	102
8205021225	12.25	51	102
8205021250	12.5	51	102
8205021275	12.75	51	102
8205021300	13.0	51	102
8205021325	13.25	54	107
8205021350	13.5	54	107
8205021375	13.75	54	107

●: Excellent ○: Good

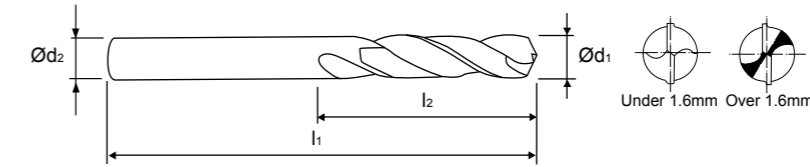
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo STUB DRILL DIN1897



Series No. 820502

▶ cutting conditions : p.225



Application

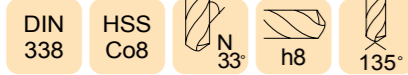
Suitable for drilling thin materials with portable electric drills.
Special twist drills for automatic and turret lathes

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8205021380	13.8	54	107
8205021400	14.0	54	107
8205021425	14.25	56	111
8205021450	14.5	56	111
8205021475	14.75	56	111
8205021500	15.0	56	111
8205021525	15.25	58	115
8205021550	15.5	58	115
8205021575	15.75	58	115
8205021600	16.0	58	115
8205021625	16.25	60	119
8205021650	16.5	60	119
8205021675	16.75	60	119
8205021700	17.0	60	119
8205021725	17.25	62	123
8205021750	17.5	62	123
8205021775	17.75	62	123
8205021800	18.0	62	123
8205021825	18.25	64	127
8205021850	18.5	64	127
8205021875	18.75	64	127
8205021900	19.0	64	127
8205021925	19.25	66	131
8205021950	19.5	66	131
8205021975	19.75	66	131
8205022000	20.0	66	131
8205022050	20.5	68	136
8205022100	21.0	68	136
8205022150	21.5	70	141
8205022200	22.0	70	141
8205022250	22.5	72	146
8205022300	23.0	72	146
8205022350	23.5	72	146
8205022400	24.0	75	151
8205022450	24.5	75	151
8205022500	25.0	75	151
8205022600	26.0	78	156
8205022700	27.0	81	162
8205022800	28.0	81	162
8205022900	29.0	84	168
8205023000	30.0	84	168
8205023100	31.0	87	174

●: Excellent ○: Good

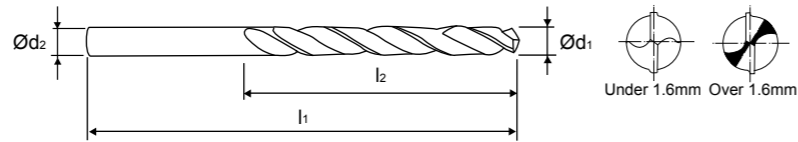
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo JOBBER DRILL DIN338



Series No. 820702

▶ cutting conditions : p.225



Application

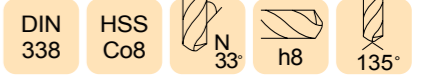
Drilling stainless steels and difficult to cut materials such as titanium.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8207020100	1.0	12	34
8207020110	1.1	14	36
8207020120	1.2	16	38
8207020125	1.25	16	36
8207020130	1.3	16	38
8207020140	1.4	18	40
8207020150	1.5	18	40
8207020160	1.6	20	43
8207020170	1.7	20	43
8207020175	1.75	22	46
8207020180	1.8	22	46
8207020190	1.9	22	46
8207020200	2.0	24	49
8207020210	2.1	24	49
8207020220	2.2	27	53
8207020225	2.25	27	53
8207020230	2.3	27	53
8207020240	2.4	30	57
8207020250	2.5	30	57
8207020260	2.6	30	57
8207020270	2.7	33	61
8207020275	2.75	33	61
8207020280	2.8	33	61
8207020290	2.9	33	61
8207020300	3.0	33	61
8207020310	3.1	36	65
8207020320	3.2	36	65
8207020325	3.25	36	65
8207020330	3.3	36	65
8207020340	3.4	39	70
8207020350	3.5	39	70
8207020360	3.6	39	70
8207020370	3.7	39	70

●: Excellent ○: Good

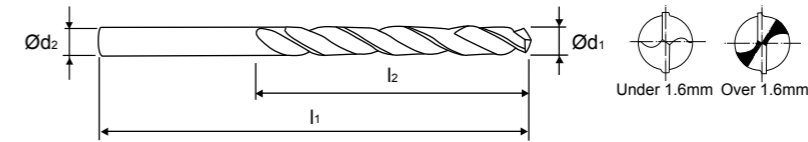
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo JOBBER DRILL DIN338



Series No. 820702

▶ cutting conditions : p.225



Application

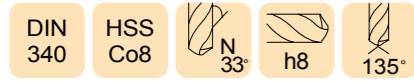
Drilling stainless steels and difficult to cut materials such as titanium.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8207020650	6.5	63	101
8207020660	6.6	63	101
8207020670	6.7	63	101
8207020675	6.75	69	109
8207020680	6.8	69	109
8207020690	6.9	69	109
8207020700	7.0	69	109
8207020710	7.1	69	109
8207020720	7.2	69	109
8207020725	7.25	69	109
8207020730	7.3	69	109
8207020740	7.4	69	109
8207020750	7.5	69	109
8207020760	7.6	75	117
8207020770	7.7	75	117
8207020775	7.75	75	117
8207020780	7.8	75	117
8207020790	7.9	75	117
8207020800	8.0	75	117
8207020810	8.1	75	117
8207020820	8.2	75	117
8207020825	8.25	75	117
8207020830	8.3	75	117
8207020840	8.4	75	117
8207020850	8.5	75	117
8207020860	8.6	81	125
8207020870	8.7	81	125
8207020875	8.75	81	125
8207020880	8.8	81	125
8207020890	8.9	81	125
8207020900	9.0	81	125
8207020910	9.1	81	125

●: Excellent ○: Good

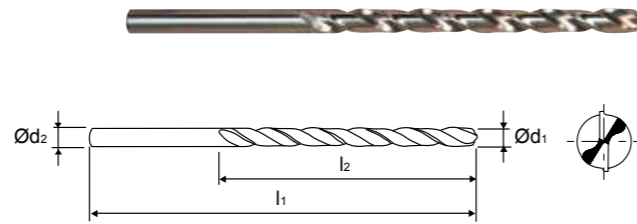
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo LONG SERIES DRILL DIN340



Series No. 820902

▶ cutting conditions : p.225



Application

Drilling stainless steels and difficult to cut materials such as titanium.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209020200	2.0	56	85
8209020210	2.1	56	85
8209020220	2.2	59	90
8209020230	2.3	59	90
8209020240	2.4	62	95
8209020250	2.5	62	95
8209020260	2.6	62	95
8209020270	2.7	66	100
8209020280	2.8	66	100
8209020290	2.9	66	100
8209020300	3.0	66	100
8209020310	3.1	69	106
8209020320	3.2	69	106
8209020330	3.3	69	106
8209020340	3.4	73	112
8209020350	3.5	73	112
8209020360	3.6	73	112
8209020370	3.7	73	112
8209020380	3.8	78	119
8209020390	3.9	78	119
8209020400	4.0	78	119
8209020410	4.1	78	119
8209020420	4.2	78	119
8209020430	4.3	82	126
8209020440	4.4	82	126
8209020450	4.5	82	126

●: Excellent ○: Good

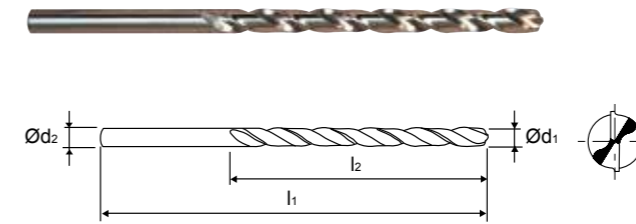
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo LONG SERIES DRILL DIN340



Series No. 820902

▶ cutting conditions : p.225



Application

Drilling stainless steels and difficult to cut materials such as titanium.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209020720	7.2	102	156
8209020730	7.3	102	156
8209020740	7.4	102	156
8209020750	7.5	102	156
8209020760	7.6	109	165
8209020770	7.7	109	165
8209020780	7.8	109	165
8209020790	7.9	109	165
8209020800	8.0	109	165
8209020810	8.1	109	165
8209020820	8.2	109	165
8209020830	8.3	109	165
8209020840	8.4	109	165
8209020850	8.5	109	165
8209020860	8.6	115	175
8209020870	8.7	115	175
8209020880	8.8	115	175
8209020890	8.9	115	175
8209020900	9.0	115	175

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209020910	9.1	115	175
8209020920	9.2	115	175
8209020930	9.3	115	175
8209020940	9.4	115	175
8209020950	9.5	115	175
8209020960	9.6	121	184
8209020970	9.7	121	184
8209020980	9.8	121	184
8209020990	9.9	121	184
8209021000	10.0	121	184
8209021020	10.2	121	184
8209021050	10.5	121	184
8209021080	10.8	128	195
8209021100	11.0	128	195
8209021120	11.2	128	195
8209021150	11.5	128	195
8209021180	11.8	128	195
8209021200	12.0	134	205

●: Excellent ○: Good

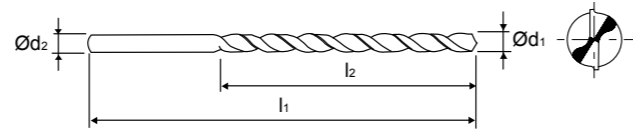
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSSCo LONG SERIES DRILL DIN340 WORM PATTERN



Series No. 820116

▶ cutting conditions : p.226



Application

Drilling deep holes in steels, alloy steels, tool steels, grey cast iron, malleable cast iron.

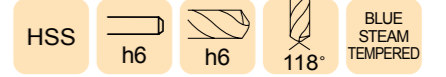
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8201160200	2.0	56	85
8201160210	2.1	56	85
8201160220	2.2	59	90
8201160230	2.3	59	90
8201160240	2.4	62	95
8201160250	2.5	62	95
8201160260	2.6	62	95
8201160270	2.7	66	100
8201160280	2.8	66	100
8201160290	2.9	66	100
8201160300	3.0	66	100
8201160310	3.1	69	106
8201160320	3.2	69	106
8201160330	3.3	69	106
8201160340	3.4	73	112
8201160350	3.5	73	112
8201160360	3.6	73	112
8201160370	3.7	73	112
8201160380	3.8	78	119
8201160390	3.9	78	119
8201160400	4.0	78	119
8201160410	4.1	78	119
8201160420	4.2	78	119
8201160450	4.5	82	126
8201160480	4.8	87	132
8201160500	5.0	87	132

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8201160520	5.2	87	132
8201160550	5.5	91	139
8201160580	5.8	91	139
8201160600	6.0	91	139
8201160620	6.2	97	148
8201160650	6.5	97	148
8201160680	6.8	102	156
8201160700	7.0	102	156
8201160720	7.2	102	156
8201160750	7.5	102	156
8201160780	7.8	109	165
8201160800	8.0	109	165
8201160820	8.2	109	165
8201160850	8.5	109	165
8201160900	9.0	115	175
8201160950	9.5	115	175
8201160980	9.8	121	184
8201161000	10.0	121	184
8201161050	10.5	121	184
8201161100	11.0	128	195
8201161150	11.5	128	195
8201161200	12.0	134	205
8201161250	12.5	134	205
8201161300	13.0	134	205

●: Excellent ○: Good

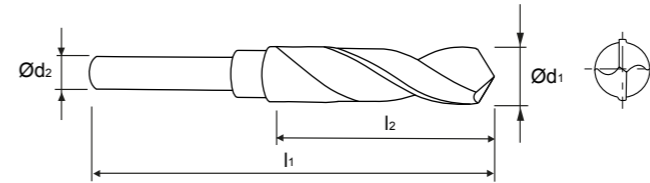
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	○			●	●									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				●	●									

BLACKSMITH DRILL



Series No. 821901

▶ cutting conditions : p.227



Surface treatment

Steam Tempered (Black Oxide Finish)

Application

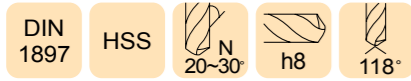
With reduced 1/2" shank for use when chuck capacity is limited.

EUROPA CODE	Diameter d ₁	Flute Length l ₂	O/All Length l ₁	Shank Dia. d ₂
8219011300	13.0	75	150	1/2"
8219011350	13.5	75	150	1/2"
8219011400	14.0	75	150	1/2"
8219011450	14.5	75	150	1/2"
8219011500	15.0	75	150	1/2"
8219011550	15.5	75	150	1/2"
8219011600	16.0	75	150	1/2"
8219011650	16.5	75	150	1/2"
8219011700	17.0	75	150	1/2"
8219011750	17.5	75	150	1/2"
8219011800	18.0	75	150	1/2"
8219011850	18.5	75	150	1/2"
8219011900	19.0	75	150	1/2"
8219011950	19.5	75	150	1/2"
8219012000	20.0	75	150	1/2"
8219012100	21.0	75	150	1/2"
8219012200	22.0	75	150	1/2"
8219012300	23.0	75	150	1/2"
8219012400	24.0	75	150	1/2"
8219012500	25.0	75	150	1/2"

●: Excellent ○: Good

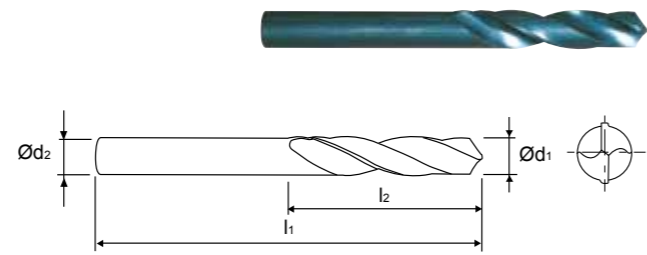
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS STUB DRILL DIN1897



Series No. 820601

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2mm

Application

Suitable for drilling thin materials with portable electric drills.
Special twist drills for automatic and turret lathes.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8206010100	1.0	6	26
8206010110	1.1	7	28
8206010120	1.2	8	30
8206010125	1.25	8	30
8206010130	1.3	8	30
8206010140	1.4	9	32
8206010150	1.5	9	32
8206010160	1.6	9	34
8206010170	1.7	10	34
8206010175	1.75	11	36
8206010180	1.8	11	36
8206010190	1.9	11	36
8206010200	2.0	12	38
8206010210	2.1	12	38
8206010220	2.2	13	40
8206010225	2.25	13	40
8206010230	2.3	13	40
8206010240	2.4	14	43
8206010250	2.5	14	43
8206010260	2.6	14	43
8206010270	2.7	16	46
8206010275	2.75	16	46
8206010280	2.8	16	46
8206010290	2.9	16	46
8206010300	3.0	16	46
8206010310	3.1	18	49
8206010320	3.2	18	49
8206010325	3.25	18	49
8206010330	3.3	18	49
8206010340	3.4	20	52
8206010350	3.5	20	52

●: Excellent ○: Good

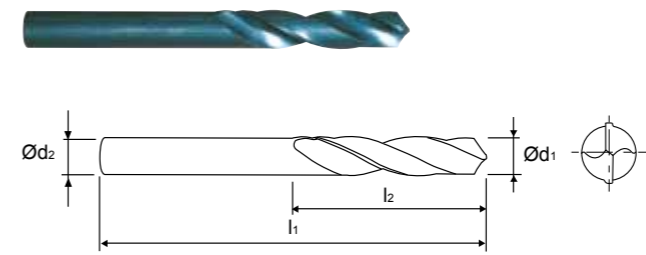
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS STUB DRILL DIN1897



Series No. 820601

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)

Application

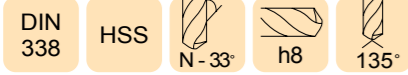
Suitable for drilling thin materials with portable electric drills.
Special twist drills for automatic and turret lathes.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8206010620	6.2	31	70
8206010625	6.25	31	70
8206010630	6.3	31	70
8206010640	6.4	31	70
8206010650	6.5	31	70
8206010660	6.6	31	70
8206010670	6.7	31	70
8206010675	6.75	34	74
8206010680	6.8	34	74
8206010690	6.9	34	74
8206010700	7.0	34	74
8206010710	7.1	34	74
8206010720	7.2	34	74
8206010725	7.25	34	74
8206010730	7.3	34	74
8206010740	7.4	34	74
8206010750	7.5	34	74
8206010760	7.6	37	79
8206010770	7.7	37	79
8206010775	7.75	37	79
8206010780	7.8	37	79
8206010790	7.9	37	79
8206010800	8.0	37	79
8206010810	8.1	37	79
8206010820	8.2	37	79
8206010825	8.25	37	79
8206010830	8.3	37	79
8206010840	8.4	37	79
8206010850	8.5	37	79
8206010860	8.6	40	84

●: Excellent ○: Good

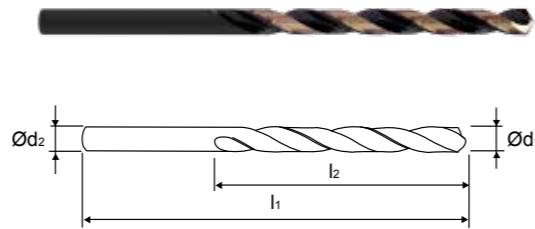
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338 TWO TONE



Series No. 0001

► cutting conditions : p.226



Point Geometry
2.5mm to 13.0mm - Split point.
Above 13.0mm - Notched thinned point.

Application
Drilling steels, cast irons, soft aluminiums and plastic.

Surface treatment
Below 5.0mm - Bright or straw colour.
5.0mm to 13.0mm - Steam tempered/straw colour (two tone).
Above 13.0mm - Straw colour

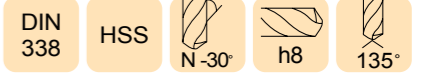
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00010098	2.5	30	57
00010102	2.6	30	57
00010106	2.7	33	61
00010110	2.8	33	61
00010113	2.85	33	61
00010114	2.9	33	61
00010117	3.0	33	61
00010120	3.05	36	65
00010122	3.1	36	65
00010127	3.2	36	65
00010130	3.3	36	65
00010134	3.4	39	70
00010137	3.5	39	70
00010142	3.6	39	70
00010143	3.65	39	70
00010146	3.7	39	70
00010147	3.75	39	70
00010150	3.8	43	75
00010153	3.9	43	75
00010158	4.0	43	75
00010161	4.1	43	75

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00010165	4.2	43	75
00010167	4.25	43	75
00010169	4.3	47	80
00010174	4.4	47	80
00010177	4.5	47	80
00010181	4.6	47	80
00010185	4.7	47	80
00010190	4.8	52	86
00010193	4.9	52	86
00010197	5.0	52	86
00010201	5.1	52	86
00010205	5.2	52	86
00010209	5.3	52	86
00010213	5.4	57	93
00010217	5.5	57	93
00010221	5.6	57	93
00010224	5.7	57	93
00010228	5.8	57	93
00010232	5.9	57	93
00010236	6.0	57	93
00010240	6.1	63	101

●: Excellent ○: Good

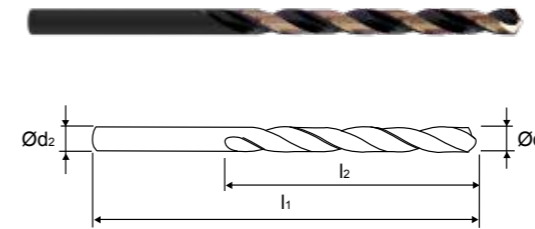
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338 TWO TONE



Series No. 0001

► cutting conditions : p.226



Point Geometry
2.5mm to 13.0mm - Split point.
Above 13.0mm - Notched thinned point.

Application
Drilling steels, cast irons, soft aluminiums and plastic.

Surface treatment
Below 5.0mm - Bright or straw colour.
5.0mm to 13.0mm - Steam tempered/straw colour (two tone).
Above 13.0mm - Straw colour

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00010244	6.2	63	101
00010246	6.25	63	101
00010248	6.3	63	101
00010252	6.4	63	101
00010256	6.5	63	101
00010260	6.6	63	101
00010263	6.7	63	101
00010268	6.8	69	109
00010275	6.9	69	109
00010276	7.0	69	109
00010279	7.1	69	109
00010284	7.2	69	109
00010287	7.3	69	109
00010291	7.4	69	109
00010295	7.5	69	109
00010299	7.6	75	117
00010303	7.7	75	117
00010307	7.8	75	117
00010311	7.9	75	117
00010315	8.0	75	117
00010319	8.1	75	117

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00010322	8.2	75	117
00010327	8.3	75	117
00010331	8.4	75	117
00010335	8.5	75	117
00010338	8.6	75	117
00010342	8.7	81	125
00010346	8.8	81	125
00010350	8.9	81	125
00010354	9.0	81	125
00010358	9.1	81	125
00010362	9.2	81	125
00010366	9.3	81	125
00010370	9.4	81	125
00010373	9.5	81	125
00010378	9.6	87	133
00010382	9.7	87	133
00010386	9.8	87	133
00010389	9.9	87	133
00010394	10.0	87	133
00010398	10.1	87	133
00010402	10.2	87	133

●: Excellent ○: Good

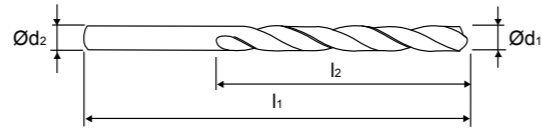
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338 TWO TONE



Series No. 0001

▶ cutting conditions : p.226



Point Geometry

2.5mm to 13.0mm - Split point.
Above 13.0mm - Notched thinned point.

Application

Drilling steels, cast irons, soft aluminums and plastic.

Surface treatment

Below 5.0mm - Bright or straw colour.
5.0mm to 13.0mm - Steam tempered/straw colour (two tone).
Above 13.0mm - Straw colour

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00010405	10.3	87	133
00010409	10.4	87	133
00010414	10.5	87	133
00010417	10.6	87	133
00010421	10.7	94	142
00010425	10.8	94	142
00010429	10.9	94	142
00010433	11.0	94	142
00010437	11.1	94	142
00010441	11.2	94	142
00010445	11.3	94	142
00010449	11.4	94	142
00010452	11.5	94	142
00010457	11.6	94	142
00010461	11.7	94	142
00010465	11.8	94	142
00010468	11.9	101	151
00010472	12.0	101	151
00010476	12.1	101	151
00010480	12.2	101	151
00010483	12.3	101	151

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00010488	12.4	101	151
00010492	12.5	101	151
00010496	12.6	101	151
00010499	12.7	101	151
00010504	12.8	101	151
00010508	12.9	101	151
00010512	13.0	101	151
00010516	13.1	101	151
00010524	13.3	108	160
00010528	13.4	108	160
00010532	13.5	108	160
00010535	13.6	108	160
00010539	13.7	108	160
00010543	13.8	108	160
00010551	14.0	108	160
00010571	14.5	114	169
00010630	16.0	120	178
00010650	16.5	125	184
00010669	17.0	125	184
00010689	17.5	130	191

●: Excellent ○: Good

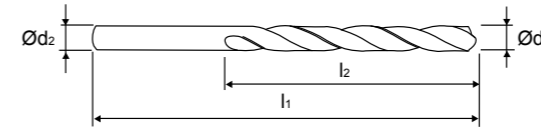
P	H	M	K	S	N	O									
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL BS328 TWO TONE



Series No. 0000

▶ cutting conditions : p.226



Point Geometry

3/32" to 1/2" - Split point.
Above 1/2" - Notched thinned point.

Application

Drilling steels, cast irons, soft aluminums and plastic.

Surface treatment

Below 3/16" - Bright or straw colour.
3/16" to 1/2" - Steam tempered/straw colour (two tone).
Above 1/2" - Straw colour.

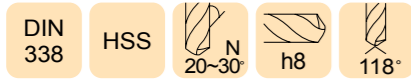
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00000094	3/32	1.1/4	2.1/4
00000109	7/64	1.1/2	2.5/8
00000125	1/8	1.5/8	2.3/4
00000140	9/64	1.3/4	2.7/8
00000156	5/32	2"	3.1/8
00000172	11/64	2.1/8	3.1/4
00000188	3/16	2.5/16	3.1/2
00000203	13/64	2.7/16	3.5/8
00000219	7/32	2.1/2	3.3/4
00000234	15/64	2.5/8	3.7/8
00000250	1/4	2.3/4	4"
00000265	17/64	2.7/8	4.1/8
00000281	9/32	2.15/16	4.1/4
00000297	19/64	3.1/16	4.3/8
00000312	5/16	3.3/16	4.1/2
00000328	21/64	3.5/16	4.5/8
00000343	11/32	3.7/16	4.3/4
00000359	23/64	3.1/2	4.7/8
00000375	3/8	3.5/8	5"
00000390	25/64	3.3/4	5.1/8

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
00000406	13/32	3.7/8	5.1/4
00000422	27/64	3.15/16	5.3/8
00000438	7/16	4.1/16	5.1/2
00000453	29/64	4.3/16	5.5/8
00000469	15/32	4.5/16	5.3/4
00000484	31/64	4.3/8	5.7/8
00000500	1/2	4.1/2	6"
00000562	9/16	4.9/16	6.3/4

●: Excellent ○: Good

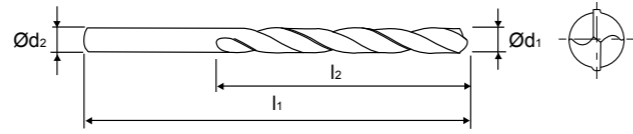
P	H	M	K	S	N	O									
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338



Series No. 820801

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2.0mm

Application

Drilling steels, cast irons, soft aluminums and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8208010100	1.0	12	34
8208010105	1.05	12	34
8208010110	1.1	14	36
8208010115	1.15	14	36
8208010120	1.2	16	38
8208010125	1.25	16	36
8208010130	1.3	16	38
8208010135	1.35	18	40
8208010140	1.4	18	40
8208010145	1.45	18	40
8208010150	1.5	18	40
8208010155	1.55	20	43
8208010160	1.6	20	43
8208010165	1.65	20	43
8208010170	1.7	20	43
8208010175	1.75	22	46
8208010180	1.8	22	46
8208010185	1.85	22	46
8208010190	1.9	22	46
8208010195	1.95	24	49
8208010200	2.0	24	49
8208010205	2.05	24	49
8208010210	2.1	24	49
8208010215	2.15	27	53
8208010220	2.2	27	53
8208010225	2.25	27	53
8208010230	2.3	27	53
8208010235	2.35	27	53
8208010240	2.4	30	57
8208010245	2.45	30	57
8208010250	2.5	30	57
8208010255	2.55	30	57

●: Excellent ○: Good

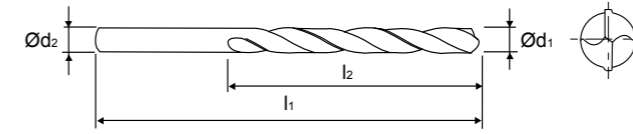
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338



Series No. 820801

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2.0mm

Application

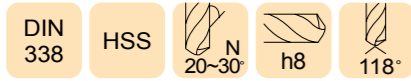
Drilling steels, cast irons, soft aluminums and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8208010420	4.2	43	75
8208010425	4.25	43	75
8208010430	4.3	47	80
8208010435	4.35	47	80
8208010440	4.4	47	80
8208010445	4.45	47	80
8208010450	4.5	47	80
8208010455	4.55	47	80
8208010460	4.6	47	80
8208010465	4.65	47	80
8208010470	4.7	47	80
8208010475	4.75	47	80
8208010480	4.8	52	86
8208010485	4.85	52	86
8208010490	4.9	52	86
8208010495	4.95	52	86
8208010500	5.0	52	86
8208010505	5.05	52	86
8208010510	5.1	52	86
8208010515	5.15	52	86
8208010520	5.2	52	86
8208010525	5.25	52	86
8208010530	5.3	52	86
8208010535	5.35	57	93
8208010540	5.4	57	93
8208010545	5.45	57	93
8208010550	5.5	57	93
8208010555	5.55	57	93
8208010560	5.6	57	93
8208010565	5.65	57	93
8208010570	5.7	57	93
8208010575	5.75	57	93

●: Excellent ○: Good

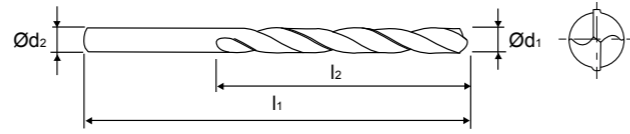
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338



Series No. 820801

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2.0mm

Application

Drilling steels, cast irons, soft aluminums and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8208010740	7.4	69	109
8208010745	7.45	69	109
8208010750	7.5	69	109
8208010755	7.55	75	117
8208010760	7.6	75	117
8208010765	7.65	75	117
8208010770	7.7	75	117
8208010775	7.75	75	117
8208010780	7.8	75	117
8208010785	7.85	75	117
8208010790	7.9	75	117
8208010795	7.95	75	117
8208010800	8.0	75	117
8208010810	8.1	75	117
8208010820	8.2	75	117
8208010825	8.25	75	117
8208010830	8.3	75	117
8208010840	8.4	75	117
8208010850	8.5	75	117
8208010860	8.6	81	125
8208010870	8.7	81	125
8208010875	8.75	81	125
8208010880	8.8	81	125
8208010890	8.9	81	125
8208010900	9.0	81	125
8208010910	9.1	81	125
8208010920	9.2	81	125
8208010925	9.25	81	125
8208010930	9.3	81	125
8208010940	9.4	81	125
8208010950	9.5	81	125
8208010960	9.6	87	133

●: Excellent ○: Good

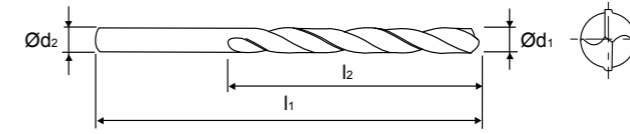
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS JOBBER DRILL DIN338



Series No. 820801

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2.0mm

Application

Drilling steels, cast irons, soft aluminums and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8208011230	12.3	101	151
8208011240	12.4	101	151
8208011250	12.5	101	151
8208011260	12.6	101	151
8208011270	12.7	101	151
8208011275	12.75	101	151
8208011280	12.8	101	151
8208011290	12.9	101	151
8208011300	13.0	101	151
8208011325	13.25	108	160
8208011350	13.5	108	160
8208011375	13.75	108	160
8208011400	14.0	108	160
8208011425	14.25	114	169
8208011450	14.5	114	169
8208011475	14.75	114	169
8208011500	15.0	114	169
8208011525	15.25	120	178
8208011550	15.5	120	178

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8208011575	15.75	120	178
8208011600	16.0	120	178
8208011625	16.25	125	184
8208011650	16.5	125	184
8208011675	16.75	125	184
8208011700	17.0	125	184
8208011725	17.25	130	191
8208011750	17.5	130	191
8208011775	17.75	130	191
8208011800	18.0	130	191
8208011825	18.25	135	198
8208011850	18.5	135	198
8208011875	18.75	135	198
8208011900	19.0	135	198
8208011925	19.25	140	205
8208011950	19.5	140	205
8208011975	19.75	140	205
8208012000	20.0	140	205

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS LONG SERIES DRILLS

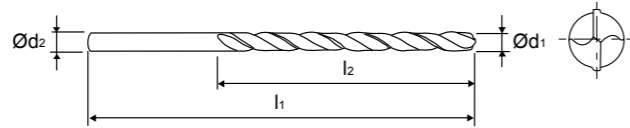


HSS DIN 340 118° STEAM TEMP



Series No. 820901

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2.0mm

Application

Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209010100	1.0	33	56
8209010120	1.2	41	65
8209010130	1.3	41	65
8209010140	1.4	45	70
8209010150	1.5	45	70
8209010160	1.6	50	76
8209010170	1.7	50	76
8209010180	1.8	53	80
8209010190	1.9	53	80
8209010200	2.0	56	85
8209010210	2.1	56	85
8209010220	2.2	59	90
8209010230	2.3	59	90
8209010240	2.4	62	95
8209010250	2.5	62	95
8209010260	2.6	62	95
8209010270	2.7	66	100
8209010280	2.8	66	100
8209010290	2.9	66	100
8209010300	3.0	66	100
8209010310	3.1	69	106
8209010320	3.2	69	106
8209010330	3.3	69	106
8209010340	3.4	73	112
8209010350	3.5	73	112
8209010360	3.6	73	112
8209010370	3.7	73	112
8209010380	3.8	78	119
8209010390	3.9	78	119
8209010400	4.0	78	119
8209010410	4.1	78	119
8209010420	4.2	78	119

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209010430	4.3	82	126
8209010440	4.4	82	126
8209010450	4.5	82	126
8209010460	4.6	82	126
8209010470	4.7	82	126
8209010480	4.8	87	132
8209010490	4.9	87	132
8209010500	5.0	87	132
8209010510	5.1	87	132
8209010520	5.2	87	132
8209010530	5.3	87	132
8209010540	5.4	91	139
8209010550	5.5	91	139
8209010560	5.6	91	139
8209010570	5.7	91	139
8209010580	5.8	91	139
8209010590	5.9	91	139
8209010600	6.0	91	139
8209010610	6.1	97	148
8209010620	6.2	97	148
8209010630	6.3	97	148
8209010640	6.4	97	148
8209010650	6.5	97	148
8209010660	6.6	97	148
8209010670	6.7	97	148
8209010680	6.8	102	156
8209010690	6.9	102	156
8209010700	7.0	102	156
8209010710	7.1	102	156
8209010720	7.2	102	156
8209010730	7.3	102	156
8209010740	7.4	102	156

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS LONG SERIES DRILLS

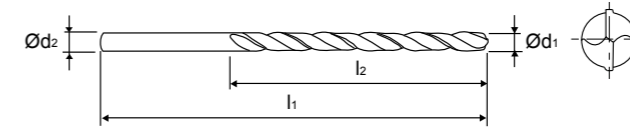


HSS DIN 340 118° STEAM TEMP



Series No. 820901

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)
Bright Finish under 2.0mm

Application

Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209010750	7.5	102	156
8209010760	7.6	109	165
8209010770	7.7	109	165
8209010780	7.8	109	165
8209010790	7.9	109	165
8209010800	8.0	109	165
8209010810	8.1	109	165
8209010820	8.2	109	165
8209010830	8.3	109	165
8209010840	8.4	109	165
8209010850	8.5	109	165
8209010860	8.6	115	175
8209010870	8.7	115	175
8209010880	8.8	115	175
8209010890	8.9	115	175
8209010900	9.0	115	175
8209010910	9.1	115	175
8209010920	9.2	115	175
8209010930	9.3	115	175
8209010940	9.4	115	175
8209010950	9.5	115	175
8209010960	9.6	121	184
8209010970	9.7	121	184
8209010980	9.8	121	184
8209010990	9.9	121	184
8209011000	10.0	121	184
8209011010	10.1	121	184
8209011020	10.2	121	184
8209011030	10.3	121	184
8209011040	10.4	121	184
8209011050	10.5	121	184
8209011060	10.6	121	184

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8209011070	10.7	128	195
8209011080	10.8	128	195
8209011090	10.9	128	195
8209011100	11.0	128	195
8209011110	11.1	128	195
8209011120	11.2	128	195
8209011130	11.3	128	195
8209011140	11.4	128	195
8209011150	11.5	128	195
8209011160	11.6	128	195
8209011170	11.7	128	195
8209011180	11.8	128	195
8209011190	11.9	134	205
8209011200	12.0	134	205
8209011210	12.1	134	205
8209011220	12.2	134	205
8209011230	12.3	134	205
8209011240	12.4	134	205
8209011250	12.5	134	205
8209011260	12.6	134	205
8209011270	12.7	134	205
8209011280	12.8	134	205
8209011290	12.9	134	205
8209011300	13.0	134	205
8209011400	14.0	140	214
8209011500	15.0	144	205
8209011600	16.0	149	227
8209011700	17.0	154	235
8209011800	18.0	158	241
8209011900	19.0	162	247
8209012000	20.0	166	254

●: Excellent ○: Good

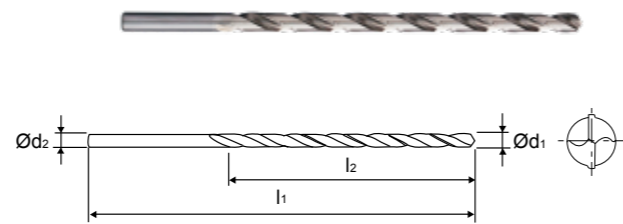
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS EXTRA LONG SERIES DRILLS



Series No. 0162

▶ cutting conditions : p.226



Surface treatment
Bright finish.

Application
Designed for drilling deep holes or deeply located holes.
Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
01620055	1.4	100	160
01620058	1.5	80	125
01620059	1.5	100	160
01620071	1.8	100	160
01620079	2.0	80	125
01620080	2.0	100	160
01620087	2.2	100	160
01620098	2.5	80	125
01620099	2.5	100	160
01620112	3.0	100	160
01620113	3.0	150	200
01620114	3.0	200	250
01620122	3.3	100	160
01620132	3.5	100	160
01620133	3.5	150	200
01620134	3.5	200	250
01620142	3.7	100	160
01620162	4.0	100	160
01620163	4.0	150	200
01620164	4.0	200	250
01620165	4.0	250	315

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
01620172	4.5	100	160
01620173	4.5	150	200
01620174	4.5	200	250
01620175	4.5	250	315
01620192	5.0	100	160
01620193	5.0	150	200
01620194	5.0	200	250
01620195	5.0	250	315
01620196	5.0	300	400
01620213	5.5	150	200
01620214	5.5	200	250
01620215	5.5	250	315
01620243	6.0	150	200
01620244	6.0	200	250
01620245	6.0	250	315
01620246	6.0	300	400
01620253	6.5	150	200
01620254	6.5	200	250
01620255	6.5	250	315

●: Excellent ○: Good

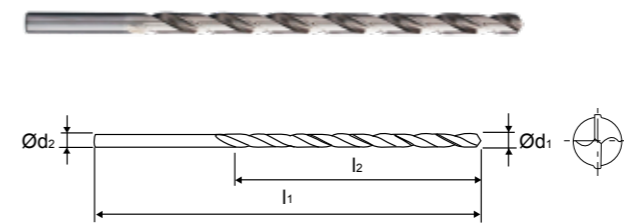
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS EXTRA LONG SERIES DRILLS



Series No. 0162

▶ cutting conditions : p.226



Surface treatment
Bright finish.

Application
Designed for drilling deep holes or deeply located holes.
Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

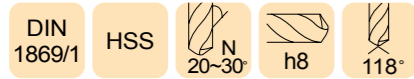
EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
01620273	7.0	150	200
01620274	7.0	200	250
01620275	7.0	250	315
01620293	7.5	150	200
01620294	7.5	200	250
01620295	7.5	250	315
01620314	8.0	200	250
01620315	8.0	250	315
01620316	8.0	300	400
01620334	8.5	200	250
01620335	8.5	250	315
01620354	9.0	200	250
01620355	9.0	250	315
01620356	9.0	300	400
01620374	9.5	200	250
01620375	9.5	250	315

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
01620394	10.0	200	250
01620395	10.0	250	315
01620396	10.0	300	400
01620414	10.5	200	250
01620415	10.5	250	315
01620416	10.5	300	400
01620424	11.0	200	250
01620425	11.0	250	315
01620426	11.0	300	400
01620474	12.0	200	250
01620475	12.0	250	315
01620476	12.0	300	400
01620515	13.0	250	315
01620516	13.0	300	400
01620555	14.0	250	315
01620556	14.0	300	400

●: Excellent ○: Good

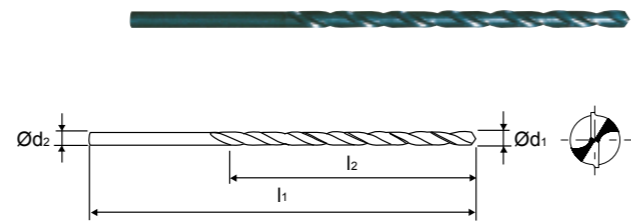
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS EXTRA LONG SERIES DRILLS



Series No. 821001

▶ cutting conditions : p.226



Surface treatment

Steam Tempered (Black Oxide Finish)

Application

Designed for drilling deep holes or deeply located holes. Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8210010200	2.0	85	125
8210010250	2.5	95	140
8210010300	3.0	100	150
8210010350	3.5	115	165
8210010400	4.0	120	175
8210010450	4.5	125	185
8210010500	5.0	135	195
8210010550	5.5	140	205
8210010600	6.0	140	205
8210010650	6.5	150	215
8210010700	7.0	155	225
8210010750	7.5	155	225

EUROPA CODE	O.D = S.D d ₁ = d ₂	FL l ₂	OAL l ₁
8210010800	8.0	165	240
8210010850	8.5	165	240
8210010900	9.0	175	250
8210010950	9.5	175	250
8210011000	10.0	185	265
8210011050	10.5	185	265
8210011100	11.0	195	280
8210011150	11.5	195	280
8210011200	12.0	205	295
8210011250	12.5	205	295
8210011300	13.0	205	295

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				○	○								○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

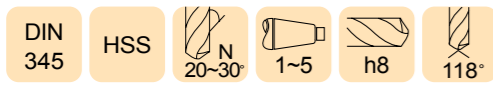
DRILL SETS



820801SET4 820801SET3 820801SET1 10220025 810504SET1

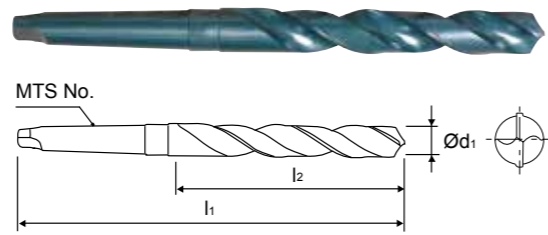
EUROPA CODE	Set No.	No. of Drills	Diameter Range	Increments	Drill Style	Drill Type
810504SET2	19M	19	1.0 - 10.0	0.5	HSS GOLDEX	JOBBER DRILLS
810504SET1	25M	25	1.0 - 13.0	0.5	HSS GOLDEX	JOBBER DRILLS
810505SET2	19M	19	1.0 - 10.0	0.5	HSS-E GOLDEX	JOBBER DRILLS
810505SET1	25M	25	1.0 - 13.0	0.5	HSS-E GOLDEX	JOBBER DRILLS
10220025	25M	25	1.0 - 13.0	0.5	TWO TONE	JOBBER DRILLS
820801SET2	19M	19	1.0 - 10.0	0.5	HSS	JOBBER DRILLS
820801SET1	25M	25	1.0 - 13.0	0.5	HSS	JOBBER DRILLS
820801SET3	M4	50	1.0 - 5.9	0.1	HSS	JOBBER DRILLS
820801SET4	M5	41	6.0 - 10.0	0.1	HSS	JOBBER DRILLS
820702SET2	19M	19	1.0 - 10.0	0.5	HSSCo	JOBBER DRILLS
820702SET1	25M	25	1.0 - 13.0	0.5	HSSCo	JOBBER DRILLS

HSS MTS DRILL DIN345



Series No. 821601

▶ cutting conditions : p.227



Surface treatment

Steam Tempered (Black Oxide Finish)

Application

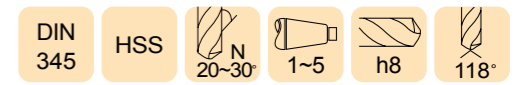
Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

EUROPA CODE	O.D d ₁	FL l ₂	OAL l ₁	MTS No.
8216011300	13.0	101	182	1
8216011320	13.2	101	182	1
8216011325	13.25	108	189	1
8216011350	13.5	108	189	1
8216011375	13.75	108	189	1
8216011380	13.8	108	189	1
8216011400	14.0	108	189	1
8216011425	14.25	114	212	2
8216011450	14.5	114	212	2
8216011475	14.75	114	212	2
8216011500	15.0	114	212	2
8216011525	15.25	120	218	2
8216011550	15.5	120	218	2
8216011575	15.75	120	218	2
8216011600	16.0	120	218	2
8216011625	16.25	125	223	2
8216011650	16.5	125	223	2
8216011675	16.75	125	223	2
8216011700	17.0	125	223	2
8216011725	17.25	130	228	2
8216011750	17.5	130	228	2
8216011775	17.75	130	228	2
8216011800	18.0	130	228	2
8216011825	18.25	135	233	2
8216011850	18.5	135	233	2
8216011875	18.75	135	233	2
8216011900	19.0	135	233	2
8216011925	19.25	140	238	2
8216011950	19.5	140	238	2
8216011975	19.75	140	238	2
8216012000	20.0	140	238	2
8216012025	20.25	145	243	2

●: Excellent ○: Good

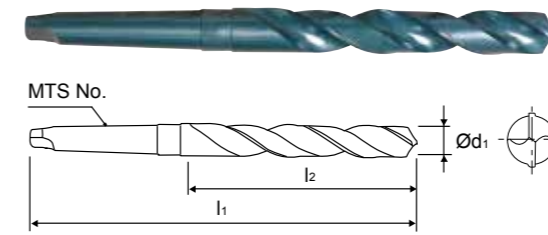
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS MTS DRILL DIN345



Series No. 821601

▶ cutting conditions : p.227



Surface treatment

Steam Tempered (Black Oxide Finish)

Application

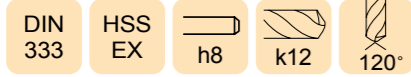
Drilling steels, stainless steels, cast irons, titanium, aluminium and plastic.

EUROPA CODE	O.D d ₁	FL l ₂	OAL l ₁	MTS No.
8216012850	28.5	175	296	3
8216012875	28.75	175	296	3
8216012900	29.0	175	296	3
8216012925	29.25	175	296	3
8216012950	29.5	175	296	3
8216012975	29.75	175	296	3
8216013000	30.0	175	296	3
8216013025	30.25	180	301	3
8216013050	30.5	180	301	3
8216013075	30.75	180	301	3
8216013100	31.0	180	301	3
8216013125	31.25	180	301	3
8216013150	31.5	180	301	3
8216013175	31.75	185	306	3
8216013200	32.0	185	334	4
8216013225	32.5	185	334	4
8216013300	33.0	185	334	4
8216013350	33.5	185	334	4
8216013400	34.0	190	339	4
8216013450	34.5	190	339	4
8216013500	35.0	190	339	4
8216013550	35.5	190	339	4
8216013600	36.0	195	344	4
8216013650	36.5	195	344	4
8216013700	37.0	195	344	4
8216013750	37.5	195	344	4
8216013800	38.0	200	349	4
8216013850	38.5	200	349	4
8216013900	39.0	200	349	4
8216013950	39.5	200	349	4
8216014000	40.0	200	349	4

●: Excellent ○: Good

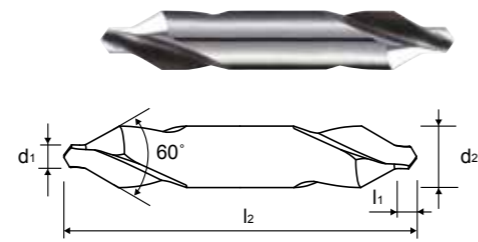
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS CENTRE DRILL



Series No. 810334

▶ cutting conditions : p.227



FORM A (60°)

EUROPA CODE	Pilot Dia. d ₁	Body Dia. d ₂	Pilot Length l ₁	Overall l ₂
8103340050	0.5	3.15	0.8	25.0
8103340080	0.8	3.15	1.1	25.0
8103340100	1.0	3.15	1.3	31.5
8103340125	1.25	3.15	1.6	31.5
8103340160	1.6	4.0	2.0	35.5
8103340200	2.0	5.0	2.5	40.0
8103340250	2.5	6.3	3.1	45.0
8103340315	3.15	8.0	3.9	50.0
8103340400	4.0	10.0	5.0	56.0
8103340500	5.0	12.5	6.3	63.0
8103340630	6.3	16.0	8.0	71.0

▶ Under 1.0mm : Single End

●: Excellent ○: Good

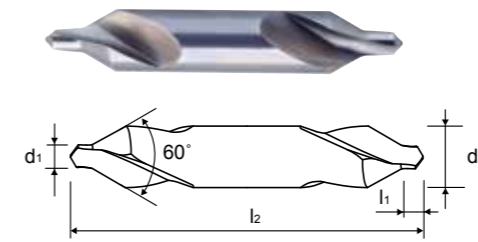
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			

HSS CENTRE DRILL



Series No. 888301

▶ cutting conditions : p.227



EUROPA CODE	BS	Pilot Dia. d ₁	Body Dia. d ₂	Pilot Length l ₁ max	Pilot Length l ₁ min	Overall l ₂
8883010010	BS1	3/64"	1/8"	5/64"	1/16"	1.1/2"
8883010020	BS2	1/16"	3/16"	3/32"	5/64"	1.3/4"
8883010030	BS3	3/32"	1/4"	5/32"	1/8"	2"
8883010040	BS4	1/8"	5/16"	3/16"	5/32"	2.1/4"
8883010050	BS5	3/16"	7/16"	9/32"	1/4"	2.1/2"
8883010060	BS6	1/4"	5/8"	3/8"	5/16"	3"
8883010070	BS7	5/16"	3/4"	15/32"	13/32"	3.1/2"


●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○						○	○
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○				○					○	○	○			



HSS DRILLS
CUTTING DATA

HSS & HSSCo CUTTING CONDITION

810504, 820504, 810505 (Goldex) 

Material Group	vc (m/min)	fn (mm/rev)									
		ø1.0 -1.9	ø2.0 -2.9	ø3.0 -3.9	ø4.0 -4.9	ø5.0 -5.9	ø6.0 -6.9	ø7.0 -7.9	ø8.0 -9.9	ø10.0 -11.9	ø12.0 -13.5
P	11 40 (35-45)	0.02	0.06	0.08	0.11	0.11	0.13	0.15	0.18	0.22	0.22
	12										
	13 23 (20-25)	0.02	0.06	0.08	0.10	0.10	0.12	0.14	0.15	0.18	0.20
M	21 23 (20-25)	0.02	0.06	0.08	0.10	0.10	0.12	0.14	0.15	0.18	0.20
	22										
S	41 23 (20-25)	0.02	0.06	0.08	0.09	0.10	0.12	0.14	0.15	0.18	0.20
	42										
N	71 90 (85-95)	0.02	0.06	0.10	0.11	0.12	0.14	0.16	0.18	0.23	0.23
	72										
	73										

811505 (Goldex Worm Pattern) 

Material Group	vc (m/min)	fn (mm/rev)									
		ø1.0 -1.9	ø2.0 -2.9	ø3.0 -3.9	ø4.0 -4.9	ø5.0 -5.9	ø6.0 -6.9	ø7.0 -7.9	ø8.0 -9.9	ø10.0 -11.9	ø12.0 -13.5
P	11 25 (23-28)	0.02	0.06	0.08	0.09	0.10	0.12	0.14	0.15	0.18	0.20
	12										
	13 18 (15-20)	0.02	0.06	0.08	0.10	0.10	0.12	0.14	0.15	0.18	0.20
M	21 18 (15-20)	0.02	0.06	0.08	0.10	0.10	0.12	0.14	0.15	0.18	0.20
	22										
K	31 45 (40-50)	0.02	0.07	0.11	0.14	0.14	0.18	0.20	0.22	0.28	0.28
	32										
	33 28 (25-30)	0.02	0.07	0.11	0.14	0.14	0.18	0.20	0.22	0.28	0.28
S	41 18 (15-20)	0.02	0.06	0.08	0.09	0.10	0.12	0.14	0.15	0.18	0.20
	42										
N	71 70 (65-75)	0.02	0.06	0.10	0.11	0.12	0.14	0.16	0.18	0.23	0.23
	72										
	73										

vc - cutting speed (m/min)
n - RPM (rev/min)
fn - feed rate (mm/rev)
ø - drill diameter (mm)

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HSS & HSSCo CUTTING CONDITION

820502, 820702, 820902 (HSSCo Stub, Jobber, Long Series) 

Material Group	vc (m/min)	fn (mm/rev)									
		ø1.0 -1.9	ø2.0 -2.9	ø3.0 -3.9	ø4.0 -4.9	ø5.0 -5.9	ø6.0 -6.9	ø7.0 -7.9	ø8.0 -9.9	ø10.0 -11.9	ø12.0 -13.5
P	11 25 (22-27)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160
	12										
	13 22 (20-25)	0.009	0.020	0.045	0.050	0.060	0.075	0.095	0.125	0.140	0.150
M	21 18 (15-20)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160
	22										
K	31 18 (15-20)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160
	32										
	33										
S	41 10 (8-12)	0.08	0.020	0.025	0.031	0.038	0.045	0.060	0.075	0.090	0.100
	42										
N	71 48 (45-50)	0.020	0.038	0.063	0.070	0.076	0.120	0.160	0.180	0.200	0.225
	72										
	73										
O	81 23 (22-25)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160
	82										

Material Group	vc (m/min)	fn (mm/rev)									
		ø14.0 -15.5	ø16.0 -17.5	ø18.0 -19.5	ø20.0 -21.5	ø22.0 -23.5	ø24.0 -25.5	ø26.0 -27.5	ø28.0 -29.5	ø30.0 -31.0	
P	11 25 (22-27)	0.180	0.200	0.230	0.240	0.250	0.260	0.270	0.275	0.280	
	12										
	13 22 (20-25)	0.170	0.210	0.220	0.230	0.240	0.250	0.260	0.265	0.270	
M	21 18 (15-20)	0.180	0.200	0.230	0.240	0.250	0.260	0.270	0.275	0.280	
	22										
K	31 18 (15-20)	0.180	0.200	0.230	0.240	0.250	0.260	0.270	0.275	0.280	
	32										
	33										
S	41 10 (8-12)	0.110	0.120	0.130	0.140	0.150	0.160	0.170	0.175	0.180	
	42										
N	71 48 (45-50)	0.250	0.275	0.300	0.325	0.350	0.360	0.370	0.375	0.380	
	72										
	73										
O	81 23 (22-25)	0.180	0.200	0.230	0.240	0.250	0.260	0.270	0.275	0.280	
	82										


vc - cutting speed (m/min)
n - RPM (rev/min)
fn - feed rate (mm/rev)
ø - drill diameter (mm)

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HSS & HSSCo CUTTING CONDITION

820116, (HSSCo L/S Worm Pattern) 

Material Group	vc (m/min)	fn (mm/rev)									
		ø2.0 -2.9	ø3.0 -3.9	ø4.0 -4.9	ø5.0 -5.9	ø6.0 -6.9	ø7.0 -7.9	ø8.0 -9.9	ø10.0 -11.9	ø12.0 -13.5	
P	11										
	12	15 (13-18)	0.03	0.05	0.06	0.06	0.08	0.09	0.10	0.12	0.13
	13										
	14										
H	15	10 (8-13)	0.02	0.04	0.05	0.05	0.06	0.08	0.10	0.12	0.13
K	31	22 (20-25)	0.06	0.10	0.13	0.13	0.16	0.18	0.20	0.23	0.25
	32										
	33	9 (7-12)	0.05	0.08	0.10	0.10	0.13	0.15	0.17	0.20	0.22
	34										

820601, 0000, 0001, 820801, 820901, 821001, 0162 (HSS Stub, Two Tone, Jobber, Long Series, Extra Long Series) 

Material Group	vc (m/min)	fn (mm/rev)														
		ø1.0 -1.9	ø2.0 -2.9	ø3.0 -3.9	ø4.0 -4.9	ø5.0 -5.9	ø6.0 -6.9	ø7.0 -7.9	ø8.0 -9.9	ø10.0 -11.9	ø12.0 -13.5	ø14.0 -15.5	ø16.0 -17.5	ø18.0 -19.5	ø20.0	
P	11	25 (22-27)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	12															
	13															
	14	22 (20-25)	0.009	0.020	0.045	0.050	0.060	0.075	0.095	0.125	0.140	0.150	0.170	0.210	0.220	0.230
M	21	18 (15-20)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	22															
K	31	18 (15-20)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	32															
	33															
S	41	10 (8-12)	0.08	0.020	0.025	0.031	0.038	0.045	0.060	0.075	0.090	0.100	0.110	0.120	0.130	0.140
42																
N	71	48 (45-50)	0.020	0.038	0.063	0.070	0.076	0.120	0.160	0.180	0.200	0.225	0.250	0.275	0.300	0.325
	72															
	73															
O	81	23 (22-25)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
82																


vc - cutting speed (m/min)
n - RPM (rev/min)
fn - feed rate (mm/rev)
ø - drill diameter (mm)

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \phi}$


To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HSS & HSSCo CUTTING CONDITION

821901, 821601 (Blacksmith, MTS) 

Material Group	vc (m/min)	fn (mm/rev)														
		ø13.0 -15.5	ø16.0 -18.5	ø19.0 -21.5	ø22.0 -24.5	ø25.0 -28.5	ø28.0 -31.5	ø32.0 -35.5	ø36.0 -39.5	ø40.0 -43.5	ø44.0 -47.5	ø48.0 -51.5	ø52.0 -55.5	ø56.0 -59.5	ø60.0	
P	11	20 (18-22)	0.17	0.20	0.23	0.24	0.25	0.26	0.28	0.30	0.31	0.32	0.33	0.35	0.38	0.40
	12															
	13															
	14	15 (13-18)	0.15	0.18	0.21	0.22	0.23	0.24	0.26	0.28	0.29	0.30	0.31	0.33	0.36	0.38
M	21	18 (15-20)	0.17	0.20	0.23	0.24	0.25	0.26	0.28	0.30	0.31	0.32	0.33	0.35	0.38	0.40
	22															
K	31	18 (15-20)	0.17	0.20	0.23	0.24	0.25	0.26	0.28	0.30	0.31	0.32	0.33	0.35	0.38	0.40
	32															
	33															
S	41	10 (8-12)	0.09	0.11	0.13	0.14	0.15	0.16	0.18	0.18	0.19	0.19	0.20	0.21	0.22	0.23
42																
N	71	45 (40-50)	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.46	0.48	0.49	0.50
	72															
	73															
O	81	22 (20-25)	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.42	0.44	0.46	0.48	0.49	0.50
	82															

810334, 888301, 821402, 8224002 (Centre Drills, Spotting Drills) 

Material Group	vc (m/min)	fn (mm/rev)														
		ø1.0 -1.9	ø2.0 -2.9	ø3.0 -3.9	ø4.0 -4.9	ø5.0 -5.9	ø6.0 -6.9	ø7.0 -7.9	ø8.0 -9.9	ø10.0 -11.9	ø12.0 -13.5	ø14.0 -15.5	ø16.0 -17.5	ø18.0 -19.5	ø20.0	
P	11	20 (25-25)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	12															
	13															
	14	18 (15-20)	0.009	0.020	0.045	0.050	0.060	0.075	0.095	0.125	0.140	0.150	0.170	0.210	0.220	0.230
M	21	8 (6-10)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	22															
K	31	8 (6-10)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	32															
	33															
S	41	5 (4-6)	0.08	0.020	0.025	0.031	0.038	0.045	0.060	0.075	0.090	0.100	0.110	0.120	0.130	0.140
42																
N	71	40 (40-45)	0.020	0.038	0.063	0.070	0.076	0.120	0.160	0.180	0.200	0.225	0.250	0.275	0.300	0.325
	72															
	73															
O	81	18 (15-20)	0.010	0.025	0.050	0.055	0.063	0.080	0.100	0.130	0.145	0.160	0.180	0.200	0.230	0.240
	82															

vc - cutting speed (m/min)
n - RPM (rev/min)
fn - feed rate (mm/rev)
ø - drill diameter (mm)

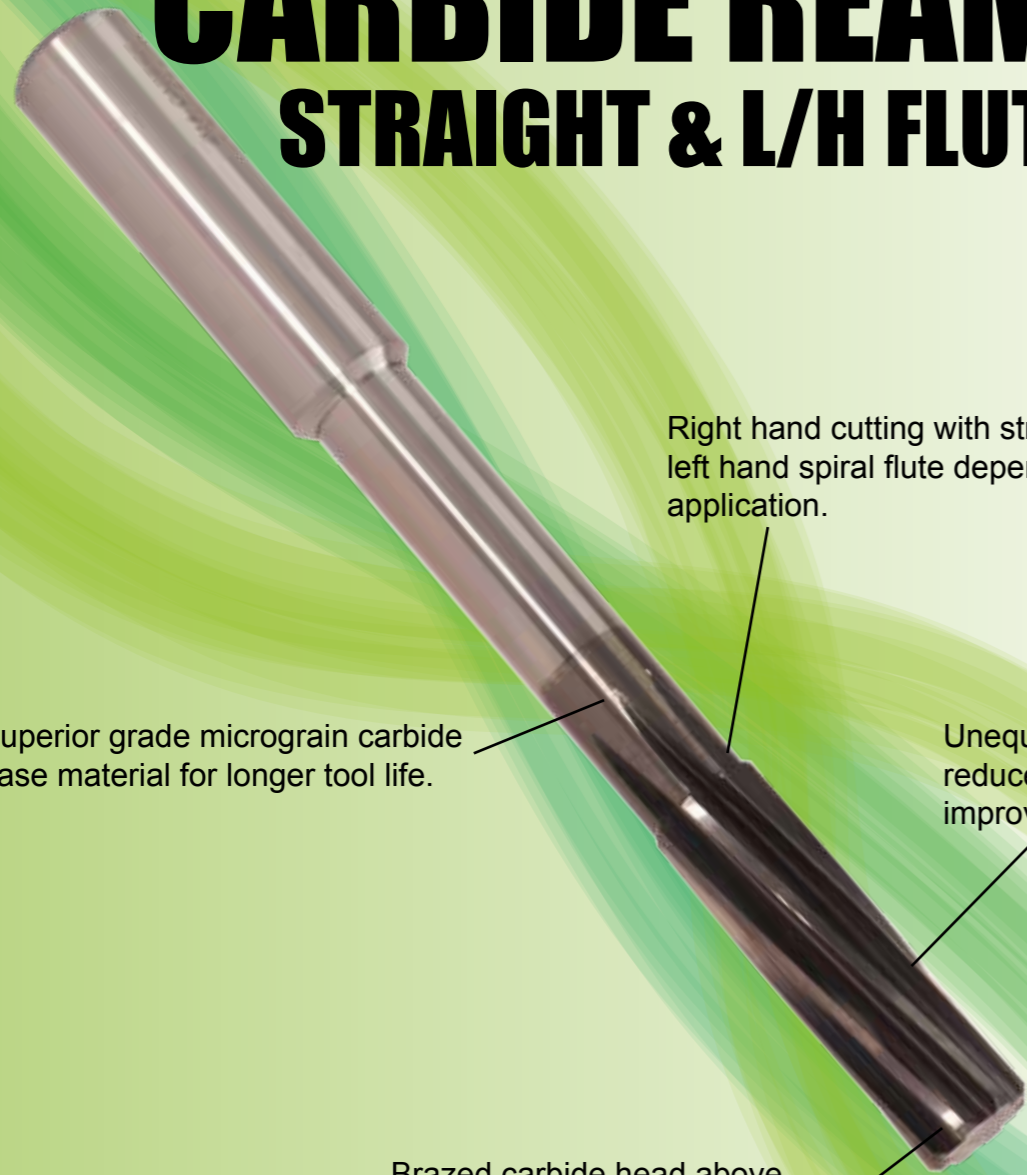
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SUPERIOR PERFORMANCE

CARBIDE REAMER STRAIGHT & L/H FLUTE



Right hand cutting with straight or left hand spiral flute depending on application.

Superior grade micrograin carbide base material for longer tool life.

Unequal flute spacing for reduced vibration and improved surface finish.

Brazed carbide head above 12.0mm for increased economy.

IDEAL FOR MATERIAL GROUPS













CARBIDE, HSSCo & HSS REAMERS

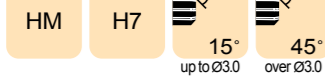


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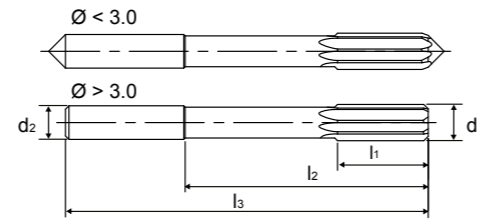
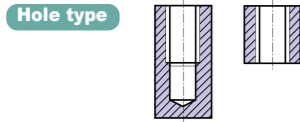
P				H		M			K				S					N							O								
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	Code	Item	Description	Page No.
○ ○ ○ ○				● ●		○ ○ ○			● ● ● ●				● ● ● ● ● ● ● ●					● ● ● ● ● ● ● ● ● ● ● ● ● ●							● ● ●			452303		Straight Flute ø2.0mm - 20.0mm	P.232		
○ ○ ○ ○				● ●		○ ○ ○			● ● ● ●				● ● ● ● ● ● ● ●					● ● ● ● ● ● ● ● ● ● ● ● ● ●							● ● ●			453303		L/H Spiral Flute ø2.0mm - 20.0mm	P.233		
● ● ● ●				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			452302		Straight Flute ø2.0mm - 20.0mm	P.234-235		
● ● ● ●				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			453302		L/H Spiral Flute ø2.0mm - 20.0mm	P.236-237		
○ ○ ○ ○																		● ● ● ● ● ● ● ● ● ● ● ● ● ●							○ ○ ○			454302		L/H Quick Spiral Flute ø4.0mm - 20.0mm	P.238-239		
● ● ● ●				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			455302		Straight Flute ø10.0mm - 50.0mm	P.240-241		
● ● ● ●				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			456302		L/H Spiral Flute ø10.0mm - 50.0mm	P.242-243		
● ● ● ●				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			457301		L/H Spiral Flute ø3.0mm - 32.0mm	P.244-245		
○ ○ ○ ○				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			450301		Straight Flute ø2.0mm - 60.0mm	P.246-247		
○ ○ ○ ○				○ ○		○ ○ ○			○ ○ ○ ○									○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○							○ ○ ○			451301		L/H Spiral Flute ø2.0mm - 60.0mm	P.248-249		
																														Cutting Data	P.250		

CARBIDE MACHINE REAMER STRAIGHT FLUTE



Series No. 452303

▶ cutting conditions : p.250



O.D. Tolerances : DIN 1420 for H7
Shank : DIN6535-HA
Chamfer angle - Up to 3.0 : 15°
- Over 3.0 : 45°

Material - Up to 12.0 : Solid carbide
- Over 12.0 : Brazed carbide head
Straight Flute / Right Hand Cut
Unequal flute spacing

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4523030200	2.0	4	11	20	50	4
4523030250	2.5	4	14	26	57	4
4523030300	3.0	4	15	31	61	6
4523030350	3.5	4	18	36	70	6
4523030400	4.0	4	19	42	75	6
4523030450	4.5	6	21	46	80	6
4523030500	5.0	6	23	51	86	6
4523030550	5.5	6	26	56	93	6
4523030600	6.0	6	26	56	93	6
4523030650	6.5	8	28	62	101	6
4523030700	7.0	8	31	68	109	6
4523230750	7.5	8	31	68	109	6
4523030800	8.0	8	33	74	117	6
4523030850	8.5	10	33	74	117	6
4523030900	9.0	10	36	80	125	6
4523030950	9.5	10	36	80	125	6
4523031000	10.0	10	38	86	133	6
4523031050	10.5	12	38	86	133	6
4523031100	11.0	12	41	95	142	6
4523031200	12.0	12	44	104	151	6
4523031300	13.0	16	44	104	151	6
4523031400	14.0	16	47	108	160	8
4523031500	15.0	16	50	110	162	8
4523031600	16.0	16	52	118	170	8
4523031700	17.0	20	54	121	175	8
4523031800	18.0	20	56	128	182	8
4523031900	19.0	20	58	129	189	8
4523032000	20.0	20	60	135	195	8

●: Excellent ○: Good

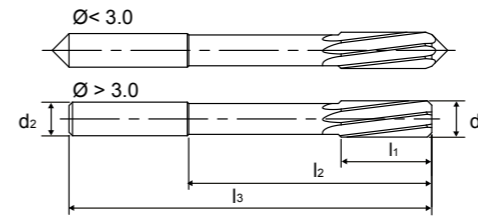
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○	●	●		●	●	●	●	●	●	●	●	●		

CARBIDE MACHINE REAMER L/H SPIRAL FLUTE



Series No. 453303

▶ cutting conditions : p.250



O.D. Tolerances : DIN 1420 for H7
Shank : DIN6535-HA
Chamfer angle - Up to 3.0 : 15°
- Over 3.0 : 45°

Material - Up to 12.0 : Solid carbide
- Over 12.0 : Brazed carbide head
L/H Spiral Flute / Right Hand Cut
Unequal flute spacing

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4533030200	2.0	4	11	20	50	4
4533030250	2.5	4	14	26	57	4
4533030300	3.0	4	15	31	61	6
4533030350	3.5	4	18	36	70	6
4533030400	4.0	4	19	42	75	6
4533030450	4.5	6	21	46	80	6
4533030500	5.0	6	23	51	86	6
4533030550	5.5	6	26	56	93	6
4533030600	6.0	6	26	56	93	6
4533030650	6.5	8	28	62	101	6
4533030700	7.0	8	31	68	109	6
4523230750	7.5	8	31	68	109	6
4533030800	8.0	8	33	74	117	6
4533030850	8.5	10	33	74	117	6
4533030900	9.0	10	36	80	125	6
4533030950	9.5	10	36	80	125	6
4533031000	10.0	10	38	86	133	6
4533031050	10.5	12	38	86	133	6
4533031100	11.0	12	41	95	142	6
4533031200	12.0	12	44	104	151	6
4533031300	13.0	16	44	104	151	6
4533031400	14.0	16	47	108	160	8
4533031500	15.0	16	50	110	162	8
4533031600	16.0	16	52	118	170	8
4533031700	17.0	20	54	121	175	8
4533031800	18.0	20	56	128	182	8
4533031900	19.0	20	58	129	189	8
4533032000	20.0	20	60	135	195	8

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
○	○	●	●		●	●	●	●	●	●	●	●	●		

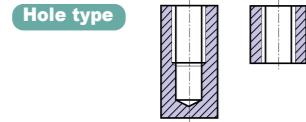
STRAIGHT SHANK CHUCKING REAMER STRAIGHT FLUTE



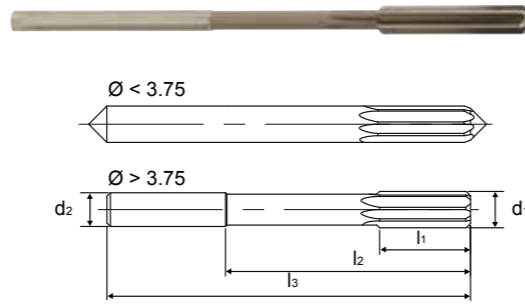
HSS-E DIN 212 H7
 15° up to Ø3.75
 45° over Ø3.75

Series No. 452302

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
 Shank Diameter tolerances: h8
 Straight Flute / Right Hand Cut



Chamfer angle - Up to 3.75 : 15° (DIN212-A)
 - Over 3.75 : 45° (DIN212-C)

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4523020200	2.0	2	11	-	49	4
4523020220	2.2	2.2	12	-	53	4
4523020250	2.5	2.5	14	-	57	4
4523020260	2.6	2.6	14	-	57	4
4523020280	2.8	2.8	15	-	61	4
4523020300	3.0	3	15	-	61	6
4523020310	3.1	3.1	16	-	65	6
4523020320	3.2	3.2	16	-	65	6
4523020350	3.5	3.5	18	-	70	6
4523020360	3.6	3.6	18	-	70	6
4523020370	3.7	3.7	18	-	70	6
4523020400	4.0	4	19	42	75	6
4523020430	4.3	4.5	21	46	80	6
4523020450	4.5	4.5	21	46	80	6
4523020460	4.6	4.5	21	46	80	6
4523020500	5.0	5	23	51	86	6
4523020550	5.5	5.6	26	56	93	6
4523020560	5.6	5.6	26	56	93	6
4523020600	6.0	5.6	26	56	93	6
4523020650	6.5	6.3	28	62	101	6

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	○	○	○	○	○				○	○	○	○	●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●	○	○		○	○				○	○	○	○		

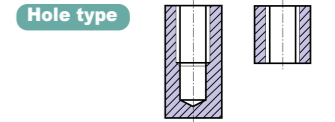
STRAIGHT SHANK CHUCKING REAMER STRAIGHT FLUTE



HSS-E DIN 212 H7
 15° up to Ø3.75
 45° over Ø3.75

Series No. 452302

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
 Shank Diameter tolerances: h8
 Straight Flute / Right Hand Cut

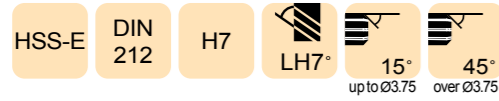
Chamfer angle - Up to 3.75 : 15° (DIN212-A)
 - Over 3.75 : 45° (DIN212-C)

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4523020700	7.0	7.1	31	68	109	6
4523230720	7.2	7.1	31	68	109	6
4523020800	8.0	8	33	74	117	6
4523020830	8.3	8	33	74	117	6
4523020850	8.5	8	33	74	117	6
4523020900	9.0	9	36	80	125	6
4523020950	9.5	9	36	80	125	6
4523021000	10.0	10	38	86	133	6
4523021050	10.5	10	38	86	133	6
4523021100	11.0	10	41	95	142	6
4523021200	12.0	10	44	104	151	6
4523021300	13.0	10	44	104	151	6
4523021400	14.0	12.5	47	108	160	8
4523021500	15.0	12.5	50	110	162	8
4523021600	16.0	12.5	52	118	170	8
4523021700	17.0	14	54	121	175	8
4523021800	18.0	14	56	128	182	8
4523021900	19.0	16	58	129	189	8
4523022000	20.0	16	60	135	195	8

●: Excellent ○: Good

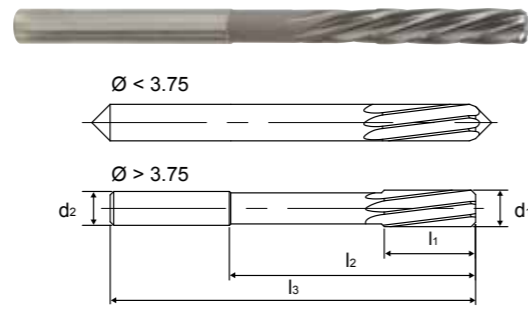
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	○	○	○	○	○				○	○	○	○	●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●	○	○		○	○				○	○	○	○		

STRAIGHT SHANK CHUCKING REAMER L/H SPIRAL FLUTE



Series No. 453302

▶ cutting conditions : p.251



Chamfer angle - Up to 3.75 : 15° (DIN212-B)
- Over 3.75 : 45° (DIN212-D)

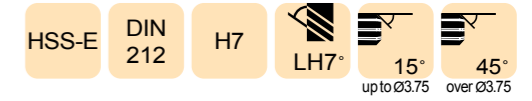
O.D. Tolerances : DIN 1420 for H7
Shank Diameter tolerances: h8
L/H Spiral Flute / Right Hand Cut

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4533020200	2.0	2	11	-	49	4
4533020220	2.2	2.2	12	-	53	4
4533020250	2.5	2.5	14	-	57	4
4533020260	2.6	2.6	14	-	57	4
4533020280	2.8	2.8	15	-	61	4
4533020300	3.0	3	15	-	61	6
4533020310	3.1	3.1	16	-	65	6
4533020320	3.2	3.2	16	-	65	6
4533020350	3.5	3.5	18	-	70	6
4533020360	3.6	3.6	18	-	70	6
4533020370	3.7	3.7	18	-	70	6
4533020400	4.0	4	19	42	75	6
4533020430	4.3	4.5	21	46	80	6
4533020450	4.5	4.5	21	46	80	6
4533020460	4.6	4.5	21	46	80	6
4533020500	5.0	5	23	51	86	6
4533020550	5.5	5.6	26	56	93	6
4533020560	5.6	5.6	26	56	93	6
4533020600	6.0	5.6	26	56	93	6
4533020650	6.5	6.3	28	62	101	6

●: Excellent ○: Good

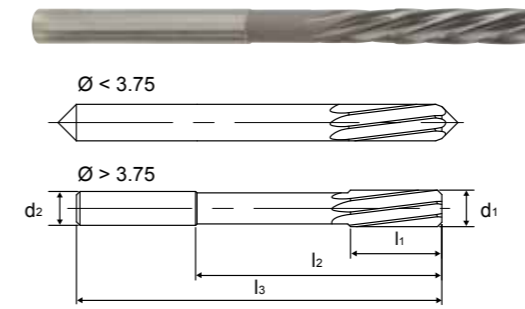
P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
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13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
●	●	○	○			○	○				○	○	○	○		

STRAIGHT SHANK CHUCKING REAMER L/H SPIRAL FLUTE



Series No. 453302

▶ cutting conditions : p.251



Chamfer angle - Up to 3.75 : 15° (DIN212-B)
- Over 3.75 : 45° (DIN212-D)

O.D. Tolerances : DIN 1420 for H7
Shank Diameter tolerances: h8
L/H Spiral Flute / Right Hand Cut

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4533020700	7.0	7.1	31	68	109	6
4533020720	7.2	7.1	31	68	109	6
4533020800	8.0	8	33	74	117	6
4533020830	8.3	8	33	74	117	6
4533020850	8.5	8	33	74	117	6
4533020900	9.0	9	36	80	125	6
4533020950	9.5	9	36	80	125	6
4533021000	10.0	10	38	86	133	6
4533021050	10.5	10	38	86	133	6
4533021100	11.0	10	41	95	142	6
4533021200	12.0	10	44	104	151	6
4533021300	13.0	10	44	104	151	6
4533021400	14.0	12.5	47	108	160	8
4533021500	15.0	12.5	50	110	162	8
4533021600	16.0	12.5	52	118	170	8
4533021700	17.0	14	54	121	175	8
4533021800	18.0	14	56	128	182	8
4533021900	19.0	16	58	129	189	8
4533022000	20.0	16	60	135	195	8

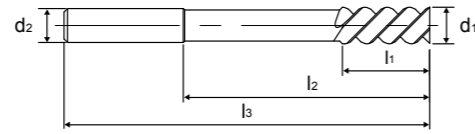
●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	○	○	○	○	○	○				○	○	○	○	●	●
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
●	●	○	○			○	○				○	○	○	○		

STRAIGHT SHANK CHUCKING REAMER L/H QUICK SPIRAL



HSS-E DIN 212 H7 LH45° FORM E



Series No. 454302

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
Shank Diameter tolerances: h8
L/H Quick Spiral Flute / Right Hand Cut

Chamfer angle : Tapered (DIN212-E)

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4543020400	4.0	4	19	42	75	3
4543020450	4.5	4.5	21	46	80	3
4543020500	5.0	5	23	51	86	3
4543020550	5.5	5.6	26	56	93	3
4543020600	6.0	5.6	26	56	93	3
4543020650	6.5	6.3	28	62	101	3
4543020700	7.0	7.1	31	68	109	3
4543020800	8.0	8	33	74	117	3
4543020850	8.5	8	33	74	117	3
4543020900	9.0	9	36	80	125	3
4543020950	9.5	9	36	80	125	3
4543021000	10.0	10	38	86	133	3

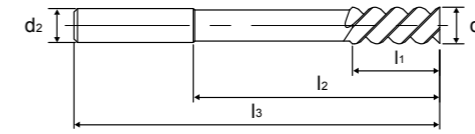
●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
○	○										●	●	●	●	○	○
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
○	○										●	●	●	●		

STRAIGHT SHANK CHUCKING REAMER L/H QUICK SPIRAL



HSS-E DIN 212 H7 LH45° FORM E



Series No. 454302

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
Shank Diameter tolerances: h8
L/H Quick Spiral Flute / Right Hand Cut

Chamfer angle : Tapered (DIN212-E)

EUROPA CODE	NOMINAL SIZE d1	SHANK DIAMETER d2	CUTTING LENGTH l1	NECK LENGTH l2	OVERALL LENGTH l3	NO.OF FLUTES
4543021100	11.0	10	41	95	142	3
4543021200	12.0	10	44	104	151	3
4543021300	13.0	10	44	104	151	3
4543021400	14.0	12.5	47	108	160	4
4543021500	15.0	12.5	50	110	162	4
4543021600	16.0	12.5	52	118	170	4
4543021700	17.0	14	54	121	175	4
4543021800	18.0	14	56	128	182	4
4543021900	19.0	16	58	129	189	4
4543022000	20.0	16	60	135	195	4

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
○	○										●	●	●	●	○	○
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
○	○										●	●	●	●		

TAPER SHANK CHUCKING REAMER STRAIGHT FLUTE



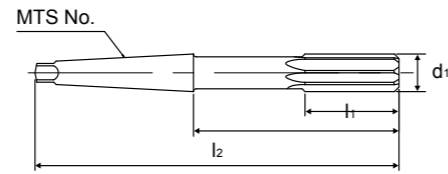
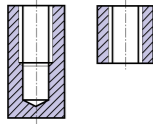
HSS-E DIN 208 H7 45°



Series No. 455302

▶ cutting conditions : p.251

Hole type



O.D. Tolerances : DIN 1420 for H7
Straight Flute / Right Hand Cut
Chamfer angle : 45° (DIN208-A)

EUROPA CODE	NOMINAL SIZE d1	MTS No.	CUTTING LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4553021000	10.0	1	38	168	6
4553021100	11.0	1	41	175	6
4553021200	12.0	1	44	182	6
4553021300	13.0	1	44	182	6
4553021400	14.0	1	47	189	8
4553021500	15.0	2	50	204	8
4553021600	16.0	2	52	210	8
4553021700	17.0	2	54	214	8
4553021800	18.0	2	56	219	8
4553021900	19.0	2	58	223	8
4553022000	20.0	2	60	228	8
4553022100	21.0	2	62	232	8
4553022200	22.0	2	64	237	8
4553022300	23.0	2	66	241	8
4553022400	24.0	3	68	268	8
4553022500	25.0	3	68	268	8
4553022600	26.0	3	70	273	8
4553022700	27.0	3	71	277	10
4553022800	28.0	3	71	277	10

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○				○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○				○	○	○	○			

TAPER SHANK CHUCKING REAMER STRAIGHT FLUTE



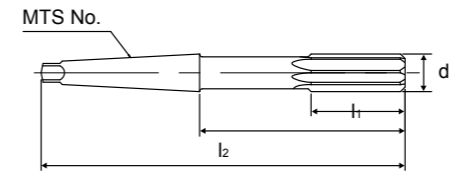
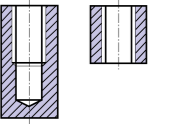
HSS-E DIN 208 H7 45°



Series No. 455302

▶ cutting conditions : p.251

Hole type



O.D. Tolerances : DIN 1420 for H7
Straight Flute / Right Hand Cut
Chamfer angle : 45° (DIN208-A)

EUROPA CODE	NOMINAL SIZE d1	MTS No.	CUTTING LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4553022900	29.0	3	73	281	10
4553023000	30.0	3	73	281	10
4553023100	31.0	3	75	285	10
4553023200	32.0	4	77	317	10
4553023400	34.0	4	78	321	10
4553023500	35.0	4	78	321	10
4553023600	36.0	4	79	325	10
4553023800	38.0	4	81	329	10
4553024000	40.0	4	81	329	10
4553024100	41.0	4	82	333	12
4553024200	42.0	4	82	333	12
4553024300	43.0	4	83	336	12
4553024400	44.0	4	83	336	12
4553024500	45.0	4	83	336	12
4553024600	46.0	4	84	340	12
4553024700	47.0	4	84	340	12
4553024800	48.0	4	86	344	12
4553025000	50.0	4	86	344	12

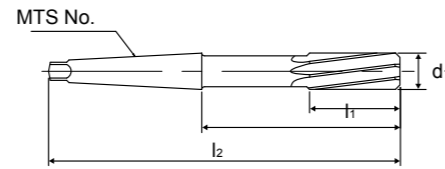
●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○				○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○				○	○	○	○			

TAPER SHANK CHUCKING REAMER L/H SPIRAL FLUTE



HSS-E DIN 208 H7 LH7° 45°



Series No. 456302

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
L/H Spiral Flute / Right Hand Cut
Chamfer angle : 45° (DIN208-B)

EUROPA CODE	NOMINAL SIZE d1	MTS No.	CUTTING LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4563021000	10.0	1	38	168	6
4563021100	11.0	1	41	175	6
4563021200	12.0	1	44	182	6
4563021300	13.0	1	44	182	6
4563021400	14.0	1	47	189	8
4563021500	15.0	2	50	204	8
4563021600	16.0	2	52	210	8
4563021700	17.0	2	54	214	8
4563021800	18.0	2	56	219	8
4563021900	19.0	2	58	223	8
4563022000	20.0	2	60	228	8
4563022100	21.0	2	62	232	8
4563022200	22.0	2	64	237	8
4563022300	23.0	2	66	241	8
4563022400	24.0	3	68	268	8
4563022500	25.0	3	68	268	8
4563022600	26.0	3	70	273	8
4563022700	27.0	3	71	277	10
4563022800	28.0	3	71	277	10

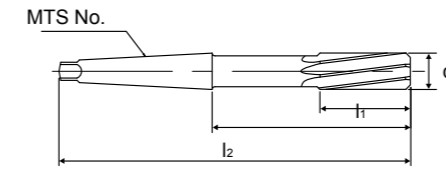
●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○				○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○				○	○	○	○			

TAPER SHANK CHUCKING REAMER L/H SPIRAL FLUTE



HSS-E DIN 208 H7 LH7° 45°



Series No. 456302

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
L/H Spiral Flute / Right Hand Cut
Chamfer angle : 45° (DIN208-B)

EUROPA CODE	NOMINAL SIZE d1	MTS No.	CUTTING LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4563022900	29.0	3	73	281	10
4563023000	30.0	3	73	281	10
4563023100	31.0	3	75	285	10
4563023200	32.0	4	77	317	10
4563023400	34.0	4	78	321	10
4563023500	35.0	4	78	321	10
4563023600	36.0	4	79	325	10
4563023800	38.0	4	81	329	10
4563024000	40.0	4	81	329	10
4563024100	41.0	4	82	333	12
4563024200	42.0	4	82	333	12
4563024300	43.0	4	83	336	12
4563024400	44.0	4	83	336	12
4563024500	45.0	4	83	336	12
4563024600	46.0	4	84	340	12
4563024700	47.0	4	84	340	12
4563024800	48.0	4	86	344	12
4563025000	50.0	4	86	344	12

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○				○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○				○	○	○	○			

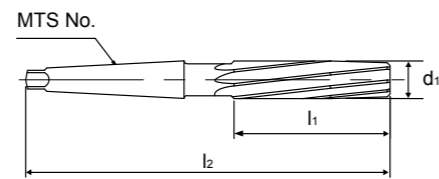
TAPER SHANK MACHINE REAMER



HSS DIN 338 H7 LH7*

Series No. 457301

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
L/H Spiral Flute / Right Hand Cut
Chamfer angle : 45° (DIN208-B)

EUROPA CODE	NOMINAL SIZE d1	MTS No.	CUTTING LENGTH l1	OVERALL LENGTH l2
4573010300	3.0	1	31	104
4573010350	3.5	1	35	108
4573010400	4.0	1	38	112
4573010450	4.5	1	41	115
4573010500	5.0	1	44	118
4573010550	5.5	1	48	125
4573010600	6.0	1	48	125
4573010650	6.5	1	50	130
4573010700	7.0	1	54	134
4573010750	7.5	1	54	134
4573010800	8.0	1	58	138
4573010850	8.5	1	58	138
4573010900	9.0	1	62	141
4573010950	9.5	1	62	141
4573011000	10.0	1	67	146
4573011050	10.5	1	67	146
4573011100	11.0	1	71	151
4573011150	11.5	1	71	151
4573011200	12.0	1	76	156

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	○	○	○	○	○				○	○	○	○	●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●	○	○		○	○				○	○	○	○		

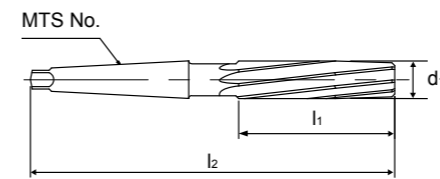
TAPER SHANK MACHINE REAMER



HSS DIN 338 H7 LH7*

Series No. 457301

▶ cutting conditions : p.251



O.D. Tolerances : DIN 1420 for H7
L/H Spiral Flute / Right Hand Cut
Chamfer angle : 45° (DIN208-B)

EUROPA CODE	NOMINAL SIZE d1	MTS No.	CUTTING LENGTH l1	OVERALL LENGTH l2
4573011250	12.5	1	76	156
4573011300	13.0	1	76	156
4573011400	14.0	1	81	160
4573011500	15.0	2	81	181
4573011600	16.0	2	87	187
4573011700	17.0	2	87	187
4573011800	18.0	2	94	194
4573011900	19.0	2	94	194
4573012000	20.0	2	100	200
4573012100	21.0	2	100	200
4573012200	22.0	2	106	206
4573012300	23.0	2	106	206
4573012400	24.0	3	114	241
4573012500	25.0	3	114	241
4573012600	26.0	3	114	241
4573012700	27.0	3	124	251
4573012800	28.0	3	124	251
4573012900	30.0	3	124	251
4573013000	32.0	4	133	294

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	○	○	○	○	○				○	○	○	○	●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●	○	○		○	○				○	○	○	○		

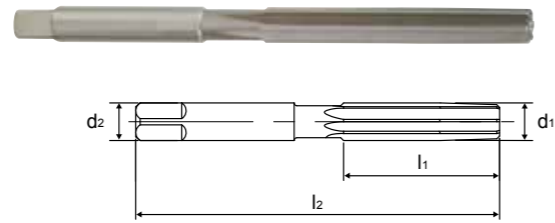
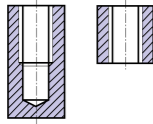
HAND REAMER STRAIGHT FLUTE



HSS DIN 206 H7

Series No. 450301

Hole type



O.D. Tolerances : DIN 1420 for H7
Shank Diameter = Nominal Reamer Diameter
Straight Flutes / Right Hand Cut

Chamfer Angle - tapered
Type of centre - Up to Ø3.75 : external centres
- Over Ø3.75 : internal centres

EUROPA CODE	NOMINAL SIZE d1 = d2	FLUTE LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4503010200	2.0	25	50	4
4503010220	2.2	27	54	4
4503010250	2.5	29	58	4
4503010280	2.8	31	62	4
4503010300	3.0	31	62	6
4503010320	3.2	33	66	6
4503010350	3.5	35	71	6
4503010400	4.0	38	76	6
4503010450	4.5	41	81	6
4503010500	5.0	44	87	6
4503010550	5.5	47	93	6
4503010600	6.0	47	93	6
4503010700	7.0	54	107	6
4503010800	8.0	58	115	6
4503010900	9.0	62	124	6
4503011000	10.0	66	133	6
4503011100	11.0	71	142	6
4503011200	12.0	76	152	6
4503011300	13.0	76	152	6
4503011400	14.0	81	163	8
4503011500	15.0	81	163	8
4503011600	16.0	87	175	8
4503011700	17.0	87	175	8
4503011800	18.0	93	188	8
4503011900	19.0	93	188	8
4503012000	20.0	100	201	8
4503012200	22.0	107	215	8
4503012400	24.0	115	231	8

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	○		○	○	○	○				○	○	○	○	○	○
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
○	○	○		○		○	○				○	○	○	○		

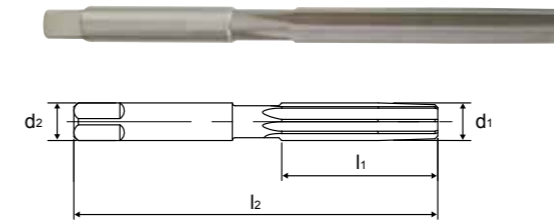
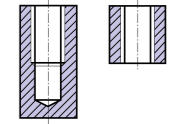
HAND REAMER STRAIGHT FLUTE



HSS DIN 206 H7

Series No. 450301

Hole type



O.D. Tolerances : DIN 1420 for H7
Shank Diameter = Nominal Reamer Diameter
Straight Flutes / Right Hand Cut

Chamfer Angle - Tapered
Type of centre - Up to Ø3.75 : external centres
- Over Ø3.75 : internal centres

EUROPA CODE	NOMINAL SIZE d1 = d2	FLUTE LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4503012500	25.0	115	231	8
4503012600	26.0	115	231	8
4503012700	27.0	124	247	10
4503012800	28.0	124	247	10
4503012900	29.0	124	247	10
4503013000	30.0	124	247	10
4503013100	31.0	133	265	10
4503013200	32.0	133	265	10
4503013300	33.0	133	265	10
4503013400	34.0	142	284	10
4503013500	35.0	142	284	10
4503013600	36.0	142	284	10
4503013700	37.0	142	284	10
4503013800	38.0	152	305	10
4503013810	38.1	152	305	10
4503013900	39.0	152	305	10
4503014000	40.0	152	305	10
4503014100	41.0	152	305	12
4503014200	42.0	152	305	12
4503014300	43.0	163	326	12
4503014400	44.0	163	326	12
4503014500	45.0	163	326	12
4503014600	46.0	163	326	12
4503014700	47.0	163	326	12
4503014800	48.0	174	347	12
4503014900	49.0	174	347	12
4503015200	52.0	174	347	12
4503016000	60.0	184	367	12

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	○		○	○	○	○				○	○	○	○	○	○
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
○	○	○		○		○	○				○	○	○	○		

HAND REAMER L/H SPIRAL FLUTE

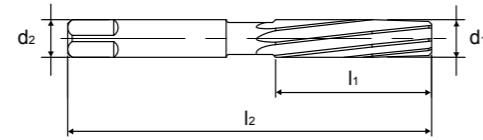


HSS DIN 206 H7 LH7*



Series No. 451301

Hole type



O.D. Tolerances : DIN 1420 for H7
Shank Diameter = Nominal Reamer Diameter
L/H Spiral Flutes / Right Hand Cut

Chamfer Angle - Tapered
Type of centre - Up to Ø3.75 : external centres
- Over Ø3.75 : internal centres

EUROPA CODE	NOMINAL SIZE d1 = d2	FLUTE LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4513010200	2.0	25	50	4
4513010220	2.2	27	54	4
4513010250	2.5	29	58	4
4513010280	2.8	31	62	4
4513010300	3.0	31	62	6
4513010320	3.2	33	66	6
4513010350	3.5	35	71	6
4513010400	4.0	38	76	6
4513010450	4.5	41	81	6
4513010500	5.0	44	87	6
4513010550	5.5	47	93	6
4513010600	6.0	47	93	6
4513010700	7.0	54	107	6
4513010800	8.0	58	115	6
4513010900	9.0	62	124	6
4513011000	10.0	66	133	6
4513011100	11.0	71	142	6
4513011200	12.0	76	152	6
4513011300	13.0	76	152	6
4513011400	14.0	81	163	8
4513011500	15.0	81	163	8
4513011600	16.0	87	175	8
4513011700	17.0	87	175	8
4513011800	18.0	93	188	8
4513011900	19.0	93	188	8
4513012000	20.0	100	201	8
4513012200	22.0	107	215	8
4513012400	24.0	115	231	8

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	○		○	○	○	○				○	○	○	○	○	○
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
○	○	○		○		○	○				○	○	○	○		

HAND REAMER L/H SPIRAL FLUTE

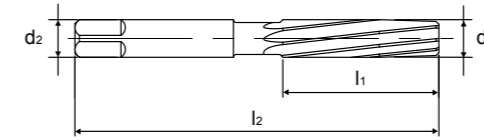


HSS DIN 206 H7 LH7*



Series No. 451301

Hole type



O.D. Tolerances : DIN 1420 for H7
Shank Diameter = Nominal Reamer Diameter
L/H Spiral Flutes / Right Hand Cut

Chamfer Angle - Tapered
Type of centre - Up to Ø3.75 : external centres
- Over Ø3.75 : internal centres

EUROPA CODE	NOMINAL SIZE d1 = d2	FLUTE LENGTH l1	OVERALL LENGTH l2	NO.OF FLUTES
4513012500	25.0	115	231	8
4513012600	26.0	115	231	8
4513012700	27.0	124	247	10
4513012800	28.0	124	247	10
4513012900	29.0	124	247	10
4513013000	30.0	124	247	10
4513013100	31.0	133	265	10
4513013200	32.0	133	265	10
4513013300	33.0	133	265	10
4513013400	34.0	142	284	10
4513013500	35.0	142	284	10
4513013600	36.0	142	284	10
4513013700	37.0	142	284	10
4513013800	38.0	152	305	10
4513013810	38.1	152	305	10
4513013900	39.0	152	305	10
4513014000	40.0	152	305	10
4513014100	41.0	152	305	12
4513014200	42.0	152	305	12
4513014300	43.0	163	326	12
4513014400	44.0	163	326	12
4513014500	45.0	163	326	12
4513014600	46.0	163	326	12
4513014700	47.0	163	326	12
4513014800	48.0	174	347	12
4513014900	49.0	174	347	12
4513015200	52.0	174	347	12
4513016000	60.0	184	367	12

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15		21	22	31	32	41	42	43	61	62	63	64	81	82
○	○	○		○	○	○	○				○	○	○	○	○	○
13	14	16		23		33	34	51	52	53	71	72	73	74	83	84
○	○	○		○		○	○				○	○	○	○		

REAMER CUTTING CONDITIONS



452303, 453303 (Carbide Chucking)



Material Group	vc (m/min)	fn (mm/rev)				
		ø2.0 -4.9	ø5.0 -8.9	ø9.0 -12.9	ø13.0 -19.9	ø20.0 -30.0
P	11 12 16 (14-18)	0.11 (0.10-0.12)	0.16 (0.12-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)
	13 14 13 (12-14)	0.09 (0.08-0.10)	0.13 (0.10-0.16)	0.18 (0.16-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)
H	15 16 11 (10-12)	0.09 (0.08-0.10)	0.13 (0.10-0.16)	0.18 (0.16-0.20)	0.25 (0.20-0.30)	0.28 (0.25-0.30)
	M	21 22 23 7 (6-8)	0.09 (0.08-0.10)	0.13 (0.10-0.16)	0.18 (0.16-0.20)	0.25 (0.20-0.30)
K	31 32 18 (15-20)	0.11 (0.10-0.12)	0.16 (0.12-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)
	33 34 13 (11-15)	0.11 (0.10-0.12)	0.16 (0.12-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)
S	41 42 43 14 (12-16)	0.11 (0.10-0.12)	0.16 (0.12-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)
	51 52 53 10 (8-12)	0.09 (0.08-0.10)	0.13 (0.10-0.16)	0.18 (0.16-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)
N	61 62 63 64 23 (20-25)	0.11 (0.10-0.12)	0.16 (0.12-0.20)	0.23 (0.20-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)
	71 72 50 (40-60)	0.14 (0.12-0.16)	0.20 (0.16-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)	0.45 (0.40-0.50)
O	73 74 25 (20-30)	0.14 (0.12-0.16)	0.20 (0.16-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)	0.45 (0.40-0.50)
	81 82 18 (15-20)	0.14 (0.12-0.16)	0.20 (0.16-0.25)	0.28 (0.25-0.30)	0.35 (0.30-0.40)	0.45 (0.40-0.50)

vc - cutting speed (m/min)
n - RPM (rev/min)
fn - feed rate (mm/rev)
ø - reamer diameter (mm)

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

REAMER CUTTING CONDITIONS



452302, 453302, 455302, 456302, 457301 (HSS-E Chucking, HSS & HSS-E Morse Taper)



Material Group	vc (m/min)	fn (mm/rev)					
		ø2.0 -4.9	ø5.0 -8.9	ø9.0 -12.9	ø13.0 -19.9	ø20.0 -30.0	>ø30.0
P	11 12 14 (12-16)	0.10 (0.05-0.15)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)	0.32 (0.25-0.40)	0.42 (0.35-0.50)
	13 14 11 (10-12)	0.08 (0.05-0.10)	0.12 (0.08-0.16)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)	0.35 (0.30-0.40)
H	15 16 5 (4-6)	0.06 (0.03-0.08)	0.08 (0.06-0.10)	0.12 (0.08-0.15)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)
	M	21 22 23 5 (4-6)	0.06 (0.03-0.08)	0.08 (0.06-0.10)	0.12 (0.08-0.15)	0.15 (0.10-0.20)	0.20 (0.15-0.25)
K	31 32 13 (12-14)	0.10 (0.05-0.15)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)	0.32 (0.25-0.40)	0.42 (0.35-0.50)
	33 34 11 (10-12)	0.08 (0.05-0.10)	0.12 (0.08-0.16)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)	0.35 (0.30-0.40)
N	61 62 63 64 17 (16-18)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)	0.32 (0.25-0.40)	0.42 (0.35-0.50)	0.50 (0.40-0.60)
	71 72 73 74 18 (16-20)	0.15 (0.10-0.20)	0.20 (0.15-0.25)	0.25 (0.20-0.30)	0.32 (0.25-0.40)	0.42 (0.35-0.50)	0.50 (0.40-0.60)
O	81 82 10 (8-12)	0.15 (0.10-0.20)	0.25 (0.20-0.30)	0.35 (0.30-0.40)	0.45 (0.40-0.50)	0.55 (0.50-0.60)	0.70 (0.60-0.80)

454302 (HSS-E Quick Spiral)



Material Group	vc (m/min)	fn (mm/rev)				
		ø2.0 -4.9	ø5.0 -8.9	ø9.0 -12.9	ø13.0 -19.9	ø20.0 -30.0
P	11 12 17 (16-18)	0.12 (0.08-0.16)	0.21 (0.16-0.25)	0.25 (0.20-0.30)	0.35 (0.30-0.40)	0.35 (0.30-0.40)
	13 14 15 (14-16)	0.12 (0.08-0.16)	0.21 (0.16-0.25)	0.25 (0.20-0.30)	0.35 (0.30-0.40)	0.35 (0.30-0.40)
N	61 62 63 64 18 (16-20)	0.12 (0.08-0.16)	0.21 (0.16-0.25)	0.25 (0.20-0.30)	0.35 (0.30-0.40)	0.35 (0.30-0.40)
	71 72 73 74 20 (18-22)	0.15 (0.10-0.20)	0.25 (0.20-0.30)	0.35 (0.30-0.40)	0.50 (0.40-0.60)	0.50 (0.40-0.60)
O	81 82 13 (12-14)	0.15 (0.10-0.20)	0.25 (0.20-0.30)	0.35 (0.30-0.40)	0.50 (0.40-0.60)	0.50 (0.40-0.60)

SUPERIOR PERFORMANCE

COUNTERSINK THREE FLUTE



90° as standard but also available as 60° or 120°.

HSS or HSSCo base material for longer tool life.

Self centering, can be used for chamfering.

Unequal flute spacing for chatter-free surface finish.

IDEAL FOR MATERIAL GROUPS







HSSCo & HSS COUNTERBORES & COUNTERSINKS



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●: Excellent ○: Good

P				H		M			K				S				N				O													
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	Code	Item	Description	Page No.	
●	●	●	●			○	○		○	○	○		○	○		○	○		○	○	○		●	●	●		●	●		151201		Screwed Shank M4 - M20, 1/4" - 1"	P.256-257	
HSSCo & HSS COUNTERSINKS																																		
●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○		●	●		702302		HSSCo 90° ø4.3mm - 31.0mm	P.258		
●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○		●	●		702301		HSS 90° ø4.3mm - 31.0mm	P.259			
DEBURRING COUNTERSINK																																		
●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	●	●		702402		HSSCo Single Hole ø10.0mm - 50.0mm	P.260
																												Cutting Data	P.261					

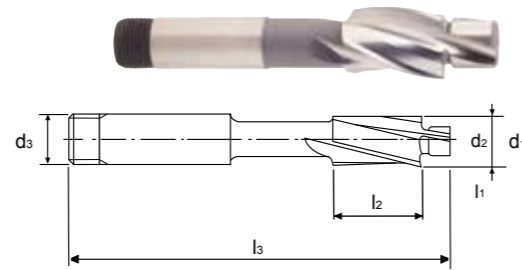
HSS COUNTERBORE



HSS CLARKSON STD FLUTE 3

Series No. 151201

▶ cutting conditions : p.261



Application

For producing recesses for cap screws.

EUROPA CODE	To suit Thread	Outside Diameter	Pilot Diameter	Shank Diameter	Pilot Length	Length Of Cut	Overall Length	Clarkson Code
1512010400	M4	8	4.3	6	5.5	12.5	65	29M04
1512010500	M5	10	5.3	6	6.5	12.5	70	29M05
1512010600	M6	11	6.4	6	8	12.5	76	29M06
1512010800	M8	15	8.4	10	9.5	19	87.3	29M08
1512011000	M10	18	10.5	10	11	19	89	29M10
1512011200	M12	20	13.0	12	13.5	25.5	108	29M12
1512011400	M14	24	15.0	16	16.5	31.5	121	29M14
1512011600	M16	26	17.0	16	19	38	124	29M16
1512011800	M18	30	19.0	25	19	44.5	147	29M18
1512012000	M20	33	21.0	25	21.5	44.5	149	29M20

●: Excellent ○: Good

P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○		○	○	○		●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				○		○	○		●	●	●			

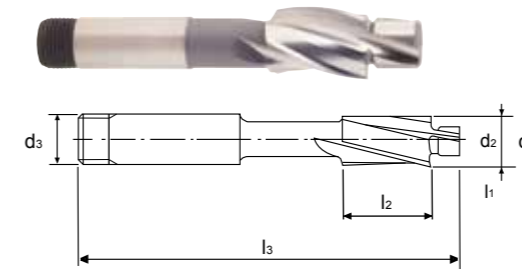
HSS COUNTERBORE



HSS CLARKSON STD FLUTE 3

Series No.151201

▶ cutting conditions : p.261



Application

For producing recesses for cap screws.

EUROPA CODE	To suit Thread	Outside Diameter d1	Pilot Diameter d2	Shank Diameter d3	Pilot Length l1	Length Of Cut l2	Overall Length l3	Clarkson Code
15120102BA	2BA	0.344"	0.200"	1/4"	7/32"	1/2"	2.1/2"	29002
15120104BA	4BA	0.251"	0.156"	1/4"	7/32"	7/16"	2.1/2"	29004
1512010250	1/4"	13/32"	9/32"	1/4"	5/16"	1/2"	3"	29016
1512010200	5/16"	15/32"	11/32"	3/8"	3/8"	5/8"	3.1/4"	29020
1512010240	3/8"	19/32"	13/32"	3/8"	7/16"	3/4"	3.1/2"	29024
1512010280	7/16"	21/32"	15/32"	1/2"	17/32"	7/8"	4	29028
1512010320	1/2"	25/32"	17/32"	1/2"	17/32"	1"	4.1/4"	29032
1512010360	9/16"	27/32"	19/32"	5/8"	19/32"	1.1/8"	4.17/32"	29036
1512019400	5/8"	29/32"	21/32"	5/8"	21/32"	1.1/4"	4.25/32"	29040
1512010480	3/4"	1.1/32"	25/32"	1"	25/32"	1.1/2"	5.7/16"	29048
1512010560	7/8"	1.5/32"	29/32"	1"	29/32"	1.3/4"	5.15/16"	29056
1512010640	1"	1.11/32"	1.1/32"	1"	1.1/32"	2"	6.7/16"	29064

●: Excellent ○: Good

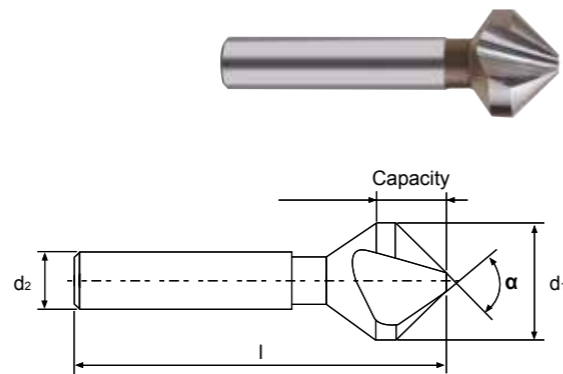
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		○	○	○	○	○	○		○	○	○		●	●
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84
●	●				○		○	○		●	●	●			

HSSCo 3-FLUTE COUNTERSINK 90°

HSSCo DIN 335C FLUTE 3

Series No. 702302

▶ cutting conditions : p.262



Application

For producing countersinks for cap screws.
Self centering and chatter free.
Can be used for chamfering.

EUROPA CODE	Nominal Diameter D ₁	Shank Diameter D ₂	Overall Length L(±1)	Capacity min/max	Angle α(-1°)
7023020430	4.3	4	40	1.3 - 4.3	90°
7023020500	5.0	4	40	1.5 - 5.0	90°
7023020600	6.0	5	45	1.5 - 6.0	90°
7023020630	6.3	5	45	1.5 - 6.3	90°
7023020700	7.0	6	50	1.8 - 7.0	90°
7023020800	8.0	6	50	2.0 - 8.0	90°
7023020830	8.3	6	50	2.0 - 8.3	90°
7023021000	10.0	6	50	2.5 - 10.0	90°
7023021040	10.4	6	50	2.5 - 10.4	90°
7023021150	11.5	8	56	2.8 - 11.5	90°
7023021240	12.4	8	56	2.8 - 12.4	90°
7023021500	15.0	10	60	3.2 - 15.0	90°
7023021650	16.5	10	60	3.2 - 16.5	90°
7023021900	19.0	10	63	3.5 - 19.0	90°
7023022050	20.5	10	63	3.5 - 20.5	90°
7023022300	23.0	10	67	3.8 - 23.0	90°
7023022500	25.0	10	67	3.8 - 25.0	90°
7023023000	30.0	12	71	4.2 - 30.0	90°
7023023100	31.0	12	71	4.2 - 31.0	90°

▶ TiN & TiAlN coating are available on request.

Nominal Dia. Tolerance(mm)	Shank Dia. Tolerance(mm)
±0.05	h9

●: Excellent ○: Good

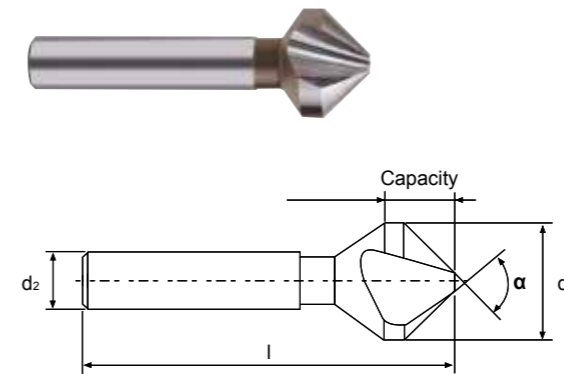
P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○	○	○	○	○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○	○	○	○	○	○	○	○			

HSS 3-FLUTE COUNTERSINK 90°

HSS DIN 335C FLUTE 3

Series No.702301

▶ cutting conditions : p.262



Application

For producing countersinks for cap screws.
Self centering and chatter free.
Can be used for chamfering.

EUROPA CODE	Nominal Diameter d ₁	Shank Diameter d ₂	Overall Length l(±1)	Capacity min/max	Angle α(-1°)
7023010430	4.3	4	40	1.3 - 4.3	90°
7023010500	5.0	4	40	1.5 - 5.0	90°
7023010600	6.0	5	45	1.5 - 6.0	90°
7023010630	6.3	5	45	1.5 - 6.3	90°
7023010700	7.0	6	50	1.8 - 7.0	90°
7023010800	8.0	6	50	2.0 - 8.0	90°
7023010830	8.3	6	50	2.0 - 8.3	90°
7023011000	10.0	6	50	2.5 - 10.0	90°
7023011040	10.4	6	50	2.5 - 10.4	90°
7023011150	11.5	8	56	2.8 - 11.5	90°
7023011240	12.4	8	56	2.8 - 12.4	90°
7023011500	15.0	10	60	3.2 - 15.0	90°
7023011650	16.5	10	60	3.2 - 16.5	90°
7023011900	19.0	10	63	3.5 - 19.0	90°
7023012050	20.5	10	63	3.5 - 20.5	90°
7023012300	23.0	10	67	3.8 - 23.0	90°
7023012500	25.0	10	67	3.8 - 25.0	90°
7023013000	30.0	12	71	4.2 - 30.0	90°
7023013100	31.0	12	71	4.2 - 31.0	90°

▶ TiN & TiAlN coating are available on request.

▶ 60° and 120° are available on request.

Nominal Dia. Tolerance(mm)	Shank Dia. Tolerance(mm)
±0.05	h9

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○	○	○	○	○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○	○	○	○	○	○	○	○			

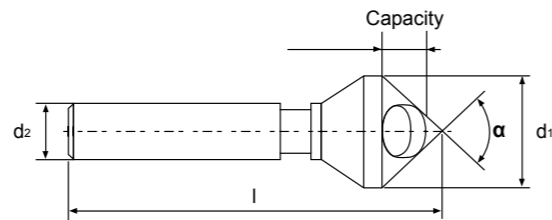
DEBURRING COUNTERSINK 90°



HSSCo

Series No. 702402

▶ cutting conditions : p.263



Application
For deburring most materials and small chamfering of light metals and plastics.
Chatter free for excellent surface finish.

EUROPA CODE	Nominal Diameter d ₁	Shank Diameter d ₂	Overall Length l(±1)	Capacity min/max	Angle α(-1°)
7024021000	10.0	6	45	2.0 - 5.0	90°
7024021500	15.0	8	55	6.0 - 14.0	90°
7024022000	20.0	10	65	8.0 - 18.0	90°
7024022500	25.0	12	78	10.0 - 23.0	90°
7024023000	30.0	12	88	12.0 - 28.0	90°
7024023500	35.0	16	110	14.0 - 33.0	90°
7024024000	40.0	16	115	16.0 - 38.0	90°
7024024500	45.0	16	120	18.0 - 43.0	90°
7024025000	50.0	16	130	20.0 - 48.0	90°

Nominal Dia. Tolerance(mm)	Shank Dia. Tolerance(mm)
+0.3	h9

●: Excellent ○: Good

P		H		M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82	
●	●	○	○	○	○	○	○	○	○	○	○	○	○	●	●	
13	14	16	23		33	34	51	52	53	71	72	73	74	83	84	
●	●	○	○		○	○	○	○	○	○	○	○	○			

COUNTERBORE & COUNTERSINK CUTTING CONDITIONS



151201 (HSS Counterbore)



Material Group	v _c (m/min)	f _n (mm/rev)					
		ø8.0 -10.0	ø11.0 -15.0	ø18.0 -20.0	ø24.0 -26.0	ø30.0 -33.0	
P	11	28 (25-30)	0.11 (0.10-0.12)	0.14 (0.12-0.16)	0.17 (0.16-0.18)	0.20 (0.18-0.22)	0.25 (0.23-0.27)
	12						
	13	18 (15-20)	0.09 (0.08-0.10)	0.12 (0.10-0.14)	0.14 (0.13-0.15)	0.18 (0.16-0.20)	0.20 (0.18-0.22)
	14						
H	15	8 (5-10)	0.07 (0.06-0.08)	0.10 (0.08-0.12)	0.12 (0.11-0.13)	0.14 (0.12-0.16)	0.16 (0.14-0.18)
	16						
M	21	7 (6-8)	0.07 (0.06-0.08)	0.10 (0.08-0.12)	0.12 (0.11-0.13)	0.14 (0.12-0.16)	0.16 (0.14-0.18)
	22						
K	31	20 (15-25)	0.11 (0.10-0.12)	0.14 (0.12-0.16)	0.17 (0.16-0.18)	0.20 (0.18-0.22)	0.25 (0.23-0.27)
	32						
	33						
S	41	11 (10-12)	0.11 (0.10-0.12)	0.14 (0.12-0.16)	0.17 (0.16-0.18)	0.20 (0.18-0.22)	0.25 (0.23-0.27)
	42						
	51	10 (8-12)	0.09 (0.08-0.10)	0.12 (0.10-0.14)	0.14 (0.13-0.15)	0.18 (0.16-0.20)	0.20 (0.18-0.22)
	52						
N	61	23 (20-25)	0.07 (0.06-0.08)	0.10 (0.08-0.12)	0.12 (0.11-0.13)	0.14 (0.12-0.16)	0.16 (0.14-0.18)
	62						
	63						
	71	28 (25-30)	0.14 (0.12-0.16)	0.16 (0.14-0.18)	0.19 (0.18-0.20)	0.22 (0.20-0.24)	0.26 (0.24-0.28)
	72						
73	20 (18-22)	0.11 (0.10-0.12)	0.14 (0.12-0.16)	0.17 (0.16-0.18)	0.20 (0.18-0.22)	0.25 (0.23-0.27)	
O	81	25 (20-30)	0.07 (0.06-0.08)	0.10 (0.08-0.12)	0.12 (0.11-0.13)	0.14 (0.12-0.16)	0.16 (0.14-0.18)
	82						

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_n - feed rate (mm/rev)
ø - tool diameter (mm)

$$\text{To calculate RPM from cutting speed: } n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$$

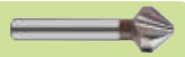
$$\text{To calculate cutting speed from RPM: } v_c = \frac{n \cdot \pi \cdot \phi}{1000}$$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

COUNTERBORE & COUNTERSINK CUTTING CONDITIONS



702302, 702301 (HSSCo & HSS Countersink)



Material Group	v _c (m/min)	f _n (mm/rev)				
		ø4.3 -6.3	ø7.0 -10.0	ø10.4 -15.0	ø16.5 -23.0	ø25.0 -31.0
P	11 28 (25-30)	0.08 (0.06-0.10)	0.10 (0.08-0.12)	0.15 (0.13-0.17)	0.18 (0.16-0.20)	0.23 (0.22-0.25)
	13 18 (15-20)	0.06 (0.04-0.08)	0.08 (0.06-0.10)	0.12 (0.10-0.14)	0.15 (0.13-0.17)	0.18 (0.16-0.20)
H	15 8 (5-10)	0.05 (0.04-0.06)	0.06 (0.04-0.08)	0.10 (0.08-0.12)	0.12 (0.10-0.14)	0.14 (0.12-0.16)
	21 7 (6-8)	0.05 (0.04-0.06)	0.06 (0.04-0.08)	0.10 (0.08-0.12)	0.12 (0.10-0.14)	0.14 (0.12-0.16)
K	31 20 (15-25)	0.08 (0.06-0.10)	0.10 (0.08-0.12)	0.15 (0.13-0.17)	0.18 (0.16-0.20)	0.23 (0.22-0.25)
	33 10 (8-12)	0.06 (0.04-0.08)	0.08 (0.06-0.10)	0.12 (0.10-0.14)	0.15 (0.13-0.17)	0.18 (0.16-0.20)
S	41 11 (10-12)	0.08 (0.06-0.10)	0.10 (0.08-0.12)	0.15 (0.13-0.17)	0.18 (0.16-0.20)	0.23 (0.22-0.25)
	51 10 (8-12)	0.06 (0.04-0.08)	0.08 (0.06-0.10)	0.12 (0.10-0.14)	0.15 (0.13-0.17)	0.18 (0.16-0.20)
N	61 23 (20-25)	0.05 (0.04-0.06)	0.06 (0.04-0.08)	0.10 (0.08-0.12)	0.12 (0.10-0.14)	0.14 (0.12-0.16)
	71 28 (25-30)	0.10 (0.08-0.12)	0.12 (0.10-0.14)	0.16 (0.14-0.18)	0.20 (0.18-0.22)	0.22 (0.20-0.24)
	73 20 (18-22)	0.08 (0.06-0.10)	0.10 (0.08-0.12)	0.15 (0.13-0.17)	0.18 (0.16-0.20)	0.23 (0.22-0.25)
O	81 25 (20-30)	0.05 (0.04-0.06)	0.06 (0.04-0.08)	0.10 (0.08-0.12)	0.12 (0.10-0.14)	0.14 (0.12-0.16)
	82					

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_n - feed rate (mm/rev)
ø - tool diameter (mm)

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

COUNTERBORE & COUNTERSINK CUTTING CONDITIONS



702402 (Deburring countersink)



Material Group	v _c (m/min)	f _n (mm/rev)				
		ø10.0 -15.0	ø20.0 -25.0	ø30.0 -35.0	ø40.0 -45.0	ø50.0
P	11 28 (25-30)	0.11 (0.10-0.12)	0.17 (0.15-0.18)	0.20 (0.18-0.22)	0.22 (0.20-0.24)	0.23 (0.21-0.25)
	13 18 (15-20)	0.09 (0.08-0.10)	0.13 (0.12-0.14)	0.16 (0.15-0.17)	0.18 (0.17-0.19)	0.19 (0.18-0.20)
H	15 8 (5-10)	0.06 (0.05-0.07)	0.08 (0.07-0.09)	0.10 (0.09-0.11)	0.12 (0.11-0.13)	0.13 (0.12-0.14)
	21 7 (6-8)	0.06 (0.05-0.07)	0.08 (0.07-0.09)	0.10 (0.09-0.11)	0.12 (0.11-0.13)	0.13 (0.12-0.14)
K	31 20 (15-25)	0.11 (0.10-0.12)	0.17 (0.15-0.18)	0.20 (0.18-0.22)	0.22 (0.20-0.24)	0.23 (0.21-0.25)
	33 10 (8-12)	0.09 (0.08-0.10)	0.13 (0.12-0.14)	0.16 (0.15-0.17)	0.18 (0.17-0.19)	0.19 (0.18-0.20)
S	41 11 (10-12)	0.11 (0.10-0.12)	0.17 (0.15-0.18)	0.20 (0.18-0.22)	0.22 (0.20-0.24)	0.23 (0.21-0.25)
	51 10 (8-12)	0.09 (0.08-0.10)	0.13 (0.12-0.14)	0.16 (0.15-0.17)	0.18 (0.17-0.19)	0.19 (0.18-0.20)
N	61 23 (20-25)	0.06 (0.05-0.07)	0.08 (0.07-0.09)	0.10 (0.09-0.11)	0.12 (0.11-0.13)	0.13 (0.12-0.14)
	71 28 (25-30)	0.11 (0.10-0.12)	0.17 (0.15-0.18)	0.20 (0.18-0.22)	0.22 (0.20-0.24)	0.23 (0.21-0.25)
	73 20 (18-22)	0.09 (0.08-0.10)	0.13 (0.12-0.14)	0.16 (0.15-0.17)	0.18 (0.17-0.19)	0.19 (0.18-0.20)
O	81 25 (20-30)	0.11 (0.10-0.12)	0.17 (0.15-0.18)	0.20 (0.18-0.22)	0.22 (0.20-0.24)	0.23 (0.21-0.25)
	82					

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_n - feed rate (mm/rev)
ø - tool diameter (mm)

To calculate RPM from cutting speed: $n = \frac{v_c \cdot 1000}{\pi \cdot \phi}$

To calculate cutting speed from RPM: $v_c = \frac{n \cdot \pi \cdot \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SUPERIOR PERFORMANCE



PM150 TAPS

SP. POINT/SP.FLUTE



Shanks to DIN371 & DIN376 to suit standard tapping collets.

High performance substrate. HSS-PM base designed for extended tool life across a wide range of material groups.

Unique patented geometry. Prevents over-feeding and oversize pitch diameter.

Specially engineered flute design. Designed for optimum chip evacuation and enhanced thread production.









IDEAL FOR MATERIAL GROUPS



PM, HAND & ISO TAPS



●: Excellent ○: Good

P				H		M			K				S					N							O			PM150 TAPS					
11	12	13	14	15	16	21	22	23	31	32	33	34	41	42	43	51	52	53	61	62	63	64	71	72	73	74	81	82	83	Code	Item	Description	Page No.
●	●	●	●	○		●	●	●	●	●	●	●	○						●	●	●			●	●	●				PM15011		Metric Spiral Point M2 - M30	P.268
●	●	●	●	○		●	●	●	●	●	●	●	○						●	●	●			●	●	●				PM15012		Metric Spiral Flute M2 - M30	P.269
ISO SPIRAL FLUTE BLUE WIZARD																																	
●	●	●							●	●														●	●					F013		Metric Vap M1.6 - M20	P.270
●	●	●							●	●														●	●					F023 F033		Metric Fine Vap M4 - M20	P.271
ISO SPIRAL FLUTE BLUE MERLIN																																	
●	●	●							●	●														●	●					F015		Metric Vap M3 - M20	P.272
●	●	●							●	●														●	●					F025 F035		Metric Fine Vap M4 - M20	P.273
STRAIGHT FLUTE HAND TAPS & SETS																																	
																														F011 G011		Metric Bright M1 - M20	P.274
																														F021 G021		Metric Fine Bright M3 - M20	P.275

PM150 SPIRAL POINT METRIC COARSE



HSS PM BRIGHT DIN376 DIN371 6H



Series No. PM15011

Size	Pitch	Overall Length	Flute Length	Shank Dia	Square A/F	Square Length	z	EUROPA CODE
M2	0.4	45	8	2.8	2.1	5	2	PM150110200
M2.2	0.45	45	8	2.8	2.1	5	2	PM150110220
M2.5	0.45	50	9	2.8	2.1	5	2	PM150110250
M3	0.5	56	11	3.5	2.7	6	3	PM150110300
M3.5	0.6	56	12	4.0	3.0	6	3	PM150110350
M4	0.7	63	13	4.5	3.4	6	3	PM150110400
M4.5	0.75	70	14	6.0	4.9	8	3	PM150110450
M5	0.8	70	15	6.0	4.9	8	3	PM150110500
M6	1.0	80	17	6.0	4.9	8	3	PM150110600
M8	1.25	90	20	8.0	6.2	9	3	PM150110800
M10	1.5	100	22	10.0	8.0	11	3	PM150111000
M12	1.75	110	24	9.0	7.0	10	3	PM150111200
M14	2.0	110	26	11.0	9.0	12	3	PM150111400
M16	2.0	110	27	12.0	9.0	12	3	PM150111600
M18	2.5	125	30	14.0	11.0	14	3	PM150111800
M20	2.5	140	32	16.0	12.0	15	3	PM150112000
M22	2.5	140	32	18.0	14.5	17	3	PM150112200
M24	3.0	160	34	18.0	14.5	17	3	PM150112400
M27	3.0	160	36	20.0	16.0	19	4	PM150112700
M30	3.5	180	40	22.0	18.0	21	4	PM150113000

Cutting Speed

V _c (m/min)	P			H	M			K	
	11, 12	13	14	15	12	13	14	31, 33	32, 34
	15-20	12-18	10-15	6-10	7-10	4-6	5-8	10-15	5-8

V _c (m/min)	S		N					
	41	51	61	62	63	72	73	74
	10-15	8-12	5-12	25-35	15-20	25-35	15-20	10-15

PM150 SPIRAL FLUTE METRIC COARSE



HSS PM BRIGHT DIN376 DIN371 6H



Series No. PM15012

Size	Pitch	Overall Length	Flute Length	Shank Dia	Square A/F	Square Length	z	EUROPA CODE
M2	0.4	45	8	2.8	2.1	5	3	PM150120200
M2.2	0.45	45	8	2.8	2.1	5	3	PM150120220
M2.5	0.45	50	9	2.8	2.1	5	3	PM150120250
M3	0.5	56	6	3.5	2.7	6	3	PM150120300
M3.5	0.6	56	7	4.0	3.0	6	3	PM150120350
M4	0.7	63	7	4.5	3.4	6	3	PM150120400
M4.5	0.75	70	8	6.0	4.9	8	3	PM150120450
M5	0.8	70	8	6.0	4.9	8	3	PM150120500
M6	1.0	80	10	6.0	4.9	8	3	PM150120600
M8	1.25	90	13	8.0	6.2	9	3	PM150120800
M10	1.5	100	15	10.0	8.0	11	3	PM150121000
M12	1.75	110	18	9.0	7.0	10	3	PM150121200
M14	2.0	110	20	11.0	9.0	12	3	PM150121400
M16	2.0	110	20	12.0	9.0	12	3	PM150121600
M18	2.5	125	25	14.0	11.0	14	4	PM150121800
M20	2.5	140	25	16.0	12.0	15	4	PM150122000
M22	2.5	140	25	18.0	14.5	17	4	PM150122200
M24	3.0	160	30	18.0	14.5	17	4	PM150122400
M27	3.0	160	30	20.0	16.0	19	4	PM150122700
M30	3.5	180	35	22.0	18.0	21	4	PM150123000

Cutting Speed

V _c (m/min)	P			H	M			K	
	11, 12	13	14	15	12	13	14	31, 33	32, 34
	15-20	12-18	10-15	6-10	7-10	4-6	5-8	10-15	5-8

V _c (m/min)	S		N					
	41	51	61	62	63	72	73	74
	10-15	8-12	5-12	25-35	15-20	25-35	15-20	10-15

BLUE WIZARD SPIRAL POINT METRIC COARSE



HSS VAP ISO529 / BS949 6H

Series No. F013



Size	Pitch	Overall Length	Flute Length	Square Length	Shank Dia	Square A/F	z	EUROPA CODE
M1.6	0.35	41	8.0	4	2.5	2.0	2	F0130066
M2	0.40	41	9.5	4	2.5	2.0	2	F0130082
M2.5	0.45	44	9.5	5	2.8	2.24	2	F0130101
M3	0.50	48	15.0	5	3.15	2.5	2	F0130120
M3.5	0.60	50	17.0	5	3.55	2.8	2	F0130140
M4	0.70	53	17.0	6	4.0	3.15	2	F0130161
M4.5	0.75	53	17.0	6	4.5	3.55	2	F0130180
M5	0.80	58	16.0	7	5.0	4.0	3	F0130200
M6	1.00	66	19.0	8	6.3	5.0	3	F0130239
M7	1.00	66	19.0	8	7.1	5.6	3	F0130279
M8	1.25	72	22.0	9	8.0	6.3	3	F0130318
M10	1.50	80	24.0	11	10.0	8.0	3	F0130397
M12	1.75	89	29.0	10	9.0	7.1	3	F0130475
M14	2.00	95	30.0	12	11.2	9.0	3	F0130554
M16	2.00	102	32.0	13	12.5	10.0	3	F0130633
M18	2.50	112	37.0	14	14.0	11.2	3	F0130712
M20	2.50	112	37.0	14	14.0	11.2	3	F0130790

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

Cutting Speed

V _c (m/min)	P			K		N	
	11	12	13	31	33	71	72
	10 - 15			8 - 10		10 - 20	

BLUE WIZARD SPIRAL POINT METRIC FINE



HSS VAP ISO529 / BS949 6H

Series No. F023, F033



Size	Pitch	Overall Length	Flute Length	Square Length	Shank Dia	Square A/F	z	EUROPA CODE
M4	0.50	53	17.0	6	4.0	3.15	2	F0230161
M5	0.50	58	16.0	7	5.0	4.0	3	F0230200
M6	0.75	66	19.0	8	6.3	5.0	3	F0230239
M8	1.00	72	22.0	9	8.0	6.3	3	F0230318
M10	1.00	80	24.0	11	10.0	8.0	3	F0330397
M10	1.25	80	24.0	11	10.0	8.0	3	F0230397
M12	1.25	89	29.0	10	9.0	7.1	3	F0230475
M12	1.50	89	29.0	10	9.0	7.1	3	F0330475
M14	1.25	95	30.0	12	11.2	9.0	3	F0330554
M14	1.50	95	30.0	12	11.2	9.0	3	F0230554
M16	1.50	102	32.0	13	12.5	10.0	3	F0230633
M18	1.50	112	37.0	14	14.0	11.2	3	F0230712
M20	1.50	112	37.0	14	14.0	11.2	3	F0230790

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

Cutting Speed

V _c (m/min)	P			K		N	
	11	12	13	31	33	71	72
	10 - 15			8 - 10		10 - 20	

BLUE MERLIN SPIRAL FLUTE METRIC COARSE



HSS VAP ISO529 / BS949 6H

Series No. F015



Size	Pitch	Overall Length	Flute Length	Square Length	Shank Dia	Square A/F	z	EUROPA CODE
M3	0.50	48	15.0	5	3.15	2.5	2	F0150121
M3.5	0.60	50	17.0	5	3.55	2.8	2	F0150141
M4	0.70	53	17.0	6	4.0	3.15	2	F0150161
M5	0.80	58	16.0	7	5.0	4.0	3	F0150200
M6	1.00	66	19.0	8	6.3	5.0	3	F0150240
M7	1.00	66	19.0	8	7.1	5.6	3	F0150280
M8	1.25	72	22.0	9	8.0	6.3	3	F0150319
M10	1.50	80	24.0	11	10.0	8.0	3	F0150398
M12	1.75	89	29.0	10	9.0	7.1	3	F0150476
M14	2.00	95	30.0	12	11.2	9.0	3	F0150555
M16	2.00	102	32.0	13	12.5	10.0	3	F0150634
M18	2.50	112	37.0	14	14.0	11.2	3	F0150713
M20	2.50	112	37.0	14	14.0	11.2	3	F0150791

▶ OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

Cutting Speed

V _c (m/min)	P			K		N	
	11	12	13	31	33	71	72
	10 - 15			8 - 10		10 - 20	

BLUE MERLIN SPIRAL FLUTE METRIC FINE



HSS VAP ISO529 / BS949 6H

Series No. F025, F035



Size	Pitch	Overall Length	Flute Length	Square Length	Shank Dia	Square A/F	z	EUROPA CODE
M4	0.50	53	17.0	6	4.0	3.15	2	F0250161
M5	0.50	58	16.0	7	5.0	4.0	3	F0250200
M6	0.75	66	19.0	8	6.3	5.0	3	F0250240
M8	1.00	72	22.0	9	8.0	6.3	3	F0250319
M10	1.00	80	24.0	11	10.0	8.0	3	F0350398
M10	1.25	80	24.0	11	10.0	8.0	3	F0250399
M12	1.25	89	29.0	10	9.0	7.1	3	F0250476
M12	1.50	89	29.0	10	9.0	7.1	3	F0350476
M14	1.25	95	30.0	12	11.2	9.0	3	F0350555
M14	1.50	95	30.0	12	11.2	9.0	3	F0250555
M16	1.50	102	32.0	13	12.5	10.0	3	F0250634
M18	1.50	112	37.0	14	14.0	11.2	3	F0250713
M20	1.50	112	37.0	14	14.0	11.2	3	F0250791

▶ OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

Cutting Speed

V _c (m/min)	P			K		N	
	11	12	13	31	33	71	72
	10 - 15			8 - 10		10 - 20	

METRIC COARSE HAND TAPS



HSS Bright ISO529 / BS949 6H

Series No. F011, G011



Size	Pitch	Overall Length	Flute Length	Square Length	Shank Dia	Square A/F	Z	EUROPA CODE			SET No. (3 TAPS)
								Taper Lead	Second Lead	Bottoming Lead	
M1.6	0.35	41	8.0	4	2.5	2.0	3	F0110063	F0110064	F0110065	G0110063
M2	0.40	41	9.5	4	2.5	2.0	3	F0110079	F0110080	F0110081	G0110079
M2.2	0.45	44.5	9.5	5	2.8	2.24	3	F0110087	F0110088	F0110089	G0110087
M2.5	0.45	44.5	9.5	5	2.8	2.24	3	F0110098	F0110099	F0110100	G0110098
M3	0.50	48	15.0	5	3.15	2.5	3	F0110117	F0110118	F0110119	G0110117
M3.5	0.60	50	17.0	5	3.55	2.8	3	F0110137	F0110138	F0110139	G0110137
M4	0.70	53	17.0	6	4.0	3.15	3	F0110158	F0110159	F0110160	G0110158
M4.5	0.75	53	17.0	6	4.5	3.55	3	F0110177	F0110178	F0110179	G0110177
M5	0.80	58	16.0	7	5.0	4.0	3	F0110197	F0110198	F0110199	G0110197
M6	1.00	66	19.0	8	6.3	5.0	3	F0110236	F0110237	F0110238	G0110236
M7	1.00	66	19.0	8	7.1	5.6	4	F0110276	F0110277	F0110278	G0110276
M8	1.25	72	22.0	9	8.0	6.3	4	F0110315	F0110316	F0110317	G0110315
M9	1.25	72	22.0	10	9.0	7.1	4	F0110354	F0110355	F0110356	G0110354
M10	1.50	80	24.0	11	10.0	8.0	4	F0110394	F0110395	F0110396	G0110394
M11	1.50	85	25.0	9	8.0	6.3	4	F0110433	F0110434	F0110435	G0110433
M12	1.75	89	29.0	10	9.0	7.1	4	F0110472	F0110473	F0110474	G0110472
M14	2.00	95	30.0	12	11.2	9.0	4	F0110551	F0110552	F0110553	G0110551
M16	2.00	102	32.0	13	12.5	10.0	4	F0110630	F0110631	F0110632	G0110630
M18	2.50	112	37.0	14	14.0	11.2	4	F0110709	F0110710	F0110711	G0110709
M20	2.50	112	37.0	14	14.0	11.2	4	F0110787	F0110788	F0110789	G0110787

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

METRIC FINE HAND TAPS



HSS Bright ISO529 / BS949 6H

Series No. F021, G021



Size	Pitch	Overall Length	Flute Length	Square Length	Shank Dia	Square A/F	Z	EUROPA CODE			SET No. (3 TAPS)
								Taper Lead	Second Lead	Bottoming Lead	
M3	0.35	48	15.0	5	3.15	2.5	3	F0210117	F0210118	F0210119	G0210117
M3.5	0.35	50	17.0	5	3.55	2.8	3	F0210137	F0210138	F0210139	G0210137
M4	0.50	53	17.0	6	4.0	3.15	3	F0210158	F0210159	F0210160	G0210158
M4.5	0.50	53	17.0	6	4.5	3.55	3	F0210177	F0210178	F0210179	G0210177
M5	0.50	58	16.0	7	5.0	4.0	3	F0210197	F0210198	F0210199	G0210197
M6	0.50	66	19.0	8	6.3	5.0	3	F0310236	F0310237	F0310238	G0310236
M6	0.75	66	19.0	8	6.3	5.0	3	F0210236	F0210237	F0210238	G0210236
M7	0.75	66	19.0	8	7.1	5.6	4	F0210276	F0210277	F0210278	G0210276
M8	0.50	72	22.0	9	8.0	6.3	4	F0410315	F0410316	F0410317	G0410315
M8	0.75	72	22.0	9	8.0	6.3	4	F0310315	F0310316	F0310317	G0310315
M8	1.00	72	22.0	9	8.0	6.3	4	F0210315	F0210316	F0210317	G0210315
M9	1.00	72	22.0	10	9.0	7.1	4	F0210354	F0210355	F0210356	G0210354
M10	0.75	80	24.0	11	10.0	8.0	4	F0410394	F0410395	F0410396	G0410394
M10	1.00	80	24.0	11	10.0	8.0	4	F0310394	F0310395	F0310396	G0310394
M10	1.25	80	24.0	11	10.0	8.0	4	F0210394	F0210395	F0210396	G0210394
M11	0.75	85	25.0	9	8.0	6.3	4	F0410433	F0410434	F0410435	G0410433
M11	1.00	85	25.0	9	8.0	6.3	4	F0210433	F0210434	F0210435	G0210433
M12	1.00	89	29.0	10	9.0	7.1	4	F0410472	F0410473	F0410474	G0410472
M12	1.25	89	29.0	10	9.0	7.1	4	F0210472	F0210473	F0210474	G0210472
M12	1.50	89	29.0	10	9.0	7.1	4	F0310472	F0310473	F0310474	G0310472
M14	1.00	95	30.0	12	11.2	9.0	4	F0410551	F0410552	F0410553	G0410551
M14	1.25	95	30.0	12	11.2	9.0	4	F0310551	F0310552	F0310553	G0310551
M14	1.50	95	30.0	12	11.2	9.0	4	F0210551	F0210552	F0210553	G0210551
M16	1.00	102	32.0	13	12.5	10.0	4	F0410630	F0410631	F0410632	G0410630
M16	1.50	102	32.0	13	12.5	10.0	4	F0210630	F0210631	F0210632	G0210630
M18	1.00	112	37.0	14	14.0	11.2	4	F0410709	F0410710	F0410711	G0410709
M18	1.50	112	37.0	14	14.0	11.2	4	F0210709	F0210710	F0210711	G0210709
M18	2.00	112	37.0	14	14.0	11.2	4	F0310709	F0310710	F0310711	G0310709
M20	1.00	112	37.0	14	14.0	11.2	4	F0410787	F0410788	F0410789	G0410787
M20	1.50	112	37.0	14	14.0	11.2	4	F0210787	F0210788	F0210789	G0210787
M20	2.00	112	37.0	14	14.0	11.2	4	F0310787	F0310788	F0310789	G0310787

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

SUPERIOR PERFORMANCE



HSGT DIES SPLIT & SOLID

DIES, DIENUTS & ACCESSORIES



13/16" - 3" diameter
depending on size.

Premium HSS for
extended tool life.

Fully ground
thread forms.

Split dies for fine thread adjustment.
Solid for dienuts.




IDEAL FOR MATERIAL GROUPS




INDEX

CIRCULAR DIES

Code	Item	Description	Page No.
J011- J015		Metric M1.6 - M20	P.280-281
J011- J015		Metric Fine M3 - M20	P.280-281

DIENUTS

J611		Metric M1.6 - M20	P.282
J612		Metric Fine M4 - M20	P.283



CIRCULAR DIES METRIC COARSE



HSS Bright BS1127 SPLIT

Series No. J011 - J015



Size	Pitch	Outside Diameter	Width	EUROPA CODE
M1.6	0.35	13/16	1/4	J0110063
M2	0.4	13/16	1/4	J0110079
M2.5	0.45	13/16	1/4	J0110098
M3	0.5	13/16	1/4	J0110118
M3.5	0.6	13/16	1/4	J0110138
M4	0.7	13/16	1/4	J0110159
M4	0.7	1	3/8	J0120161
M4.5	0.75	13/16	1/4	J0110178
M5	0.8	13/16	1/4	J0110198
M5	0.8	1	3/8	J0120200
M6	1.0	13/16	1/4	J0110237
M6	1.0	1	3/8	J0120238
M6	1.0	1.5/16	7/16	J0130239
M8	1.25	1	3/8	J0120316
M8	1.25	1.5/16	7/16	J0130317
M10	1.5	1	3/8	J0120396
M10	1.5	1.5/16	7/16	J0130397
M10	1.5	1.1/2	1/2	J0140398
M12	1.75	1.5/16	7/16	J0130473
M12	1.75	1.1/2	1/2	J0140474
M12	1.75	2	5/8	J0150475
M14	2.0	1.5/16	7/16	J0130553
M14	2.0	1.1/2	1/2	J0140554
M14	2.0	2	5/8	J0150555
M16	2.0	1.1/2	1/2	J0140631
M16	2.0	2	5/8	J0150632
M18	2.5	1.1/2	1/2	J0140710
M18	2.5	2	5/8	J0150710
M20	2.5	1.1/2	1/2	J0140788
M20	2.5	2	5/8	J0150788

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

CIRCULAR DIES METRIC FINE



HSS Bright BS1127 SPLIT

Series No. J011 - J015



Size	Pitch	Outside Diameter	Width	EUROPA CODE
M3	0.35	13/16	1/4	J0110117
M4	0.5	13/16	1/4	J0110158
M5	0.5	13/16	1/4	J0110197
M6	0.75	13/16	1/4	J0110236
M8	1.0	1	3/8	J0120315
M10	1.0	1	3/8	J0120394
M10	1.25	1	3/8	J0120395
M12	1.25	1.5/16	7/16	J0130472
M14	1.5	1.5/16	7/16	J0130552
M16	1.5	1.1/2	1/2	J0140630
M18	1.5	1.1/2	1/2	J0140709
M20	1.5	2	5/8	J0150787

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

DIENUTS METRIC COARSE



HSS Bright BS1127

Series No. J611



Size	Pitch	A/F (INCH)	Width	EUROPA CODE
M3	0.5	0.71	1/4	J6110117
M4	0.7	0.71	1/4	J6110158
M5	0.8	0.71	1/4	J6110197
M6	1.0	0.71	1/4	J6110236
M8	1.25	0.82	5/16	J6110315
M10	1.5	0.92	3/8	J6110394
M12	1.75	1.1	1/2	J6110472
M14	2.0	1.3	5/8	J6110551
M16	2.0	1.3	5/8	J6110630
M18	2.5	1.48	11/16	J6110709
M20	2.5	1.48	11/16	J6110787

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST

DIENUTS METRIC FINE



HSS Bright BS1127

Series No. J612



Size	Pitch	A/F (INCH)	Width	EUROPA CODE
M3	0.35	0.71	1/4	J6120117
M4	0.5	0.71	1/4	J6120158
M5	0.5	0.71	1/4	J6120197
M6	0.75	0.71	1/4	J6120236
M8	1.0	0.82	5/16	J6120315
M10	1.0	0.92	3/8	J6120394
M12	1.25	1.1	1/2	J6120472
M14	1.5	1.3	1/2	J6120551
M16	1.5	1.3	1/2	J6120630
M18	1.5	1.48	1/2	J6120709
M20	1.5	1.48	5/8	J6120787

► OTHER SIZES AND THREADFORMS AVAILABLE ON REQUEST






ACCESSORIES INDEX

DIESTOCKS

Code	Item	Description	Page No.
J895		DS1 - DS8 13/16" - 4"	P.286

TAP WRENCHES

J891		TW1 - TW2 M2 - M12	P.287
J892		TW3 - TW7 M3 - M42	P.287
J893		T1 - TL4 M1 - M12	P.287

Series No. J895



Stock No.	Die Outside Dia.	Length mm	EUROPA CODE
DS1	13/16	165	J8950001
DS2	1	230	J8950002
DS3	1.5/16	280	J8950003
DS4	1.1/2	350	J8950004
DS5	2	550	J8950005
DS6	2.1/4	610	J8950006
DS7	3	790	J8950007
DS8	4	1075	J8950008

Series No. J891 / 2 / 3

J891Bar Type



Wrench No.	Nominal Tap Size					Length mm	EUROPA CODE
	Inch	UN	BA	mm	Pipe (inch)		
TW1	1/16 - 1/4	0 - 12	12 - 0	M2 - M6	-	105	J8910001
TW2	1/8 - 1/2			M3 - M12	1/8 - 1/4	160	J8910002

J892 Adjustable Type



Wrench No.	Nominal Tap Size					Length mm	EUROPA CODE
	Inch	UN	BA	mm	Pipe (inch)		
TW3	1/8 - 1/2	4.-12		M3 - M12	1/8 - 1/4	270	J8920003
TW4	7/32 - 3/4			M6 - M20	1/8 - 3/8	380	J8920004
TW5	7/16 - 1			M12 - M27	1/4 - 5/8	500	J8920005
TW6	3/4 - 1.1/2			M18 - M42	3/8. - 1	815	J8920006
TW7	1 - 2.1/2			>M24	5/8 - 2.1/2	1300	J8920007

J893 Ratchet Type



Wrench No.	Nominal Tap Size					Length mm	EUROPA CODE
	Inch	UN	BA	mm	Pipe (inch)		
T1 STD	1/16 - 1/4	0 - 12	12 - 0	M1 - M6		85	J8930001
T2 STD	1/4 - 1/2			M6 - M12	1/8 - 1/4	110	J8930002
TL3 LONG	1/16 - 1/4	0 - 12	12 - 0	M1 - M6		250	J8930003
TL4 LONG	1/4 - 1/2			M6 - M12	1/8 - 1/4	300	J8930004



GENERAL INFORMATION

Speed, feed and depth of cut are the most important factors to consider for best results in milling. Improper feeds and speeds often cause low production, poor work quality and unnecessary damage to the cutter. This section covers the basic principles of speed and feed selection for milling cutters and end mills. It will serve as a guide in setting-up new milling jobs.

Speeds

In milling, SPEED is measured in peripheral metres per minute. (rpm x cutter circumference in metres). This is frequently referred to as "peripheral speed" "cutting speed" or "surface speed".

Use lower speed ranges for	Use higher speed ranges for
Hard materials Tough materials Abrasive materials Heavy cuts Minimum tool wear Maximum cutter life	Softer materials Better finishes Smaller diameter cutters Light cuts Unstable workpiece set-ups Hand feed operations Maximum production rates Non-metallic materials

Feeds

Feed is usually measured in millimeters per minute. It is the product of feed per tooth times revolution per minute times the number of teeth in the cutter. Due to variations in cutter sizes, numbers of teeth and revolutions per minute, all feed rates should be calculated from feed per tooth. Feed per tooth is the basis of all feed rates per minute, whether the cutters are large or small, fine or coarse tooth, and are run at high or low peripheral speed. Because feed per tooth affects chip thickness. It is a very important factor in cutter life. Highest possible feed per tooth will usually give longer cutter life between grinds and greater production per grind. Excessive feeds may over load the cutter teeth and cause breakage or chipping of the cutting edges. The following factors should be kept in mind when using the recommended starting feed per tooth.

Use lower feeds for	Use higher feeds for
Light and finishing cuts Unstable set-ups Hard to machine materials Small diameter cutters Deep slots High tensile strength materials Fine tooth cutters	Heavy, roughing cuts Rigid set-ups Easy to machine materials Rugged cutters Low tensile strength materials Coarse tooth cutters Abrasive materials

Basic formulae

v_c - cutting speed (m/min) To calculate RPM from cutting speed: $n = \frac{v_c \times 1000}{\pi \times \phi}$
 n - RPM (rev/min)
 f_n - feed rate (mm/rev)
 ϕ - tool diameter (mm) To calculate cutting speed from RPM: $v_c = \frac{n \times \pi \times \phi}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

Problem	Instance of problem	Solution options
Tool breaks	At start or end of cut	Reduce overhang Use shorter tool Use lower feed rate
	During cutting	Check tool for wear and replace sooner Check toolholder for wear and replace Reduce overhang Use shorter tool Use lower feed rate Check coolant flow
	Changing direction	Check tool for wear and replace sooner Check toolholder for wear and replace Use lower feed rate when changing direction Use circular interpolation if possible
Cutting edge breaks	Corner chipping	Reduce overhang Use shorter tool Use climb milling
	Break at depth of cut	Use climb milling Use lower cutting speed
	Centre chipping	Use larger tool if possible Use higher cutting speed If noisy during cutting, use higher feed rate Check coolant flow Check toolholder for wear and replace
	Break of cutting edge	Use larger tool if possible Use lower feed rate Use lower cutting speed Check toolholder for wear and replace Check coolant flow
Heavy tool wear		Use lower cutting speed Use conventional milling Use higher feed rate Check coolant flow
Poor surface finish	Good finish but rough	Use lower feed rate Check coolant flow
	Chip welding	Use higher cutting speed Use higher feed rate Use conventional milling Check coolant flow
	Scoring	Use climb milling Check coolant flow
	Excessive cut marks	Use smaller radial depth of cut for finishing Use higher cutting speed Use lower feed rate
Poor accuracy	Undersize	Use conventional milling Use smaller radial depth of cut for finishing Check toolholder for wear and replace Reduce overhang Use higher cutting speed
	Not perpendicular	Use smaller radial depth of cut for finishing Check toolholder for wear and replace Reduce overhang Use higher cutting speed Use lower feed rate Check tool for wear and replace sooner
Chattering		Use higher or lower cutting speed Use higher feed rate Check toolholder for wear and replace Reduce overhang Use climb milling

Drilling guide.

Recommendations for use.

Ensure workpiece is firmly and securely fastened.

Avoid excess lateral loads.

Ensure collets and drill chucks are in good condition and will not allow drill slippage. Both drill and component damage can occur.

When using taper shank drills ensure all taper sleeves are clean and in good condition. Never allow the drill to drive off the tang. This is an indication that either the drill, the sleeve, or both are damaged. Use only soft faced hammers to drive the taper shank into the sleeve. Use a proper drift key to remove the shank from the sleeve.

Ensure drill is kept sharp, and sharpen before point of failure. If allowed to become blunt extra grinding will be needed to bring the drill back to optimum performance.

Keep the flutes free from swarf. Clogged flutes will hamper drill performance.

Use adequate coolant, particularly at the drill point.

Avoid excessive speed and feed rates. Use the charts in this catalogue. If unsure of the correct speed or feed rate to use, it is generally better to start at low speeds and feeds, and build up as appropriate.

When resharping it is important that all wear is removed, and the correct point geometry is maintained. Do not overheat or burn the drill when grinding.

Ensure correct drill is chosen for application and material type, particularly with deeper holes to avoid pecking where possible.

Reaming guide.

Recommendations for use.

Ensure workpiece is firmly and securely fastened. Bending and moving may break reamer.

When using taper shank reamers ensure all taper sleeves are clean and in good condition.

Reamers must be kept sharp. As reamers only cut on the bevel lead, only the bevel, and the taper lead in the case of hand reamers, require regrinding. A blunt reamer wears on the outer corners on the bevel lead, resulting in a poor finish, undersized holes and increased torque.

When reaming, ensure that swarf is not allowed to build up in the flutes.

Adequate lubricant must be directed to the cutting area. When reaming high tensile materials, an improved finish can be achieved by using chlorinated or sulphurised oils.

The correct amount of stock must be left in the hole after drilling or coring to obtain the required hole size and finish, and eliminate excessive reamer wear. If too little stock is left for removal by reaming the reamer will rub in the hole giving rise to premature wear and loss of size. The table below shows approximate amounts of stock to be removed by reaming. This is **for guidance only**, as the amount of stock to be left depends greatly on the type of material being reamed and the type of reamer used.

When hand reaming, leave approximately two thirds of machine reaming allowance.

Stock removal.

Amount of material to be left in prior to reaming.

Operation	Finish Reamed Size					
	<ø1.5	ø1.5 -3.0	ø3.0 -6.0	ø6.0 -16.0	ø16.0 -25.0	ø25.0 -50.0
Pre Drilled	0.20	0.20	0.20	0.30	0.30	0.40
Pre Core Drilled or Bored	0.10	0.10	0.10	0.20	0.20	0.30

All recommendations are for guidance only. Adjustments may need to be made according to your set-up.

Troubleshooting - Drilling

Problem	Probable causes	Suggested actions
Drill will not enter work	Drill is dull	Regrind lip relief
	Lip relief too small	Regrind web thinning
	Web too thick	Select drill with narrow web
Cutting lip breaks	Lip relief too large	Regrind lip relief
	Feed too high	Choose correct data from cutting charts
Tang breaks	Bad fit in taper shank socket	Ensure socket is clean
	Burred or badly worn socket	Replace socket
Drill centre chipped	Lip relief too large	Regrind lip relief
	Feed too high	Choose correct data from cutting charts
Oversize hole	Unequal cutting edge length or angle	Resharpener drill point
	Tool not held tight	Tighten collet or chuck
Outer edges chipped	Cutting speed too high	Choose correct data from cutting charts
	Flutes clogged	Choose correct drill from application guide
	Drill worn	Replace or regrind drill
	Hard spots in work material	Choose correct drill from application guide
Poor surface finish	Incorrect grinding of drill point	Replace or regrind drill
	Insufficient coolant supply	Ensure coolant is targetted correctly
	Feed too high	Choose correct data from cutting charts
	Workpiece not held securely	Replace or tighten fixture or vice

Troubleshooting - Reaming

Problem	Probable causes	Suggested actions
Chattering	Workpiece not held securely	Replace or tighten fixture or vice
	Incorrect speed or feed	Choose correct data from cutting charts
	Incorrect reamer	Select reduced vibration carbide reamer
Rapid wear	Incorrect size of pre-drilled hole	Choose correct data from reaming guide
	Incorrect speed or feed	Choose correct data from cutting charts
Tapering or Bell moutingh	Machine spindle/bearings worn	Replace/repair equipment
	Reamer and hole mis-aligned	Check set-up and re-align
Rubbing	Incorrect size of pre-drilled hole	Choose correct data from reaming guide
	Incorrect bevel lead on reamer	Replace or regrind reamer
Oversize hole	Excessive run-out in collet/chuck	Replace collet/chuck
	Incorrect size of pre-drilled hole	Choose correct data from reaming guide
Poor surface finish	Incorrect speed or feed	Choose correct data from cutting charts
	Reamer worn or damaged	Replace or regrind reamer
	Insufficient coolant supply	Ensure coolant is targetted correctly

Tapping guide.

TAP SELECTION

The type of tap used depends on the type of material to be machined. Generally, any materials with an elongation of at least 10% can be cold formed, but any other materials need to be cut. Please refer to tap selection guide for most suitable tap.

CORE HOLES

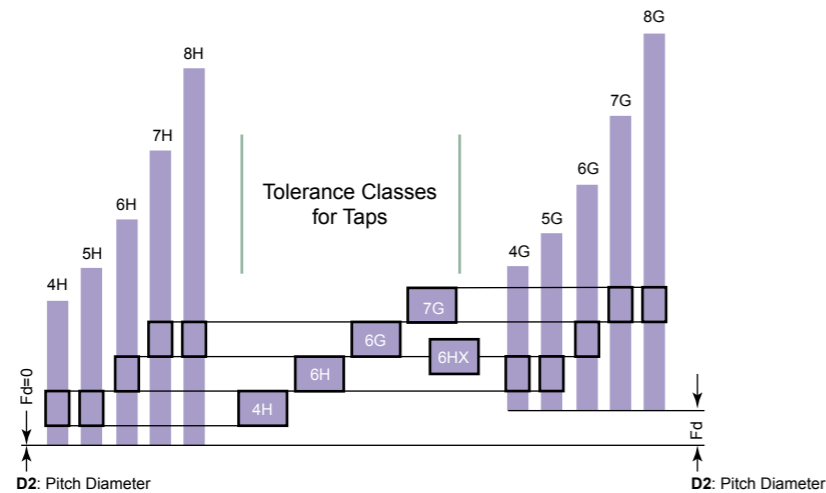
Core holes should be clean and swarf free. In materials that have a tendency to close down after drilling, a slightly larger tapping drill size should be used. Each tap size in this catalogue has a recommended tapping drill size shown in its dimension table.

CUTTING SPEEDS

The correct cutting speed is necessary to control chip flow and establish the best tool life for the tap. Guide values are given in the cutting data charts on pages 86-89. Material hardness and rigidity of workpiece can have a detrimental effect on the tap, so it is worth experimenting with the guide data to establish the best speeds for your particular application.

Tap tolerances.

Tolerance classes of taps and tolerance positions for screw threads as per Metric ISO standard



Tap tolerance ISO	Tap tolerance DIN	Correct class to obtain nut thread with tolerance				
		4H	5H	6H	7H	8H
ISO 1	4H	4H	5H			
ISO 2	6H	4G	5G	6H		
ISO 3	6G			6G	7H	8H
	7G				7G	8G

Standard fit for a thread corresponds to tolerance class ISO 2/6H. For more precise fits, without allowance on thread flank, tolerance class ISO 1/4H must be chosen. ISO 3/6G is used in case of loose fits, with large allowance, which is often required for subsequent coatings.

Between classes 6H and 6G taps are produced with tolerance 6HX. These taps are used for tapping abrasive materials, such as cast iron or Al-Si alloys, in order to increase their tool life. Another important application is on cold forming taps, which create the thread by plastic deformation and not by cutting. In this case, due to the elastic return of the material, in order to obtain a thread 6H tolerance, a 6HX tap must be used.

The tolerances described above are collected in the ISO standard ISO 68-1.

Problem	Probable causes	Suggested actions
Tapped hole oversize	Incorrect tap in use (cutting geometry unsuitable for application)	Use tap selected from the relevant material group
	Faulty alignment	Ensure that the tap is correctly aligned with the core hole axis
	Cold welding	Improve lubrication and direction of coolant Adjust cutting speed
	Re-ground tap (lead-in is not concentric)	Regrind tap lead correctly on a suitable tap grinding machine
Stripped threads	Incorrect tap in use (cutting geometry incorrect for application)	Use a tap from the relevant material group.
	Spindle speed and feed rate not synchronized	Check feed rate programming and / or pitch of leading spindle Use a tapping spindle with axial float
	Insufficient start pressure exerted on tap with peel-cut	Increase start pressure
Bell mouthed tapped hole	Incorrect start pressure applied to tap	Use a tapping spindle with axial float
Unsatisfactory thread surface finish	Incorrect tap in use (Cutting geometry unsuitable for application)	Select tap from the relevant material group
	The tap is blunt	Replace or re-grind tap
	Tap badly re-ground	Re-grind tap again. Check that cutting geometry is suitable for material
	Coolant lacking in lubricating qualities and / or quantity	Ensure the use of a suitable coolant and an ample supply
Partial chipping of tap	Swarf jamming	Check cutting speed Use alternative tap type
	Tap has jammed against bottom of core hole	Check hole and thread depths Drill core hole deeper
	Tap incorrectly re-ground (lead-in diameter too small therefore too few cutting teeth)	Ensure that original values are maintained when regrinding
	Irregular workpiece material structure	Adjust cutting speed Improve lubricating quality of coolant
Excessive tap wear	Incorrect cutting speed	Adjust cutting speed to suit workpiece material
	Coolant lacking in lubricating qualities and / or quantity	Ensure the use of a suitable coolant and an ample supply Check that coolant is reaching the cutting zone
	Surface of the core hole is compacted	Check core hole drilling conditions (drill carefully to reduce risk of surface compacting) Check drill cutting edges
Tap breakage	Incorrect tap in use (cutting geometry unsuitable for application)	Use tap from the relevant material group
	Centering error	Ensure that axes of tap and core hole are aligned
	Blunt tap	Re-grind tap Ensure that taps are stored carefully
	Tap has reached bottom of core hole	Use tapping spindle with axial float and slipping clutch
	Core hole too small	Ensure tapping drill is correct size.

GENERAL INFORMATION THREADING



Tapping drill sizes for Metric threads.

Metric-ISO threads coarse pitch				Metric-ISO threads fine pitch				Metric-ISO threads fine pitch			
M	Pitch mm.	Maximun core dia. mm.	Drill size mm.	MF	Pitch mm.	Maximun core dia. mm.	Drill size mm.	MF	Pitch mm.	Maximun core dia. mm.	Drill size mm.
1	0.25	0.785	0.75	2.5	0.35	2.221	2.15	25	2.0	23.21	23.0
1.1	0.25	0.885	0.85	3	0.35	2.271	2.65	26	1.5	24.676	24.5
1.2	0.25	0.985	0.95	3.5	0.35	3.221	3.15	27	1.0	26.153	26.0
1.4	0.3	1.16	1.1	4	0.5	3.599	3.5	27	1.5	25.676	25.5
1.6	0.35	1.321	1.25	4.5	0.5	4.099	4.0	27	2.0	25.21	25.0
1.7	0.35	1.346	1.3	5	0.5	4.599	4.5	28	1.0	27.153	27.0
1.8	0.35	1.521	1.45	5.5	0.5	5.099	5.0	28	1.5	26.676	26.5
2	0.4	1.679	1.6	6	0.75	5.378	5.2	28	2.0	26.21	26.0
2.2	0.45	1.838	1.75	7	0.75	6.378	6.2	30	1.0	29.153	29.0
2.3	0.4	1.92	1.9	8	0.75	7.378	7.2	30	1.5	28.676	28.5
2.5	0.45	2.138	2.05	8	1.0	7.153	7.0	30	2.0	28.21	28.0
2.6	0.45	2.176	2.1	9	0.75	8.378	8.2	30	3.0	27.252	27.0
3	0.5	2.599	2.5	9	1.0	8.153	8.0	32	1.5	30.675	30.5
3.5	0.6	3.01	2.9	10	0.75	9.378	9.2	32	2.0	30.21	30.0
4	0.7	3.422	3.3	10	1.0	9.153	9.0	33	1.5	31.676	31.5
4.5	0.75	3.878	3.7	10	1.25	8.912	8.8	33	2.0	31.21	31.0
5	0.8	4.334	4.2	11	0.75	10.378	10.2	33	3.0	30.252	30.0
6	1.0	5.153	5.0	11	1.0	10.153	10.0	35	1.5	33.676	33.5
7	1.0	6.153	6.0	12	1.0	11.153	11.0	36	1.5	34.676	34.5
8	1.25	6.912	6.8	12	1.25	10.912	10.8	36	2.0	34.21	34.0
9	1.25	7.912	7.8	12	1.5	10.676	10.5	36	3.0	33.252	33.0
10	1.5	8.676	8.5	14	1.0	13.153	13.0	38	1.5	36.676	36.5
11	1.5	9.676	9.5	14	1.25	12.912	12.8	39	1.5	37.676	37.5
12	1.75	10.441	10.2	14	1.5	12.676	12.5	39	2.0	37.21	37.0
14	2.0	12.21	12.0	15	1.0	14.153	14.0	39	3.0	36.252	36.0
16	2.0	14.21	14.0	15	1.5	13.676	13.5	40	1.5	38.676	38.5
18	2.5	15.744	15.5	16	1.0	15.153	15.0	40	2.0	38.21	38.0
20	2.5	17.744	17.5	16	1.5	14.676	14.5	40	3.0	37.252	37.0
22	2.5	19.744	19.5	17	1.0	16.153	16.0	42	1.5	40.676	40.5
24	3.0	21.252	21.0	17	1.5	15.676	15.5	42	2.0	40.21	40.0
27	3.0	24.252	24.0	18	1.0	17.153	17.0	42	3.0	39.252	39.0
30	3.5	26.771	26.5	18	1.5	16.676	16.5	45	1.5	43.676	43.5
33	3.5	29.771	29.5	18	2.0	16.21	16.0	45	2.0	43.21	43.0
36	4.0	32.27	32.0	20	1.0	19.153	19.0	45	3.0	42.252	42.0
39	4.0	35.27	35.0	20	1.5	18.676	18.5	48	1.5	46.676	46.5
42	4.5	37.799	37.5	20	2.0	18.21	18.0	48	2.0	46.21	46.0
45	4.5	40.799	40.5	22	1.0	21.153	21.0	48	3.0	45.252	45.0
48	5.0	43.297	43.0	22	1.5	20.676	20.5	50	1.5	48.676	48.5
52	5.0	47.297	47.0	22	2.0	20.21	20.0	50	2.0	48.21	48.0
56	5.5	50.796	50.5	24	1.0	23.153	23.0	50	3.0	47.252	47.0
60	5.5	54.796	54.5	24	1.5	22.676	22.5	52	1.5	50.676	50.5
64	6.0	58.305	58.0	24	2.0	22.21	22.0	52	2.0	50.21	50.0
68	6.0	62.305	62.0	25	1.0	24.153	24.0	52	3.0	49.252	49.0
				25	1.5	23.676	23.5				

GENERAL INFORMATION THREADING



Tapping drill sizes for UNC and UNF threads.

Unified Coarse threads			
UNC	TPI	Maximun core dia. mm.	Drill size mm.
No.1	64	1.585	1.5
No.2	56	1.872	1.8
No.3	48	2.146	2.1
No.4	40	2.385	2.3
No.5	40	2.697	2.6
No.6	32	2.896	2.85
No.8	32	3.528	3.6
No.10	24	3.95	3.9
No.12	24	4.59	4.5
1/4	20	5.25	5.2
5/16	18	6.68	6.6
3/8	16	8.082	8.0
7/16	14	9.441	9.4
1/2	13	10.881	10.75
9/16	12	12.301	12.25
5/8	11	13.693	13.5
3/4	10	16.624	16.5
7/8	9	19.520	19.5
1	8	22.344	22.25
1.1/8	7	25.082	25.0
1.1/4	7	28.258	28.25
1.3/8	6	30.851	30.75
1.1/2	6	34.026	34.0
1.3/4	5	39.560	39.5
2	4.5	45.367	45.25

Unified Fine threads			
UNF	TPI	Maximun core dia. mm.	Drill size mm.
No.0	80	1.306	1.3
No.1	72	1.613	1.6
No.2	64	1.913	1.9
No.3	56	2.197	2.1
No.4	48	2.459	2.4
No.5	44	2.741	2.7
No.6	40	3.012	3.0
No.8	36	3.597	3.5
No.10	32	4.168	4.1
No.12	28	4.717	4.7
1/4	28	5.563	5.5
5/16	24	6.995	6.9
3/8	24	8.565	8.5
7/16	20	9.947	9.9
1/2	20	11.524	11.5
9/16	18	12.969	12.9
5/8	18	14.554	14.5
3/4	16	17.546	17.5
7/8	14	20.493	20.5
1	12	23.363	23.25
1.1/8	12	26.538	26.5
1.1/4	12	29.713	29.5
1.3/8	12	32.888	32.7
1.1/2	12	36.063	36.0

MATERIAL CHARTS



Please note: These charts are not cross-reference charts.
Materials are grouped according to machinability and are not necessarily identical in chemical composition.

ISO GROUP	STANDARDS					VDI GROUP	
	GERMANY		FRANCE	GREAT BRITAIN	EN & OTHER		U.S.A.
	W.Nr	DIN	AFNOR	B.S.	CLASSES		AISI
10 STEEL P	11. Magnetic soft steels - Hardness < 120 HB 30 - Tensile strength < 400 N/mm²					1, 2	
	1.1013	RFe 100		OSOA12	EN2		
	1.1014	RFe 80					
	1.1015	RFe 60		230Mo7	EN1		
	1.0718	9 S MnPb 28					
	12. Structural steels - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²					3, 4	
	12.1 - Structural steels						
	1.0034	RSt 34-2	A34-2 EN	1449 34/20 HR			
	1.0035	St 33	A33	Fe 310-0			
	1.0036	St 37-2		060A35	EN3A,4,5,6,7,8		
	1.0037	RSt 37-2			EN3B		
	1.0044	St 44-2					
	1.0050	St 50-2		4360-50B	EN 207		
	1.0060	St 60-2					
	1.0070	St 70-2					
	1.0116	St 37-3					
	1.0144	St 44-3					
	12.2 - Case carburizing steels						
	1.0301	C 10	AF 34 C 10	040 A 10			M 1010
	1.0401	C 15	AF 37 C 12	080 A 15			M 1015
	1.1121	Ck 10	XC 10	040 A 10			1010
	1.1141	Ck 15	XC 12	040 A 15			1015
	1.5732	14 Ni Cr 10	14 NC 11				3415
	1.7015	15 Cr 3	12 C 3	523 M 15			5015
	1.7131	16 Mn Cr 5	16 MC 4	527 M 17	EN 32		5115
	1.7147	20 Mn Cr 5	20 MC 5				5120
	12.3 - Free machining steels						
	1.0710	15 S 10					
	1.0715	9 S Mn 28	S 250	230 M 07			1213
	1.0718	9 S Mn Pb 28	S 250 Pb				12 L 13
	1.0721	10 S 20	10 F1	210 M 15			1108 1109
	1.0722	10 S Pb 20	10 Pb F 2				11 L 08
	1.0723	15 S 20		210 A 15			
	1.0726	35 S 20	35 MF 6	212 M 36			1140
	1.0727	45 S 20	45 MF 4				1146
	1.0736	9 S Mn 36	S 300				1215
	1.0737	9 S Mn Pb 36	S 300 P				12 L 14
	12.4 - Cast structural steels						
	1.0416	GS - 38					
	1.0446	GS - 45					
	1.0552	GS - 52					
	1.0553	GS - 60	E 36 - 3				
	1.0554	GS - 70					
	13. Plain carbon steels - tempered						5
	13.1 - Steels, tempered - Hardness < 250 HB 30 - Tensile strength < 850 N/mm ²						
	1.0402	C 22	1 C 22	070 M 20		M 1023	
	1.0501	C 35	1 C 35	080 A 32		1035	
	1.0503	C 45	1 C 45	060 A 47		1045	
	1.0535	C 55	1 C 55	070 M 55		1055	
	1.0601	C 60	1 C 60	060 A 62	EN 43	1060	
	1.1157	40 Mn 4	35 M 5	150 M 36		1035 1041	
	1.1151	Ck 22	2 C 22	055 M 15		1020 1023	
	1.1181	Ck 35	2 C 35	080 A 35		1035 1038	
	1.1191	Ck 45	2 C 45	080 M 46	EN 9, 10	1045	
	1.1203	Ck 55	2 C 55	060 A 57		1055	
	1.1221	Ck 60	2 C 60	060 A 62		1060 1064	

MATERIAL CHARTS



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ISO GROUP	STANDARDS					VDI GROUP		
	GERMANY		FRANCE	GREAT BRITAIN	EN & OTHER		U.S.A.	
	W.Nr	DIN	AFNOR	B.S.	CLASSES		AISI	
10 STEEL P	14. Alloy steels - Hardness < 250 HB 30, < 25 HRC - Tensile strength < 850 N/mm²					6 - 9		
	14.1 - Cold work tool steels							
	1.2056	90 Cr 3						
	1.2067	100 Cr 6	Y 100 C 6	BL 3			L 1 L 3	
1.2080	X 210 Cr 12	Z 200 C 12	BD 3		D3			
1.2083	X 42 Cr 13	Z 40 C 14			420			
1.2363	X 100 CrMoV5 1	Z 100 CDV 5	BA 2		A 2			
1.2379	X 155 CrVMo 12 1	Z 160 CDV 12	BD 2		D 2			
1.2510	100 MnCrW 4	90 MWCV 5	BO 1		O1			
1.2550	60 WCrV 7	55WC 20	BS 1		S1			
1.2823	70 Si 7							
1.2826	60 Mn Si Cr 4							
1.2842	90 MnCrV 8	90 MV 8	BO 2		O 2			
	14.2 - High speed steels							
1.3202	S 12-4-4-5	Z130WKCV 12-05-04-04	BT 15		T 15			
1.3207	S 10-4-3-10	Z130WKCDV10-10-04-04-03	BT 42		T 42			
1.3243	S 6-5-2-5	Z85WDCV 06-05-05-04-02	BM 35		M 35			
1.3247	S 2-10-1-8	Z110DKCW 09-08-04-02-01	BM 42		M 42			
1.3343	S 6-5-2	Z85WDCV 06-05-04-02	BM 2		M 2			
1.3344	S 6-5-3	Z120WDCV 06-05-04-03			M 3 / 2			
1.3348	S 2-9-2	Z100DCWV 09-04-02-02			M 7			
ASP 23	(S 6-5-3)							
ASP 30								
ASP 60								
	14.3 - Tempered steels							
1.0503	C 45	1 C 45	060 A 47		1045			
1.7220	34 Cr Mo 4	34 Cr Mo 4	708 A 37		4135, 4137			
1.7225	42 Cr Mo 4	42 CD 4	708 A 42	EN16, 17, 19	4140, 4142			
1.7228	50 Cr Mo 4	50 Cr Mo 4	708 A 47		4150			
	14.4 - Nitriding steels							
1.7779	20 Cr Mo V 13.5							
1.8504	34 Cr Al 6							
1.8506	34 Cr Al S 5							
1.8507	34 Cr Al Mo 5	30 CAD 6.12			A 355 Cl.D			
1.8509	41 Cr Al Mo 7	40 CAD 6.12	905 M 39		A 355 Cl.A			
1.8515	31 Cr Mo 12	30 CD 12	722 M 24					
10 HARDENED STEEL H	15. Alloy steels / Tempered steels - Hardness 250-350 HB 30, 25-38 HRC						10, 11	
	Tensile strength 850-1,200 N/mm²							
	15.1 - Alloy steels for tools							
	1.2311	40 Cr Mn Mo 7						
	1.2312	40 Cr Mn Mo S 86						
	1.2436	X 210 Cr W 12	Z 200 CW 12					
	1.2711	54 Ni Cr Mo V 6						
	1.2713	55 Ni Cr Mo V 6	55 NCDV 7	826 M 40	S95, 97, 98			L 6
	1.2714	56 Ni Cr Mo V 7						
	1.2743	60 Ni Cr Mo V 12 4						
	1.2766	35 Ni Cr Mo 16						
	15.2 - Alloy steels for hot work							
	1.2343	X 38 Cr Mo V 5 1	Z 38 CDV 5	BH 11		H 11		
	1.2344	X 40 Cr Mo V 5 1	Z 40 CDV 5	BH 13		H 13		
1.2365	X 32 Cr Mo V 3 3	32 DCV 28	BH 10		H 10			
1.2367	X 40 Cr Mo V 5 3	Z 38 CDV 5.3						
1.2581	X 30 W Cr V 9 3	Z 30 WCV 9.3	BH 21		H 21			
1.2622	X 60 W Cr Mo V 9							
1.2678	X 45 CoCrWV 5 5 5							
1.2550	60 WCr V 7	55 WC 20	BS 1		S 1			
1.2567	X 30 W Cr V 5 3	Z 32 WCV 5						

MATERIAL CHARTS



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ISO GROUP	STANDARDS					VDI GROUP		
	GERMANY		FRANCE	GREAT BRITAIN	EN & OTHER		U.S.A.	
	W.Nr	DIN	AFNOR	B.S.	CLASSES		AISI	
H HARDENED STEEL	15.3 -Hardened tempered steels - Hardness may differ according to presentation and dimensions of material					10, 11		
	1.5864	35 Ni Cr 18						
	1.6580	30 Cr Ni Mo 8	30 Cr Ni Mo 8		S99			
	1.7361	32 Cr Mo 12	30 CD 12	722 M 24				
	1.7707	30 Cr Mo V 9						
	1.8161	58 Cr V 4						
	15.4 - Nitriding steels							
	1.8515	31 Cr Mo 12	30 CD 12	722 M 24				
	1.8519	31 Cr Mo V 9		830 M 31				
	1.8523	39 Cr Mo V 13 9		897 M 39				
	1.8550	34 Cr Al Ni 7		826 M 40	EN24T			
	16. Alloy steels / Hardened tempered steels - Hardness > 38 HRC - Tensile strength > 1,200 N/mm² To this group belong most of the materials of group 15, but present a higher tensile strength						38, 39	
	1.2713	100 Mn Cr W 12			Hardox 400			M42
	1.3247	X 210 Cr 12			Hardox 500			
1.2080				Hardox 600	8130			
1.3343				P20				
M STAINLESS STEEL	21. Free machining stainless steels - Hardness < 250 HB 30 - Tensile strength < 850 N/mm²					12		
	1.4104	X 12 Cr Mo S 17	Z 13 CF 17	416 S 37	EN 56		430 F	
	1.4305	X 10 Cr Ni S 18 09	Z 8 CNF 18-09	303 S 21	EN 60		303	
	22. Austenitic stainless steels - Hardness < 250 HB 30 - Tensile strength < 850 N/mm²					13		
	1.4300	X 12 Cr Ni 18 8		320 S 12	S130			
	1.4301	X 5 Cr Ni 18 10	Z 6 CN 18-09	304 S 15	EN80, EN 58 + C		304	
	1.4311	X 2 CrNi 18 10	Z 3 CN 18-07 Az	304 S 61			304 LN	
	1.4406	X 2 CrNiMoN 17 12 2	Z 3 CND 17 11 02	316 S 61			316 LN	
	1.4433	X 2 CrNiMo 18 15		316 S				
	1.4435	X 2 CrNiMo 18 14 3	Z3 CND 17-12-03	316 S 11			316 L	
	1.4539	X 1 CrNiMoCu 25 20 5	Z 1 NCDU 25-20	321 S 17			UNS N08904	
	1.4541	X 6 CrNiTi 18 10	Z 6 CNT 18 10	321 S 18	EN 58 J, 316		321	
	1.4571	X 6 CrNiMoTi 17 12 2	Z 6 CNDT 17 12	320 S 18			316 Ti	
	1.4573	X 10 CrNiMoTi 18 12		320 S 33				
	1.4828	X 15 CrNiSi 20 12	Z 15 CNS 20-12	309 S 24			309	
	22.1 - Cast austenitic stainless steels							
	1.4308	G-X 6 CrNi 18 9	Z 6 CN 18.10 M	304 C 15(LT196)			CF-8	
	1.4313	G-X 5 CrNi 13 4	Z 8 CD 17-01	425 C 12			CA 6 -NM	
	1.4408	G-X 6 CrNiMo 18 10		316 C 16(LT196)			CF-8M	
	1.4581	G-X 5 CrNiMoNb 18 10	Z 4 CNDNb 18.12M	318 C 17				
	23. Martensitic stainless steels - Hardness < 320 HB 30 - Tensile strength < 1,100 N/mm²						14	
	1.4021	X 20 Cr 13	Z 20 C 13	420 S 37				420
	1.4034	X 46 Cr 13	Z 44 C 14	(420 S 45)				
	1.4057	X 20 CrNi 17 2	Z 15 CN 16-02	431 S 29		431		
	1.4112	X 90 CrMoV 18						
	1.4116	X 45 CrMoV 15			EN 58, b.e.j.t			
	1.4125	X 105 CrMo 17	Z 100 CD 17		Duplex alloys	440 C		
	1.4718	X 45 CrSi 9 3	Z 45 CS 9	401 S 45		HNV 3		
	1.4747	X 80 CrNiSi 20	Z 80 CSN 20-02	443 S 65		HNV 6		
	1.4086	G-X 120 Cr 29						
	1.4106	G-X 10 CrMo 13						
	1.4138	G-X 120 CrMo 29 2						
	23.1 Ferritic stainless steels - Hardness < 320 HB 30 - Tensile strength < 1,100 N/mm ²							
	1.4002	X 6 Cr Al 13	Z 8 CA 12	405 S 17		405		
	1.4006	X 10 Cr 13	Z 10 C 13	410 C 21	Super Duplex	410		
	1.4016	X 6 Cr 17	Z 8 C 17	430 S 17		430		
	1.4510	X 6 Cr Ti 17	Z 8 CT 17			430 Ti		
	1.4512	X 6 Cr Ti 12	Z 6 CT 12	409 S 19		409		
	23.2 Ferritic-Austenitic stainless steels - Hardness < 320 HB 30 - Tensile strength < 1,100 N/mm ²							
	1.4460	X 8 CrNiMo 27 5	Z 5 CND 27-05 Az			329		
	1.4582	X 4 CrNiMoNb 25 7			15-5PH			
	1.4821	X 20 CrNiSi 25 4			17-4PH			

MATERIAL CHARTS



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ISO GROUP	STANDARDS					VDI GROUP	
	GERMANY		FRANCE	GREAT BRITAIN	EN & OTHER		U.S.A.
	W.Nr	DIN	AFNOR	B.S.	CLASSES		AISI
K CAST IRON	31. Grey graphite cast irons - Hardness < 150 HB 30 - Tensile strength < 500 N/mm²					15	
	0.6010	GG-10	Ft 10 D				A 48-20 B
	0.6015	GG-15	Ft 20 D	Grade 150	Grey cast iron soft		A 48-25 B
	0.6020	GG-20	Ft 25 D	Grade 220			A 48-30 B
	0.6025	GG-25	Ft 30 D	Grade 260			A 48-40 B
	0.6030	GG-30	Ft 30 D	Grade 300			A 48-45 B
	0.6035	GG-35	Ft 35 D	Grade 350			A 48-50 B
	0.6040	GG-40	Ft 40 D	Grade 400			A 48-60 B
	31.1 - Meehanite - Hardness < 150 HB 30 - Tensile strength < 500 N/mm ²						
		GF - 150					
		GD - 260					
	32. Grey graphite cast irons - Hardness 150 - 300 HB 30 - Tensile strength 500 - 1,000 N/mm²					16	
	0.6020	GG - 20	Ft 25 D	Grade 220	Grey cast iron hard		A 48-30 B
	0.6025	GG - 25	Ft 30 D	Grade 260			A 48-40 B
	0.6030	GG - 30	Ft 30 D	Grade 300			A 48-45 B
	0.6035	GG - 35	Ft 35 D	Grade 350			A 48-50 B
	0.6040	GG - 40	Ft 40 D	Grade 400			A 48-60 B
	32.1 - Meehanite - Hardness 150-300 HB 30 - Tensile strength 500-1,000 N/mm ²						
		GF - 150					
		GD - 260					
33. Nodular graphite, malleable cast irons - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²					17, 18		
0.7033	GGG-35.3						
0.7040	GGG-40	FGS 400-12	420 / 12			60-40-18	
0.7043	GGG-40.3	FGS 370-17	370 / 17				
0.7050	GGG-50	FGS 500-7	500 / 7				
0.7060	GGG-60	FGS 600-3	600 / 3	S.G.iron, Meehanite		65-45-12	
0.8035	GTW-35		700/2,30g/72	Black & White Heart		80-55-06	
0.8040	GTW-40						
0.8045	GTW-45						
0.8065	GTW-65						
33.1 - Meehanite - Hardness < 200 HB 30 -Tensile strength < 700 N/mm ²							
	SF 400						
	SPF 600						
34. Nodular graphite, tempered malleable cast irons - Hardness 200-300 HB 30 - Tensile strength 700-1,000 N/mm² Also materials from Group 33 tempered					19, 20		
0.7070	GGG-70	FGS 700-2	700 / 2	S.G.iron,Meehanite		100-70-03	
0.7080	GGG-80	FGS 800-2	800 / 2	Black & White Heart		120-90-02	
34.1 - Meehanite - Hardness 200-300 HB 30 - Tensile strength 700-1,000 N/mm ²							
	SH 800		420/12, P 440/7				
	SH 1000						
41. Titanium, unalloyed - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²						36	
3.7024.1LN	Ti 99.5						
3.7034.1LN	Ti 99.7						
3.7035	Ti 2						
3.7055	Ti 99.4		TA 1-9	Ti 99,0			
3.7064.1LN	Ti 99.2						
3.7065	Ti 4						
3.7255	Ti 3 Pd						
42. Titanium alloys - Hardness < 270 HB 30 - Tensile strength < 900 N/mm²					37		
	Ti4Al4 Mn						
3.7144 LN	Ti5Al2Sn						
3.7124 LN	Ti2Cu		TA 10-14, TA 17	Ti - 2AL			
3.7164 LN	Ti6Al4V		TA 18				
3.7174 LN	Ti6Al6V2Sn						
	Ti6Al2Sn4Zr2Mo						
	Ti4Al4Mo2Sn0.5Si						

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	GERMANY		FRANCE	GREAT BRITAIN	EN & OTHER		U.S.A.
	W.Nr	DIN	AFNOR	B.S.	CLASSES		AISI
40 TITANIUM S	43. Titanium alloys - Hardness 270-300 HB 30 - Tensile strength 900-1,300 N/mm²					37	
		Ti10Al2Fe3Al					
		Ti5Al5V5Mo3Cr			Ti AL		
		Ti7Al4Mo		TA 10-13, TA 28			
		Ti3Al8V6Cr4Zr4Mo					
		Ti6Al6V6Sn					
	Ti15V3Cr3Sn3Al						
50 NICKEL ALLOYS S	51. Nickel, unalloyed - Hardness < 150 HB 30 - Tensile strength < 500 N/mm²					31, 32	
	2.1504 LN	Ni Al Bz					
	2.4042	Ni 99 CSi		NA 11, NA 12	Nickel 200		
	2.4060	Ni 99.6			Nickel 270		
	2.4062	Ni 99.4 Fe					
	52. Heat resisting nickel alloys - Hardness < 270 HB 30 - Tensile strength < 900 N/mm²					33	
	2.4360 LN	Monel 400					
	2.4374 LN	Monel 500					
	2.4617	Hastelloy B 2			Nimonic 75		
	2.4665	Hastelloy X		HR 203			
	2.4812			3027-76			
2.4816	Inconel 600, 617, 625			Haynes Alloys			
1.4876	Incoloy 800, 825						
2.4983	Udimet 500						
53. Heat resisting nickel alloys - Hardness 270-410 HB 30 - Tensile strength 900-1,400 N/mm²					34, 35		
2.4631	Nimonic 80 A			Nimonic 80			
2.4632	Nimonic 90						
2.4634	Nimonic 105			Hastelloy B, C			
2.4662	Nimonic 901		HR 8				
2.4668	Inconel 718		HR 401, 601	Rene 41			
2.4669	Inconel 750-X						
2.4670 LN	Nimocast 713			Incoloy 925			
2.4674 LN	Nimocast PK 24						
2.4856	Inconel 625			Monel K-500			
2.6554 LN	Waspaloy						
60 COPPER N	61. Copper, unalloyed - Hardness < 100 HB 30 - Tensile strength < 350 N/mm²					26	
	2.0060	E - Cu 57					
	2.0070	SE - Cu			Pure		
	2.0090	SF - Cu		C 101			
	2.1356	Cu Mn 3					
	2.1522	Cu Si 2 Mn					
	62. Short chip copper alloys - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²					26	
	62.1 - Brass						
	2.0360	Cu Zn 40(MS 60)					
	2.0380	Cu Zn 39 Pb 2 (MS 58)		CZ120, CZ109			
	2.0410	Cu Zn 44 Pb 2		PB104			
	2.0561	Cu Zn 40 Al 1			2.1030, 2.1080		
	2.0580	Cu Zn 40 Mn 1 Pb					
	2.0771	Cu Ni 7 Zn 39 Mn 5 Pb3					
	62.2 - Bronzes						
	2.1086	G-Cu Sn 10 Zn					
	2.1093	G-Cu Sn 6 Zn Ni					
	2.1096	G-Cu Sn 5 Zn Pb					
	63. Long chip copper alloys - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²					27	
	63.1 - Brass						
	2.0250	Cu Zn 20					
	2.0265	Cu Zn 30					
	2.0321	Cu Zn 37		CZ108, CZ106			
	2.0335	Cu Zn 36 (Ms 63)					
	63.2 - Bronzes						
	2.1020	Cu Sn 6					
	2.1030	Cu Sn 8					
2.1080	Cu Sn 6 Zn 6						

MATERIAL CHARTS



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	GERMANY		FRANCE	GREAT BRITAIN	EN & OTHER		U.S.A.
	W.Nr	DIN	AFNOR	B.S.	CLASSES		AISI
60 COPPER N	63.3 - Copper alloys tempered by forging					28	
	2.1245	Cu Be 1.7					
	2.1247	Cu Be 2					
	2.1293	Cu Cr Zr					
	64. Cu - Al - Fe alloys Hardness < 440 HB 30 - Tensile strength < 1,500 N/mm²						
	64.1 - Ampco						
		Ampco 18			Ampco 18		
		Ampco 20		AB 1 type			
		Ampco 25			Ampco 26		
	70 ALUMINIUM N	71. Aluminium - Magnesium, unalloyed - Hardness < 100 HB 30 - Tensile strength < 350 N/mm²					21
3.0250		Al 99.5 H		LM0, 1B			
3.0280		Al 99.8 H					
3.0305		Al 99.9					
3.3308		Al 99.9 Mg 0.5					
72. Aluminium alloys, Si < 0.5% - Hardness < 180 HB 30 - Tensile strength < 600 N/mm²					22		
72.1 - Forging aluminium alloys							
3.0515		Al Mn 1		LM5, 10, 12			
3.0516		S-Al Mn					
3.0525		Al Mn 1 Mg 0.5				6061	
3.0615		Al Mg Si Pb					
3.1325		Al Cu Mg 1				7075	
3.1355		Al Cu Mg 2					
3.3315		Al Mg 1					
3.3535		Al Mg 3					
3.4365		Al Zn Mg Cu 1.5					
72.2 - Cast aluminium alloys							
3.1841		G - Al Cu 4 Ti					
3.3241		G - Al Mg 3 Si					
3.3292	GD - Al Mg 9						
73. Aluminium alloys, 0.5-10% Si - Hardness < 180 HB 30 - Tensile strength < 600 N/mm²					23, 24		
73.1 - Cast aluminium alloys							
3.2134	G - AL SI 5 CU 1 MG		LM2, 4	6063			
3.2152	GD - Al Si 6 Cu 4		LM16, 18, 21	6082			
3.2162	GD - AL SI 8 CU 3		LM22, 24, 25				
3.2373	G - AL SI 9 MG		LM26, 27				
74. Aluminium alloys, Si > 10% - Hardnes < 180 HB 30 - Tensile strength < 600 N/mm²					25		
74.1 - Cast aluminium alloys							
3.2381	G - AL SI 10 MG		LM6,12,13				
3.2383	G - AL SI 10 MG (CU)		LM20,28				
3.2581	G - AL SI 12		LM29, 30				
3.2583	G - AL SI 12 (CU)						
3.2982	GD - AL SI 12 (CU)						
74.2 - Cast aluminium - magnesium alloys							
3.5106	G - MG AG 3 SE 2 ZR 1						
3.5662	G - MG AL 6						
3.5812	G - MG AL 8 ZN 1						
3.5912	G - MG AL 9 ZN 1						
80 SYNTHETIC MATERIAL O	81. Thermoplastics					29	
				Nylon	Nylon		
				PVC Cellulose	PVC		
				Acetate	Acetal		
	82. Thermosetting Plastics					29	
				Tufnol			
				Bakelite	Bakelite		
	83. Reinforced Plastics					29	
				CFRP, GFRP			
				Printed Circuit Board			
				Kevlar	Kevlar		
	84. Graphite					30	
			Synthetic graphite				

ALPHA-NUMERIC INDEX



Code	Page
Drill Sets	217
01M, 01PM	146-147
02M, 02PM	148-149
03M, 03PM	146-147
04M, 04PM	148-149
10PM	140-141
11M, 11PM	142-143
13PM	140-141
14M	150
16M	142-143
24L	114
24M	113
24N	115
27M	151
776A	155
776L	153
776M	152, 154
777L	153
777M	152, 154
0000	207
0001	204-206
0162	214-215
100102	80-81
100121	80-81
101102	82
101121	82
102102	83
102121	83
103102	84
103121	84
104102	85
104121	85
105102	86
105121	86
107102	87
107121	87
108102	88
108121	88
112102	89
112121	89
114102	90
114121	90
115102	91
115121	91
116102	92
116121	92
118102	99
118121	99
118202	152
119102	100
119121	100
119202	153

Code	Page
120323	36
121102	106
121113	108
121121	106
121122	108
121202	154
121323	37
122102	107
122121	107
124102	103
124121	103
124202	155
125102	104
125121	104
126102	109
126121	109
127102	105
127121	105
128102	94
128121	94
128128	66
129102	95
129121	95
129128	67
131102	98
131121	98
132102	93
132121	93
133102	101
133121	101
134102	102
134121	102
134123	12
134323	12
135123	13
135316	96
135323	13
135327	96
136123	7
136316	97
136323	7
136327	97
137102	110
137121	110
137123	8
137323	8
138102	111
138121	111
138123	9
138323	9
139102	112
139121	112

Code	Page
139123	10
139323	10
140323	36
142323	37
146123	11
146323	11
151201	256-257
152116	175
153116	172
154116	172
155116	173
156116	173
158116	174
159102	176
162303	39
162323	39
197303	38
301201	140-141
301202	140-141
301303	24
301323	24
302201	142-143
302202	142-143
302303	25
302323	25
304202	144
304303	26
304323	26
305202	145
305303	27
305323	27
307201	146-147
307202	146-147
307303	32
307323	32
308201	148-149
308202	148-149
308303	33
308323	33
310303	28
310323	28
311303	29
311323	29
313201	150
313202	150
313303	30
313323	30
314201	151
314202	151
314303	31
314323	31
315303	34

Code	Page
315323	34
316303	35
316323	35
328102	113
329102	114
334102	115
450301	246-247
451301	248-249
452302	234-235
452303	232
453302	236-237
453303	233
454302	238-239
455302	240-241
456302	242-243
457301	244-245
702301	259
702302	258
702402	260
810334	220
810504	188-189
810505	184-185
811505	186-187
820116	200
820502	192-195
820504	190
820601	202-203
820702	196-197
820801	208-211
820901	212-213
820902	198-199
821001	216
821402	191
821601	218-219
821901	201
822402	191
888301	221
F011, G011	274
F013	270
F015	272
F021, G021	275
F023, F033	271
F025, F035	273
J011-J015	280-281
J611, J612	282-283
J891-J895	286-287
PM15011	268
PM15012	269
PM75E	68
PM75S	69