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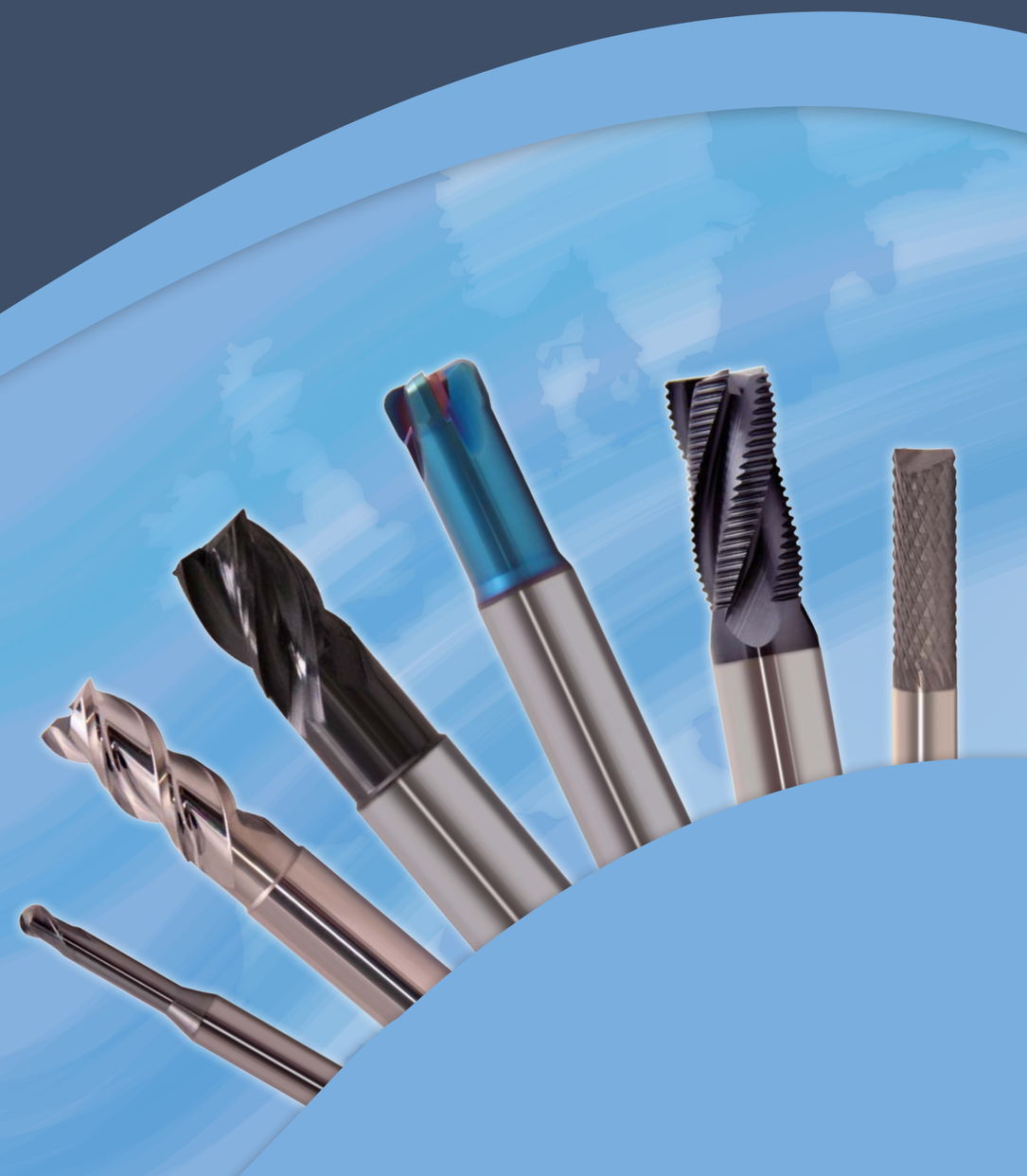
MILLING 2016

Europa Tool Co Ltd

MILLING 2016



Material Group Examples

Steel **P**	**11** Magnetic soft steels	**12** Structural steels	**13** Plain carbon steels	**14** Alloy steels
	EN1 EN2 OSOA12 230Mo7	EN3A, 4, 5, 6, 7, 8 060A35 040A10 EN32 210M15	EN9, 10 EN43 070M20 060A62 080M46	EN16, 17, 19 BO1 BO2 D2 D3
Hardened Steel **H**	**15** Alloy/Tempered steels	**16** Hardened steels		
	S95 S98, S99 BH11 BH13 830M31	>38 HRc Hardox400 Hardox500 P20		
Stainless Steel **M**	**21** Free machining	**22** Austenitic	**23** Martensitic/Ferritic	
	EN56, 58 303S21 304S15 316S 321S17	EN58J 420S37 431S29	Duplex Super Duplex 17-4 PH S130	
Cast Iron **K**	**31** Grey cast iron soft	**32** Grey cast iron hard	**33** Nodular graphite	**34** Nodular graphite
	GG10 GG20 GG30 GG40	GG25 GG35 GF150	GGG40 GGG50 SG Iron	GGG70 GGG80 Meehanite
Titanium **S**	**41** Titanium unalloyed	**42** Titanium alloys	**43** Titanium alloys	
	Pure Titanium TA1 - 9 Ti99.0	Ti6Al4V Ti6Al2Sn4Zr2Mo Ti4Al4Mo2Sn0.5Si	Ti10Al2Fe3Al Ti5Al5V5Mo3Cr Ti7Al4Mo Ti3Al8V6Cr4Zr4Mo Ti6Al6V6Sn Ti15V3 Cr3Sn3Al	
Nickel **S**	**51** Nickel unalloyed	**52** Heat resisting alloys	**53** Heat resisting alloys	
	NA11 NA12 Nickel 200	Nimonic 75 Hastelloy C Inconel 601, 617, 625 Incoloy 800, 825 Monel 400	Nimonic 80 Rene 41 Inconel 718, 750-X Incoloy 925 Monel K-500	
Copper **N**	**61** Copper unalloyed	**62** Short chip alloys	**63** Long chip alloys	**64** Cu - Al - Fe alloys
	Commercially pure C101	CZ120 PB104 G-CuSn5ZnPb	CZ106 CZ108 CuZn37	Ampco18 Ampco20 Ampco26
Aluminium **N**	**71** Aluminium unalloyed	**72** Aluminium, Si <0.5%	**73** Aluminium, Si 0.5-10%	**74** Aluminium, Si >10%
	Al99.5H Al99.9 Al99.9Mg0.5	AlMn1 AlMn1Mg0.5 LM5, 10, 12 6061	HE9, 30 LM2, 4, 16, 18, 21-27 6082 6063	G-AlSi10Mg G-AlSi12 G-MgAl6 LM6,12, 13, 20, 28-30
Synthetics **O**	81 Thermoplastics	82 Thermosetting plastics	83 Reinforced plastics	
	Nylon Acetal	Tufnol	CFRP, GFRP Circuit Board Kevlar	

▸ For full material group tables, refer to pages 444-449

EUROPA TOOL · Clarkson · sborn

●: Excellent ○: Good

SUPERIOR PERFORMANCE

HIGH FEED
SHORT AND LONG

Heavy core with reduced diameter allows greater depths and maximum rigidity.

Nano grain carbide substrate and high heat resistant coating for increased tool life in dry machining applications.

Extra short flute length for high rigidity.

Reduced clearance angles and short flutes to strengthen corner radius and reduce chattering.

IDEAL FOR MATERIAL GROUPS

P H

PULSAR BLUE
END MILLS

Designed specifically for use in dry cutting conditions

www.europatool.co.uk

APPLICATION GUIDE

●: Excellent **O**: 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
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		o	o	●	●																								
		o	o	●	●														o	o	o	o							
		o	o	●	●																								
		o	o	●	●																								
		o	o	●	●																								
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		o	o	●	●														o	o	o	o							
		o	o	●	●																								
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		o	o	●	●																								
		o	o	●	●																								
		o	o	●	●																								

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

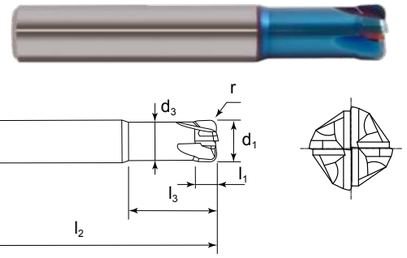
4 FLUTE HIGH FEED CORNER RADIUS SHORT LENGTH

NG | BLUE | FLUTE 4 | R ±0.005

Series No. 110350

▶ cutting conditions : p.38-39

Excellent wear resistance at heavy feed rates on high hardened material.
Designed with reduced clearance angles and short flutes for strength.
High hardness & heat resistant coating for long life in dry applications.



EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1103500200	**2.0**	0.5	6	1.0	6.0	50	1.8
1103500300	**3.0**	0.5	6	1.2	8.0	50	2.8
1103500400	**4.0**	0.5	6	1.5	10.0	50	3.8
1103500600	**6.0**	0.5	6	2.5	12.0	60	5.4
1103500601	**6.0**	1.0	6	2.5	12.0	60	5.4
1103500800	**8.0**	1.0	8	3.5	16.0	60	7.2
1103500802	**8.0**	2.0	8	3.5	16.0	60	7.2
1103501000	**10.0**	1.0	10	4.0	20.0	70	9.0
1103501002	**10.0**	2.0	10	4.0	20.0	70	9.0
1103501200	**12.0**	2.0	12	5.0	25.0	80	11.0
1103501203	**12.0**	3.0	12	5.0	25.0	80	11.0

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.02	±0.005	h6

●: Excellent **O**: 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	
O	O	●													

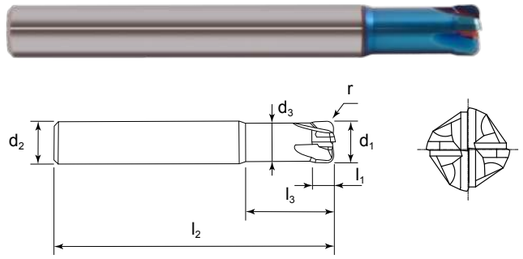
4 FLUTE HIGH FEED CORNER RADIUS LONG LENGTH

NG | BLUE | FLUTE 4 | R ±0.005

Series No. 111350

▶ cutting conditions : p.38-39

Excellent wear resistance at heavy feed rates on high hardened material.
Designed with reduced clearance angles and short flutes for strength.
High hardness & heat resistant coating for long life in dry applications.



EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1113500200	**2.0**	0.5	6	1.0	6.0	70	1.8
1113500300	**3.0**	0.5	6	1.2	8.0	70	2.8
1113500400	**4.0**	0.5	6	1.5	10.0	70	3.8
1113500500	**5.0**	0.5	6	2.0	10.0	70	4.6
1113500600	**6.0**	0.5	6	2.5	12.0	90	5.4
1113500601	**6.0**	1.0	6	2.5	12.0	90	5.4
1113500800	**8.0**	1.0	8	3.5	16.0	100	7.2
1113500802	**8.0**	2.0	8	3.5	16.0	100	7.2
1113501000	**10.0**	1.0	10	4.0	20.0	100	9.0
1113501002	**10.0**	2.0	10	4.0	20.0	100	9.0
1113501200	**12.0**	2.0	12	5.0	25.0	110	11.0
1113501203	**12.0**	3.0	12	5.0	25.0	110	11.0
1113501600	**16.0**	3.0	16	6.5	30.0	110	15.0

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

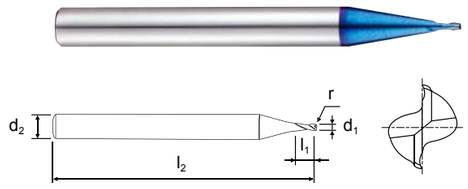
MILL DIA TOLERANCE	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.02	±0.005	h6

●: Excellent **O**: 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	
O	O	●													

2 FLUTE MINIATURE

NG | 30° | BLUE | FLUTE 2 | R ±0.010



Series No. 100350

▶ cutting conditions : p.46

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1003500030	**0.3**	-	6	0.45	50
1003500040	**0.4**	-	6	0.6	50
1003500050	**0.5**	0.05	6	0.7	50
1003500060	**0.6**	0.05	6	0.9	50
1003500080	**0.8**	0.05	6	1.2	50
1003500100	**1.0**	0.10	6	1.5	50
1003500120	**1.2**	0.10	6	1.8	50
1003500150	**1.5**	0.15	6	2.2	50
1003500200	**2.0**	0.15	6	2.2	50

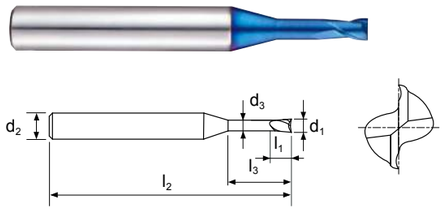
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012	±0.010	h6

●: Excellent **O**: 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	
O	**O**	●													

2 FLUTE RIB PROCESSING



NG | 30° | BLUE | FLUTE 2 | PLAIN

Series No. 100450

▶ cutting conditions : p.34-35

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	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
1004500010	**0.1**	4	0.15	0.3	45	0.085
1004500011	**0.1**	4	0.15	0.5	45	0.085
1004500020	**0.2**	4	0.3	0.5	45	0.17
1004500021	**0.2**	4	0.3	1.0	45	0.17
1004500022	**0.2**	4	0.3	1.5	45	0.17
1004500030	**0.3**	4	0.45	1.0	45	0.27
1004500031	**0.3**	4	0.45	1.5	45	0.27
1004500032	**0.3**	4	0.45	2.0	45	0.27
1004500033	**0.3**	4	0.45	3.0	45	0.27
1004500034	**0.3**	4	0.45	4.0	45	0.27
1004500040	**0.4**	4	0.6	1.0	45	0.37
1004500041	**0.4**	4	0.6	2.0	45	0.37
1004500042	**0.4**	4	0.6	3.0	45	0.37
1004500043	**0.4**	4	0.6	4.0	45	0.37
1004500044	**0.4**	4	0.6	5.0	45	0.37
1004500050	**0.5**	4	0.7	2.0	45	0.45
1004500051	**0.5**	4	0.7	2.5	45	0.45
1004500052	**0.5**	4	0.7	4.0	45	0.45
1004500053	**0.5**	4	0.7	6.0	45	0.45
1004500054	**0.5**	4	0.7	8.0	45	0.45
1004500060	**0.6**	4	0.9	2.0	45	0.55
1004500061	**0.6**	4	0.9	3.0	45	0.55
1004500062	**0.6**	4	0.9	4.0	45	0.55
1004500063	**0.6**	4	0.9	6.0	45	0.55
1004500064	**0.6**	4	0.9	8.0	45	0.55
1004500065	**0.6**	4	0.9	10.0	45	0.55
1004500080	**0.8**	4	1.2	2.0	45	0.75
1004500081	**0.8**	4	1.2	4.0	45	0.75
1004500082	**0.8**	4	1.2	6.0	45	0.75

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.012	h6

●: Excellent **O**: Good

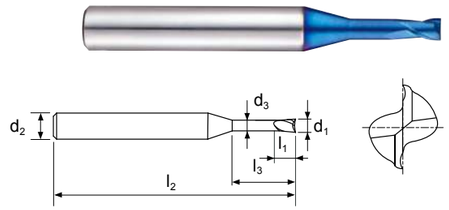
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
		●								**O**	**O**	**O**	**O**		
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	**O**	●													

2 FLUTE RIB PROCESSING

NG | 30° | BLUE | FLUTE 2 | PLAIN

Series No. 100450

▶ cutting conditions : p.34-35



Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	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
1004500083	**0.8**	4	1.2	8.0	45	0.75
1004500084	**0.8**	4	1.2	10.0	45	0.75
1004500085	**0.8**	4	1.2	12.0	45	0.75
1004500100	**1.0**	4	1.5	4.0	45	0.95
1004500101	**1.0**	4	1.5	6.0	45	0.95
1004500102	**1.0**	4	1.5	8.0	45	0.95
1004500103	**1.0**	4	1.5	10.0	45	0.95
1004500104	**1.0**	4	1.5	12.0	45	0.95
1004500105	**1.0**	4	1.5	16.0	50	0.95
1004500106	**1.0**	4	1.5	20.0	55	0.95
1004500120	**1.2**	4	1.8	6.0	45	1.15
1004500121	**1.2**	4	1.8	8.0	45	1.15
1004500122	**1.2**	4	1.8	10.0	45	1.15
1004500123	**1.2**	4	1.8	12.0	45	1.15
1004500124	**1.2**	4	1.8	16.0	50	1.15
1004500150	**1.5**	4	2.3	6.0	45	1.45
1004500151	**1.5**	4	2.3	8.0	45	1.45
1004500152	**1.5**	4	2.3	10.0	45	1.45
1004500153	**1.5**	4	2.3	12.0	45	1.45
1004500154	**1.5**	4	2.3	14.0	50	1.45
1004500155	**1.5**	4	2.3	16.0	50	1.45
1004500156	**1.5**	4	2.3	18.0	55	1.45
1004500157	**1.5**	4	2.3	20.0	55	1.45
1004500200	**2.0**	4	3.0	6.0	45	1.95
1004500201	**2.0**	4	3.0	8.0	45	1.95
1004500202	**2.0**	4	3.0	10.0	45	1.95
1004500203	**2.0**	4	3.0	12.0	45	1.95
1004500204	**2.0**	4	3.0	14.0	50	1.95
1004500205	**2.0**	4	3.0	16.0	50	1.95

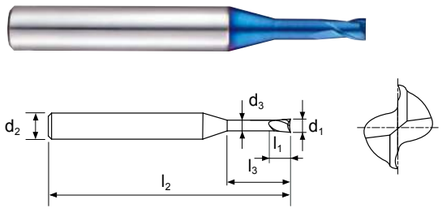
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.012	h6

●: Excellent **O**: Good

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

2 FLUTE RIB PROCESSING



NG | 30° | BLUE | FLUTE 2 | PLAIN

Series No. 100450

▶ cutting conditions : p.34-35

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	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
1004500206	**2.0**	4	3.0	18.0	55	1.95
1004500207	**2.0**	4	3.0	20.0	55	1.95
1004500208	**2.0**	4	3.0	25.0	60	1.95
1004500209	**2.0**	4	3.0	30.0	70	1.95
1004500300	**3.0**	6	4.5	10.0	45	2.85
1004500301	**3.0**	6	4.5	12.0	45	2.85
1004500302	**3.0**	6	4.5	14.0	50	2.85
1004500303	**3.0**	6	4.5	16.0	55	2.85
1004500304	**3.0**	6	4.5	18.0	55	2.85
1004500305	**3.0**	6	4.5	20.0	60	2.85
1004500306	**3.0**	6	4.5	25.0	65	2.85
1004500307	**3.0**	6	4.5	30.0	70	2.85
1004500308	**3.0**	6	4.5	35.0	80	2.85
1004500309	**3.0**	6	4.5	40.0	90	2.85
1004500400	**4.0**	6	6.0	12.0	50	3.85
1004500401	**4.0**	6	6.0	16.0	60	3.85
1004500402	**4.0**	6	6.0	20.0	60	3.85
1004500403	**4.0**	6	6.0	25.0	70	3.85
1004500404	**4.0**	6	6.0	30.0	70	3.85
1004500405	**4.0**	6	6.0	35.0	80	3.85
1004500406	**4.0**	6	6.0	40.0	90	3.85
1004500407	**4.0**	6	6.0	45.0	90	3.85
1004500408	**4.0**	6	6.0	50.0	100	3.85

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.012	h6

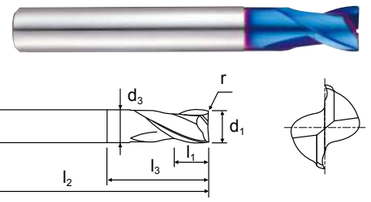
●: Excellent **O**: Good

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

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

2 FLUTE CORNER RADIUS STUB LENGTH

NG | 30° | BLUE | FLUTE 2 | ±0.010 < ø 6.0 | ±0.015 > ø 6.0



Series No. 101350

▶ cutting conditions : p.48-51

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1013500030	**0.3**	-	3	0.45	-	40	-
1013500040	**0.4**	-	3	0.6	-	40	-
1013500050	**0.5**	0.05	3	0.7	-	40	-
1013500060	**0.6**	0.05	3	0.9	-	40	-
1013500080	**0.8**	0.05	3	1.2	-	40	-
1013500100	**1.0**	0.10	3	1.5	-	40	-
1013500901	**1.0**	0.10	4	1.5	-	40	-
1013500150	**1.5**	0.10	3	2.2	-	40	-
1013500200	**2.0**	0.10	3	3.0	6.0	40	1.9
1013500902	**2.0**	0.10	4	3.0	6.0	40	1.9
1013500250	**2.5**	0.10	3	4.0	6.0	40	2.4
1013500300	**3.0**	0.10	6	4.0	7.0	45	2.9
1013500350	**3.5**	0.10	6	5.0	9.0	45	3.3
1013500400	**4.0**	0.10	6	5.0	9.0	45	3.8
1013500450	**4.5**	0.10	6	6.0	10.0	45	4.3
1013500500	**5.0**	0.20	6	6.0	11.0	50	4.8
1013500600	**6.0**	0.20	6	7.0	14.0	50	5.8
1013500800	**8.0**	0.20	8	9.0	18.0	60	7.8
1013501000	**10.0**	0.20	10	12.0	25.0	75	9.7
1013501200	**12.0**	0.30	12	15.0	30.0	75	11.7
1013501600	**16.0**	0.30	16	18.0	38.0	90	15.7
1013502000	**20.0**	0.30	20	24.0	45.0	100	19.7

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

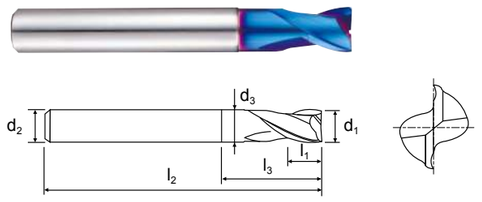
MILL DIA TOLERANCE	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012(up to Ø6) 0~-0.015(over Ø6)	±0.010(up to Ø6) ±0.015(over Ø6)	h6

●: Excellent **O**: 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	
O	**O**	●													

2 FLUTE EXTENDED NECK

NG | 30° | BLUE | FLUTE 2 | PLAIN



Series No. 101450

▶ cutting conditions : p.48-51

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	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
1014500010	**0.1**	4	0.2	-	40	-
1014500020	**0.2**	4	0.4	-	40	-
1014500030	**0.3**	4	0.6	-	40	-
1014500040	**0.4**	4	0.8	-	40	-
1014500050	**0.5**	4	1.0	-	40	-
1014500060	**0.6**	4	1.2	-	40	-
1014500070	**0.7**	4	1.4	-	40	-
1014500080	**0.8**	4	1.6	-	40	-
1014500090	**0.9**	4	2.0	-	40	-
1014500100	**1.0**	6	1.5	3.0	50	0.95
1014500150	**1.5**	6	1.7	4.0	50	1.45
1014500200	**2.0**	6	2.0	5.0	50	1.95
1014500250	**2.5**	6	2.5	6.0	55	2.4
1014500300	**3.0**	6	3.0	8.0	55	2.85
1014500350	**3.5**	6	3.5	9.0	55	3.35
1014500400	**4.0**	6	4.0	10.0	55	3.85
1014500500	**5.0**	6	5.0	13.0	55	4.85
1014500600	**6.0**	6	6.0	15.0	55	5.85
1014500800	**8.0**	8	8.0	20.0	65	7.7
1014501000	**10.0**	10	10.0	25.0	75	9.7
1014501200	**12.0**	12	12.0	28.0	85	11.7
1014501600	**16.0**	16	16.0	32.0	90	15.7
1014502000	**20.0**	20	20.0	40.0	105	19.7

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.012(up to Ø6) 0~-0.015(over Ø6)	h6

●: Excellent **O**: 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	
O	**O**	●													

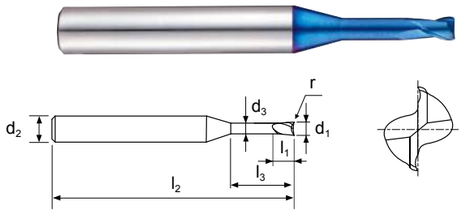
PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

2 FLUTE CORNER RADIUS RIB PROCESSING

NG | 30° | BLUE | FLUTE 2 | R ±0.010

Series No. 101850

▶ cutting conditions : p.44-45



Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1018500926	**1.0**	0.1	6	1.5	6	50	0.95
1018500100	**1.0**	0.2	6	1.5	4	50	0.95
1018500910	**1.0**	0.2	6	1.5	6	50	0.95
1018500911	**1.0**	0.2	6	1.5	8	50	0.95
1018500102	**1.0**	0.3	6	1.5	8	50	0.95
1018500152	**1.5**	0.2	6	2.5	6	50	1.45
1018500153	**1.5**	0.2	6	2.5	8	50	1.45
1018500913	**1.5**	0.2	6	2.5	10	50	1.45
1018500914	**1.5**	0.2	6	2.5	12	50	1.45
1018500927	**2.0**	0.2	6	3.0	6	50	1.95
1018500201	**2.0**	0.2	6	3.0	8	50	1.95
1018500203	**2.0**	0.2	6	3.0	10	55	1.95
1018500205	**2.0**	0.3	6	3.0	12	55	1.95
1018500207	**2.0**	0.3	6	3.0	16	55	1.95
1018500917	**2.0**	0.5	6	3.0	6	50	1.95
1018500918	**2.0**	0.5	6	3.0	12	55	1.95
1018500301	**3.0**	0.2	6	4.0	8	55	2.85
1018500303	**3.0**	0.2	6	4.0	12	55	2.85
1018500304	**3.0**	0.2	6	4.0	16	55	2.85
1018500305	**3.0**	0.3	6	4.0	8	55	2.85
1018500919	**3.0**	0.3	6	4.0	10	55	2.85
1018500307	**3.0**	0.3	6	4.0	16	55	2.85
1018500901	**3.0**	0.5	6	4.0	16	55	2.85
1018500403	**4.0**	0.2	6	4.0	12	55	3.85
1018500904	**4.0**	0.5	6	4.0	20	55	3.85
1018500600	**6.0**	0.5	6	7.0	20	60	5.85
1018500929	**8.0**	0.5	6	9.0	25	60	7.70

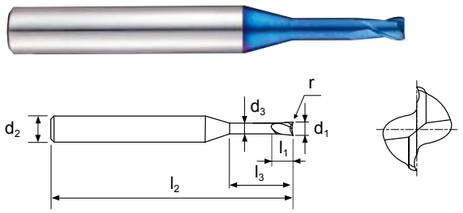
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012	±0.010	h6

●: Excellent **O**: 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	
O	**O**	●													

2 FLUTE CORNER RADIUS RIB PROCESSING



NG | 30° | BLUE | FLUTE 2 | R ±0.010

Series No. 102350

▶ cutting conditions : p.44-45

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1023500050	**0.5**	0.05	6	0.7	1.5	50	0.45
1023500901	**0.5**	0.05	6	0.7	3.3	50	0.45
1023500060	**0.6**	0.05	6	0.9	2.0	50	0.55
1023500902	**0.6**	0.05	6	0.9	4.0	50	0.55
1023500080	**0.8**	0.05	6	1.2	2.5	50	0.75
1023500903	**0.8**	0.05	6	1.2	5.5	50	0.42
1023500100	**1.0**	0.10	6	1.5	3.3	50	0.95
1023500904	**1.0**	0.10	6	1.5	6.7	50	0.95
1023500120	**1.2**	0.10	6	1.8	4.4	50	1.15
1023500905	**1.2**	0.10	6	1.8	8.0	50	1.15
1023500150	**1.5**	0.15	6	2.2	5.0	50	1.40
1023500906	**1.5**	0.15	6	2.2	9.7	50	1.40
1023500200	**2.0**	0.15	6	2.2	6.0	50	1.90
1023500907	**2.0**	0.15	6	2.2	13.0	50	1.90

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

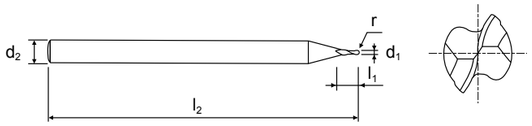
MILL DIA TOLERANCE(mm)	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012	±0.010	h6

●: Excellent **O**: 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	
O	**O**	●													

2 FLUTE MINIATURE BALL NOSE

NG | 30° | BLUE | FLUTE 2 | R ±0.005



Series No. 104350

▶ cutting conditions : p.42-43

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1043500040	**0.4**	0.20	6	0.4	50
1043500050	**0.5**	0.25	6	0.5	50
1043500060	**0.6**	0.30	6	0.6	50
1043500080	**0.8**	0.40	6	0.8	50
1043500100	**1.0**	0.50	6	1.0	50
1043500120	**1.2**	0.60	6	1.2	50
1043500150	**1.5**	0.75	6	1.5	50
1043500200	**2.0**	1.00	6	2.0	50

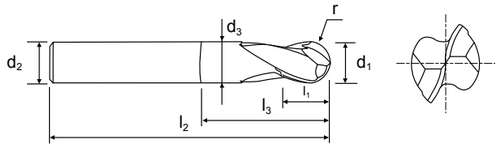
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

RADIUS r TOLERANCE	SHANK DIA TOLERANCE
±0.005	h6

●: Excellent **O**: 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	
O	O	●													

2 FLUTE EXTENDED NECK BALL NOSE STUB LENGTH



NG | 30° | BLUE | FLUTE 2 | R ±0.005 < ø 6.0 | R ±0.010 > ø 6.0

Series No. 105350

▶ cutting conditions : p.42-43

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1053500100	**1.0**	0.50	4	1.0	2.2	50	0.95
1053500120	**1.2**	0.60	4	1.2	2.6	50	1.1
1053500150	**1.5**	0.75	4	1.5	3.0	50	1.4
1053500200	**2.0**	1.00	6	2.0	4.0	50	1.9
1053500300	**3.0**	1.50	6	3.0	6.0	60	2.9
1053500400	**4.0**	2.00	6	4.0	8.0	70	3.9
1053500500	**5.0**	2.50	6	5.0	10.0	80	4.9
1053500600	**6.0**	3.00	6	6.0	12.0	90	5.9
1053500700	**7.0**	3.50	8	7.0	14.0	90	6.9
1053500800	**8.0**	4.00	8	8.0	16.0	100	7.9
1053500900	**9.0**	4.50	10	9.0	18.0	100	8.9
1053501000	**10.0**	5.00	10	10.0	20.0	100	9.9
1053501200	**12.0**	6.00	12	12.0	24.0	110	11.9
1053501400	**14.0**	7.00	14	14.0	28.0	110	13.8
1053501600	**16.0**	8.00	16	16.0	32.0	140	15.8
1053501800	**18.0**	9.00	18	18.0	36.0	140	17.8
1053502000	**20.0**	10.00	20	20.0	40.0	160	19.8
1053502500	**25.0**	12.50	25	25.0	50.0	180	24.8

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

RADIUS r TOLERANCE	SHANK DIA TOLERANCE
±0.005(up to Ø6) ±0.010(over Ø6)	h6

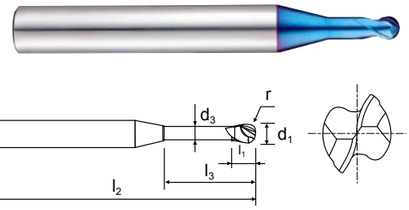
●: Excellent **O**: Good

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	
O	O	●													

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

2 FLUTE RIB PROCESSING BALL NOSE 6.0 SHANK

NG | 30° | BLUE | FLUTE 2 | R ±0.005



Series No. 106350

▶ cutting conditions : p.36-37

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1063500050	**0.5**	0.25	6	0.5	1.5	50	0.45
1063500901	**0.5**	0.25	6	0.5	3.3	50	0.45
1063500060	**0.6**	0.3	6	0.6	2.0	50	0.55
1063500902	**0.6**	0.3	6	0.6	4.0	50	0.55
1063500080	**0.8**	0.4	6	0.8	2.5	50	0.75
1063500903	**0.8**	0.4	6	0.8	5.5	50	0.75
1063500100	**1.0**	0.5	6	1.0	3.3	50	0.95
1063500904	**1.0**	0.5	6	1.0	6.7	50	0.95
1063500905	**1.0**	0.5	6	1.0	12.0	50	0.95
1063500120	**1.2**	0.6	6	1.2	4.4	50	1.15
1063500906	**1.2**	0.6	6	1.2	8.0	50	1.15
1063500150	**1.5**	0.75	6	1.5	5.0	50	1.45
1063500907	**1.5**	0.75	6	1.5	9.7	50	1.45
1063500908	**1.5**	0.75	6	1.5	15.0	50	1.45
1063500200	**2.0**	1.0	6	2.0	6.0	50	1.95
1063500909	**2.0**	1.0	6	2.0	13.0	50	1.95
1063500910	**2.0**	1.0	6	2.0	20.0	60	1.95

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

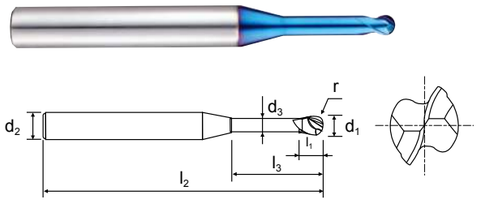
RADIUS r TOLERANCE	SHANK DIA TOLERANCE
±0.005	h6

●: Excellent **O**: Good

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

2 FLUTE RIB PROCESSING BALL NOSE

NG | 30° | BLUE | FLUTE 2 | R ±0.005 | PLAIN



Series No. 109350

▶ cutting conditions : p.36-37

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1093500010	**0.1**	0.05	4	0.1	0.3	45	0.085
1093500011	**0.1**	0.05	4	0.1	0.5	45	0.085
1093500020	**0.2**	0.1	4	0.2	0.5	45	0.17
1093500021	**0.2**	0.1	4	0.2	1.0	45	0.17
1093500022	**0.2**	0.1	4	0.2	1.5	45	0.17
1093500030	**0.3**	0.15	4	0.3	1.0	45	0.27
1093500031	**0.3**	0.15	4	0.3	2.0	45	0.27
1093500032	**0.3**	0.15	4	0.3	3.0	45	0.27
1093500040	**0.4**	0.2	4	0.4	1.0	45	0.37
1093500041	**0.4**	0.2	4	0.4	2.0	45	0.37
1093500042	**0.4**	0.2	4	0.4	3.0	45	0.37
1093500043	**0.4**	0.2	4	0.4	4.0	45	0.37
1093500044	**0.4**	0.2	4	0.4	5.0	45	0.37
1093500050	**0.5**	0.25	4	0.4	2.0	45	0.45
1093500051	**0.5**	0.25	4	0.4	2.5	45	0.45
1093500052	**0.5**	0.25	4	0.4	4.0	45	0.45
1093500053	**0.5**	0.25	4	0.4	6.0	45	0.45
1093500054	**0.5**	0.25	4	0.4	8.0	45	0.45
1093500060	**0.6**	0.3	4	0.5	2.0	45	0.55
1093500061	**0.6**	0.3	4	0.5	3.0	45	0.55
1093500062	**0.6**	0.3	4	0.5	4.0	45	0.55
1093500063	**0.6**	0.3	4	0.5	5.0	45	0.55
1093500064	**0.6**	0.3	4	0.5	6.0	45	0.55
1093500065	**0.6**	0.3	4	0.5	8.0	45	0.55
1093500066	**0.6**	0.3	4	0.5	10.0	45	0.55
1093500080	**0.8**	0.4	5	0.6	2.0	45	0.75
1093500081	**0.8**	0.4	5	0.6	4.0	45	0.75
1093500082	**0.8**	0.4	6	0.6	6.0	45	0.75
1093500083	**0.8**	0.4	4	0.6	8.0	45	0.75

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

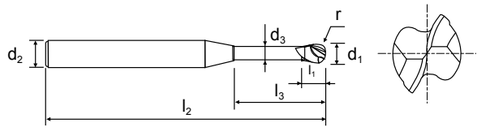
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0 ~ -0.012	h6

●: Excellent **O**: Good

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

2 FLUTE RIB PROCESSING BALL NOSE

NG | 30° | BLUE | FLUTE 2 | R ±0.005 | PLAIN



Series No. 109350

▶ cutting conditions : p.36-37

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1093500084	**0.8**	0.4	4	0.6	10.0	45	0.75
1093500100	**1.0**	0.5	4	0.8	3.0	45	0.95
1093500101	**1.0**	0.5	4	0.8	4.0	45	0.95
1093500102	**1.0**	0.5	4	0.8	5.0	45	0.95
1093500103	**1.0**	0.5	4	0.8	6.0	45	0.95
1093500104	**1.0**	0.5	4	0.8	7.0	45	0.95
1093500105	**1.0**	0.5	4	0.8	8.0	45	0.95
1093500106	**1.0**	0.5	4	0.8	9.0	45	0.95
1093500107	**1.0**	0.5	4	0.8	10.0	45	0.95
1093500108	**1.0**	0.5	4	0.8	12.0	45	0.95
1093500109	**1.0**	0.5	4	0.8	14.0	50	0.95
1093500110	**1.0**	0.5	4	0.8	16.0	50	0.95
1093500112	**1.0**	0.5	4	0.8	20.0	55	0.95
1093500120	**1.2**	0.6	4	1.0	6.0	45	1.15
1093500121	**1.2**	0.6	4	1.0	8.0	45	1.15
1093500122	**1.2**	0.6	4	1.0	10.0	45	1.15
1093500123	**1.2**	0.6	4	1.0	12.0	45	1.15
1093500150	**1.5**	0.75	4	1.2	6.0	45	1.45
1093500151	**1.5**	0.75	4	1.2	8.0	45	1.45
1093500152	**1.5**	0.75	4	1.2	10.0	45	1.45
1093500153	**1.5**	0.75	4	1.2	12.0	45	1.45
1093500154	**1.5**	0.75	4	1.2	14.0	50	1.45
1093500155	**1.5**	0.75	4	1.2	16.0	50	1.45
1093500156	**1.5**	0.75	4	1.2	20.0	55	1.45
1093500200	**2.0**	1.0	4	1.6	4.0	45	1.95
1093500201	**2.0**	1.0	4	1.6	6.0	45	1.95
1093500202	**2.0**	1.0	4	1.6	8.0	45	1.95
1093500203	**2.0**	1.0	4	1.6	10.0	45	1.95
1093500204	**2.0**	1.0	4	1.6	12.0	50	1.95

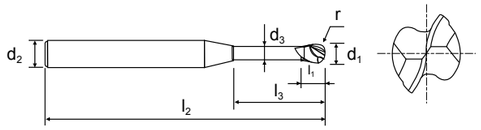
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0 ~ -0.012	h6

●: Excellent **O**: Good

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

2 FLUTE RIB PROCESSING BALL NOSE



NG | 30° | BLUE | FLUTE 2 | R ±0.005 | PLAIN

Series No. 109350

▶ cutting conditions : p.36-37

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1093500205	**2.0**	1.0	4	1.6	14.0	50	1.95
1093500206	**2.0**	1.0	4	1.6	16.0	50	1.95
1093500207	**2.0**	1.0	4	1.6	18.0	55	1.95
1093500208	**2.0**	1.0	4	1.6	20.0	55	1.95
1093500209	**2.0**	1.0	4	1.6	22.0	60	1.95
1093500210	**2.0**	1.0	4	1.6	25.0	60	1.95
1093500211	**2.0**	1.0	4	1.6	30.0	70	1.95
1093500300	**3.0**	1.5	6	2.4	12.0	50	2.85
1093500301	**3.0**	1.5	6	2.4	14.0	55	2.85
1093500302	**3.0**	1.5	6	2.4	16.0	55	2.85
1093500303	**3.0**	1.5	6	2.4	18.0	60	2.85
1093500304	**3.0**	1.5	6	2.4	20.0	60	2.85
1093500305	**3.0**	1.5	6	2.4	25.0	65	2.85
1093500306	**3.0**	1.5	6	2.4	30.0	70	2.85
1093500307	**3.0**	1.5	6	2.4	35.0	80	2.85
1093500400	**4.0**	2.0	6	3.2	12.0	60	3.85
1093500401	**4.0**	2.0	6	3.2	16.0	60	3.85
1093500402	**4.0**	2.0	6	3.2	20.0	65	3.85
1093500403	**4.0**	2.0	6	3.2	25.0	70	3.85
1093500404	**4.0**	2.0	6	3.2	30.0	70	3.85
1093500405	**4.0**	2.0	6	3.2	35.0	80	3.85
1093500406	**4.0**	2.0	6	3.2	40.0	90	3.85
1093500407	**4.0**	2.0	6	3.2	45.0	90	3.85
1093500408	**4.0**	2.0	6	3.2	50.0	100	3.85

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0 ~ -0.012	h6

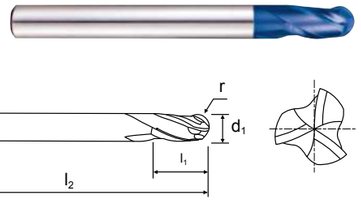
●: Excellent **O**: Good

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

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

3 FLUTE BALL NOSE CENTRE MATCH

NG | 30° | BLUE | FLUTE 3 | ±0.005 < ø 6.0 | ±0.010 > ø 6.0



Series No. 107350

▶ cutting conditions : p.40

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1073500300	**3.0**	1.5	6	8.0	60
1073500400	**4.0**	2.0	6	8.0	70
1073500500	**5.0**	2.5	6	10.0	80
1073500600	**6.0**	3.0	6	12.0	90
1073500800	**8.0**	4.0	8	14.0	100
1073501000	**10.0**	5.0	10	18.0	100
1073501200	**12.0**	6.0	12	22.0	110
1073501600	**16.0**	8.0	16	30.0	140
1073502000	**20.0**	10.0	20	38.0	160

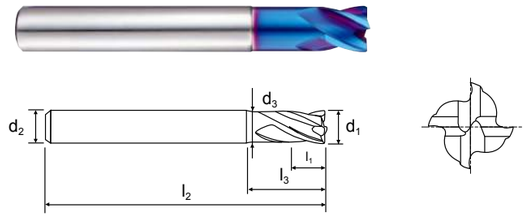
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

RADIUS r TOLERANCE	SHANK DIA TOLERANCE
±0.005(up to Ø6) ±0.010(over Ø6)	h6

●: Excellent **O**: 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	
O	**O**	●													

4 FLUTE EXTENDED NECK



NG | 30° | BLUE | FLUTE 4 | PLAIN

Series No. 101550

▶ cutting conditions : p.52-53

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	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
1015500100	**1.0**	6	1.5	3.0	50	0.95
1015500200	**2.0**	6	2.0	5.0	50	1.95
1015500300	**3.0**	6	3.0	8.0	55	2.85
1015500400	**4.0**	6	4.0	10.0	55	3.85
1015500500	**5.0**	6	5.0	13.0	55	4.85
1015500600	**6.0**	6	6.0	15.0	55	5.85
1015500800	**8.0**	8	8.0	20.0	65	7.7
1015501000	**10.0**	10	10.0	25.0	75	9.7
1015501200	**12.0**	12	12.0	28.0	85	11.7
1015501600	**16.0**	16	16.0	32.0	90	15.7
1015502000	**20.0**	20	20.0	40.0	105	19.7

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

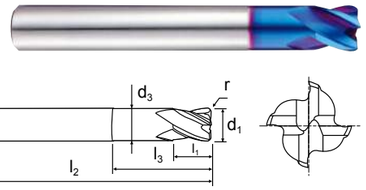
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.012(up to Ø6) 0~-0.015(over Ø6)	h6

●: Excellent **O**: 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	
O	**O**	●													

4 FLUTE CORNER RADIUS EXTENDED NECK STUB LENGTH

NG | 30° | BLUE | FLUTE 4 | R ±0.010 < ø 6.0 | R ±0.015 > ø 6.0



Series No. 103350

▶ cutting conditions : p.52-53

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for deep slotting.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1033500100	**1.0**	0.10	3	1.5	-	40	-
1033500150	**1.5**	0.10	3	2.2	-	40	-
1033500200	**2.0**	0.10	3	3.0	6.0	40	1.9
1033500250	**2.5**	0.10	3	4.0	6.0	40	2.4
1033500300	**3.0**	0.10	6	4.0	7.0	45	2.9
1033500350	**3.5**	0.10	6	5.0	9.0	45	3.3
1033500400	**4.0**	0.10	6	5.0	9.0	45	3.8
1033500450	**4.5**	0.10	6	6.0	10.0	45	4.3
1033500500	**5.0**	0.20	6	6.0	11.0	50	4.8
1033500600	**6.0**	0.20	6	7.0	14.0	50	5.8
1033500800	**8.0**	0.20	8	9.0	18.0	60	7.8
1033501000	**10.0**	0.20	10	12.0	25.0	75	9.7
1033501200	**12.0**	0.30	12	15.0	30.0	75	11.7
1033501600	**16.0**	0.30	16	18.0	38.0	90	15.7
1033502000	**20.0**	0.30	20	24.0	45.0	100	19.7

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

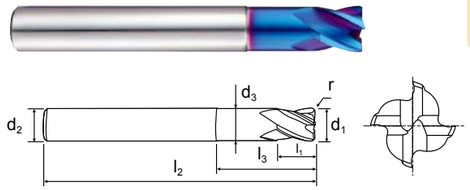
MILL DIA TOLERANCE(mm)	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012(up to Ø6) 0~-0.015(over Ø6)	±0.010(up to Ø6) ±0.015(over Ø6)	h6

●: Excellent **O**: 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	
O	**O**	●													

4 FLUTE CORNER RADIUS EXTENDED NECK SHORT LENGTH

NG | 30° | BLUE | FLUTE 4 | R ±0.010 < ø 6.0 | R ±0.015 > ø 6.0 | PLAIN



Series No. 101650

▶ cutting conditions : p.47

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for deep slotting.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1016500300	**3.0**	0.3	6	4.0	12.0	55	2.85
1016500901	**3.0**	0.3	6	4.0	16.0	55	2.85
1016500902	**3.0**	0.3	6	4.0	20.0	55	2.85
1016500903	**3.0**	0.5	6	4.0	10.0	55	2.85
1016500904	**3.0**	0.5	6	4.0	16.0	55	2.85
1016500905	**3.0**	0.5	6	4.0	20.0	55	2.85
1016500400	**4.0**	0.3	6	5.0	12.0	55	3.85
1016500906	**4.0**	0.3	6	5.0	16.0	55	3.85
1016500907	**4.0**	0.3	6	5.0	20.0	55	3.85
1016500908	**4.0**	0.5	6	5.0	12.0	55	3.85
1016500909	**4.0**	0.5	6	5.0	16.0	55	3.85
1016500910	**4.0**	0.5	6	5.0	20.0	55	3.85
1016500911	**4.0**	1.0	6	5.0	12.0	55	3.85
1016500600	**6.0**	0.5	6	7.0	20.0	60	5.85
1016500601	**6.0**	1.0	6	7.0	20.0	60	5.85
1016500912	**6.0**	1.5	6	7.0	20.0	60	5.85
1016500800	**8.0**	0.5	8	9.0	25.0	60	7.7
1016500913	**8.0**	1.0	8	9.0	25.0	60	7.7
1016500914	**8.0**	1.5	8	9.0	25.0	60	7.7
1016500915	**8.0**	2.0	8	9.0	25.0	60	7.7
1016501000	**10.0**	0.5	10	11.0	32.0	70	9.7
1016500916	**10.0**	1.0	10	11.0	32.0	70	9.7
1016500917	**10.0**	1.5	10	11.0	32.0	70	9.7
1016500918	**10.0**	2.0	10	11.0	32.0	70	9.7
1016501200	**12.0**	0.5	12	12.0	38.0	80	11.7
1016500919	**12.0**	1.0	12	12.0	38.0	80	11.7
1016500920	**12.0**	1.5	12	12.0	38.0	80	11.7
1016500921	**12.0**	2.0	12	12.0	38.0	80	11.7

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012(up to Ø6) 0~-0.015(over Ø6)	±0.010(up to Ø6) ±0.015(over Ø6)	h6

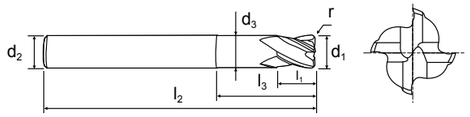
●: Excellent **O**: Good

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	
O	**O**	●													

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

4 FLUTE CORNER RADIUS EXTENDED NECK LONG LENGTH

NG | 30° | BLUE | FLUTE 4 | R ±0.010 < ø 6.0 | R ±0.015 > ø 6.0 | PLAIN



Series No. 101750

▶ cutting conditions : p.47

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for deep slotting.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1017500605	**6.0**	0.5	6	9.0	20.0	90	5.85
1017600601	**6.0**	1.0	6	9.0	20.0	90	5.85
1017500805	**8.0**	0.5	8	12.0	25.0	100	7.7
1017500801	**8.0**	1.0	8	12.0	25.0	100	7.7
1017501005	**10.0**	0.5	10	15.0	32.0	100	9.7
1017501001	**10.0**	1.0	10	15.0	32.0	100	9.7
1017501002	**10.0**	2.0	10	15.0	32.0	100	9.7
1017501205	**12.0**	0.5	12	18.0	38.0	110	11.7
1017501201	**12.0**	1.0	12	18.0	38.0	110	11.7
1017501202	**12.0**	2.0	12	18.0	38.0	110	11.7

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

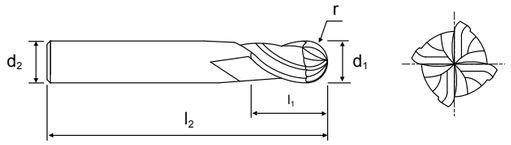
MILL DIA TOLERANCE(mm)	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012(up to Ø6) 0~-0.015(over Ø6)	±0.010(up to Ø6) ±0.015(over Ø6)	h6

●: Excellent **O**: 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	
O	O	●													

4 FLUTE BALL NOSE CENTRE MATCH

NG | 30° | BLUE | FLUTE 4 | R ±0.005 < ø 6.0 | R ±0.010 > ø 6.0 | PLAIN



Series No. 101950

▶ cutting conditions : p.41

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1019500300	**3.0**	1.5	6	8	60
1019500400	**4.0**	2.0	6	8	70
1019500500	**5.0**	2.5	6	10	80
1019500600	**6.0**	3.0	6	12	90
1019500800	**8.0**	4.0	8	14	100
1019501000	**10.0**	5.0	10	18	100
1019501200	**12.0**	6.0	12	22	110
1019501600	**16.0**	8.0	16	30	140
1019502000	**20.0**	10.0	20	38	160

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.012(up to R3) 0~-0.015(over R4)	±0.005(up to Ø6) ±0.010(over Ø6)	h6

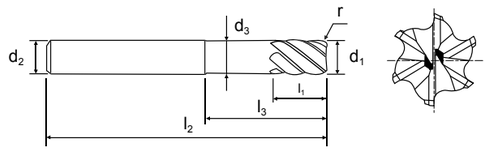
●: Excellent **O**: Good

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	
O	O	●													

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

6FLUTE 45º HELIX CORNER RADIUS

NG | 45° | BLUE | FLUTE 6 | R ±0.010 < ø 6.0 | R ±0.015 > ø 6.0



Series No. 108350

▶ cutting conditions : p.54

Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for deep slotting.
Higher wear-resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1083500600	**6.0**	0.5	6	6.0	14.0	50	5.7
1083500800	**8.0**	0.5	8	8.0	24.0	60	7.65
1083501000	**10.0**	1.0	10	10.0	30.0	70	9.65
1083501200	**12.0**	1.0	12	12.0	30.0	75	11.6

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1083500901	**6.0**	0.5	6	13.0	-	70	-
1083500910	**6.0**	0.5	6	26.0	-	70	-
1083500902	**8.0**	0.5	8	19.0	-	90	-
1083500911	**8.0**	0.5	8	36.0	-	90	-
1083500903	**10.0**	0.5	10	22.0	-	100	-
1083500904	**10.0**	1.0	10	22.0	-	100	-
1083500912	**10.0**	1.0	10	46.0	-	100	-
1083500905	**12.0**	0.5	12	26.0	-	110	-
1083500906	**12.0**	1.0	12	26.0	-	110	-
1083500913	**12.0**	1.0	12	56.0	-	110	-
1083501600	**16.0**	1.0	16	32.0	-	130	-
1083500907	**16.0**	1.5	16	32.0	-	130	-
1083500914	**16.0**	1.5	16	66.0	-	130	-
1083502000	**20.0**	1.0	20	38.0	-	140	-
1083500908	**20.0**	1.5	20	38.0	-	140	-
1083500909	**20.0**	2.0	20	38.0	-	140	-
1083500915	**20.0**	2.0	20	76.0	-	140	-

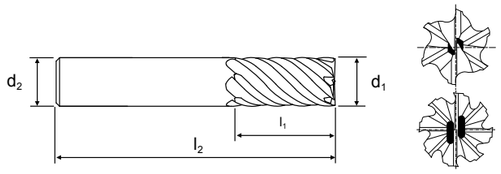
▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	CORNER r TOLERANCE	SHANK DIA TOLERANCE
0~-0.02 (Extra Long Type: 0~-0.03)	±0.010(up to Ø6) ±0.015(over Ø6)	h6

●: Excellent **O**: 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	
O	**O**	●													

6 & 8 FLUTE 45º HELIX LONG SERIES



NG | 45° | BLUE | FLUTE 6&8 | PLAIN

Series No. 102950

▶ cutting conditions : p.55

Designed to machine high hardened materials.
Negative rake angle for high abrasion resistance.
Excellent side-cutting of press mould field.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE
1029500600	**6.0**	6	13.0	57	6
1029500800	**8.0**	8	19.0	63	6
1029501000	**10.0**	10	22.0	72	6
1029501200	**12.0**	12	26.0	83	6
1029501400	**14.0**	14	26.0	83	6
1029501600	**16.0**	16	32.0	92	6
1029501800	**18.0**	18	32.0	92	8
1029502000	**20.0**	20	38.0	104	8
1029502500	**25.0**	25	44.0	104	8

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0 ~ -0.02	h6

●: Excellent **O**: 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	
O	**O**	●													

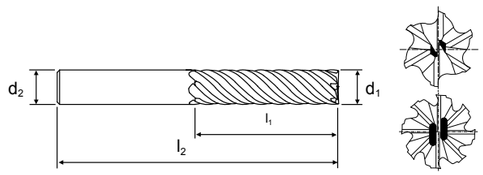
6 & 8 FLUTE 45º HELIX EXTRA LONG SERIES

NG | 45° | BLUE | FLUTE 6&8 | PLAIN

Series No. 103950

▶ cutting conditions : p.56

Designed to machine high hardened materials.
Negative rake angle for high abrasion resistance.
Excellent side-cutting of press mould field.



EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE
1039500600	**6.0**	6	26.0	70	6
1039500800	**8.0**	8	36.0	90	6
1039501000	**10.0**	10	46.0	100	6
1039501200	**12.0**	12	56.0	110	6
1039501600	**16.0**	16	66.0	130	6
1039502000	**20.0**	20	76.0	140	8
1039502500	**25.0**	25	92.0	180	8

▶ The blue decoration layer may be worn away quickly and the colour may not be uniform. This will not affect the performance of the tool.

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

●: Excellent **O**: Good

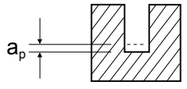
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
		●													
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O	●													

PULSAR BLUE
CUTTING DATA

PULSAR BLUE CUTTING CONDITION

100450 (2 Flute Rib Processing) 

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.8**
P	13	**30-45**	a_p (mm)	0.01	0.01	0.01	0.016	0.018	0.021	0.024
			v_c (m/min)	15	31	44	45	46	52	54
	14		n	47770	49360	46700	35800	29200	27600	21490
			f_z	0.0025	0.0035	0.004	0.006	0.007	0.008	0.011
			f (mm/min)	240	345	375	430	410	440	470
H	15	**45-55**	a_p (mm)	0.007	0.007	0.009	0.011	0.013	0.014	0.017
			v_c (m/min)	15	31	41	41	39	40	40
	16		n	47770	49360	43520	32640	24840	21230	15920
			f_z	0.002	0.003	0.003	0.005	0.006	0.007	0.009
			f (mm/min)	190	295	260	320	295	295	285
	16	**55-65**	a_p (mm)	0.005	0.005	0.007	0.008	0.008	0.009	0.01
			v_c (m/min)	15	31	26	27	25	26	27
	16		n	47770	49360	27600	21490	15920	13800	10740
			f_z	0.001	0.002	0.003	0.004	0.005	0.006	0.007
			f (mm/min)	95	195	165	170	160	165	150
N	61		a_p (mm)	0.016	0.016	0.018	0.031	0.033	0.035	0.041
	62		v_c (m/min)	15	31	46	62	74	82	90
			n	47770	49360	48830	49360	47130	43520	35820
	63		f_z	0.003	0.005	0.006	0.008	0.011	0.012	0.014
	64		f (mm/min)	285	490	585	790	1035	1045	1000



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

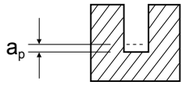
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

100450 (2 Flute Rib Processing) 

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				1.0	**1.2**	**1.5**	**2.0**	**3.0**	**4.0**	
P	13	**30-45**	a_p (mm)	0.02	0.047	0.047	0.08	0.13	0.17	
			v_c (m/min)	49	52	53	53	53	54	
	14		n	15600	13800	11250	8435	5620	4295	
			f_z	0.014	0.017	0.024	0.027	0.063	0.064	
			f (mm/min)	435	465	540	455	705	550	
H	15	**45-55**	a_p (mm)	0.014	0.028	0.033	0.057	0.095	0.12	
			v_c (m/min)	34	35	36	40	41	41	
	16		n	10800	9280	7640	6365	4350	3260	
			f_z	0.012	0.014	0.018	0.022	0.056	0.056	
			f (mm/min)	260	260	275	280	485	365	
	16	**55-65**	a_p (mm)	0.008	0.017	0.02	0.034	0.057	0.076	
			v_c (m/min)	22	23	23	26	26	26	
	16		n	7000	6100	4880	4140	2760	2070	
			f_z	0.007	0.008	0.011	0.013	0.035	0.035	
			f (mm/min)	95	95	105	105	190	145	
N	61		a_p (mm)	0.033	0.068	0.08	0.138	0.228	0.3	
	62		v_c (m/min)	89	93	94	102	104	104	
			n	28340	24680	19955	16240	11040	8280	
	63		f_z	0.018	0.021	0.026	0.033	0.079	0.079	
	64		f (mm/min)	1020	1030	1035	1070	1740	1305	



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

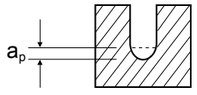
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

106350, 109350 (2 Flute B/N Rib Processing)

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.8**
P	13	**30-45**	a_p (mm)	0.01	0.01	0.013	0.022	0.017	0.02	0.04
			v_c (m/min)	15	31	46	61	65	65	66
			n	47770	49360	48830	48560	41400	34500	26270
	14		f_z	0.007	0.013	0.021	0.031	0.035	0.041	0.058
			f (mm/min)	665	1280	2050	3010	2895	2825	3045
H	15	**45-55**	a_p (mm)	0.009	0.009	0.011	0.018	0.014	0.017	0.032
			v_c (m/min)	15	31	46	51	52	53	53
			n	47770	49360	48830	40600	33120	28130	21095
	16		f_z	0.006	0.012	0.018	0.02	0.031	0.036	0.05
			f (mm/min)	570	1185	1755	1620	2050	2025	2110
	16	**55-65**	a_p (mm)	0.008	0.008	0.01	0.017	0.013	0.015	0.03
			v_c (m/min)	15	31	45	60	52	52	53
			n	47770	49360	47770	47770	33120	27600	21100
	16		f_z	0.005	0.01	0.017	0.018	0.027	0.03	0.044
			f (mm/min)	475	985	1620	1720	1785	1655	1855
N	61		a_p (mm)	0.016	0.016	0.012	0.034	0.026	0.03	0.06
	62		v_c (m/min)	15	31	46	62	78	86	102
			n	47770	49360	48830	49360	49680	45640	40600
	63		f_z	0.009	0.019	0.03	0.044	0.05	0.059	0.08
	64		f (mm/min)	860	1875	2930	4340	4965	5385	6495



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

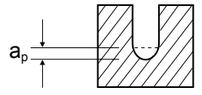
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

106350, 109350 (2 Flute B/N Rib Processing)

MATERIAL GROUP		HARDNESS HRc		Size (mm)					
				1.0	**1.2**	**1.5**	**2.0**	**3.0**	**4.0**
P	13	**30-45**	a_p (mm)	0.044	0.028	0.039	0.087	0.15	0.2
			v_c (m/min)	66	62	59	61	65	66
			n	21010	16450	12520	9710	6900	5250
	14		f_z	0.07	0.083	0.105	0.14	0.244	0.318
			f (mm/min)	2940	2730	2630	2720	3365	3340
H	15	**45-55**	a_p (mm)	0.036	0.023	0.032	0.075	0.12	0.16
			v_c (m/min)	51	49	50	52	52	52
			n	16240	13000	10615	8280	5520	4140
	16		f_z	0.061	0.078	0.095	0.12	0.223	0.29
			f (mm/min)	1980	2025	2015	1985	2460	2400
	16	**55-65**	a_p (mm)	0.033	0.021	0.029	0.069	0.084	0.15
			v_c (m/min)	51	49	50	52	52	51
			n	16240	13000	10610	8280	5520	4060
	16		f_z	0.057	0.07	0.084	0.1	0.21	0.265
			f (mm/min)	1850	1820	1780	1655	2315	2150
N	61		a_p (mm)	0.066	0.042	0.059	0.138	0.228	0.3
	62		v_c (m/min)	115	126	107	115	136	120
			n	36620	33435	22715	18310	14435	9550
	63		f_z	0.09	0.102	0.133	0.177	0.314	0.39
	64		f (mm/min)	6590	6820	6040	6480	9065	7450



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

110350, 111350 (4 Flute High Feed)

MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)								
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
H	15	<40	v_c (m/min)	85	90	100	100	110	110	110	110	110
			n	13530	9550	7960	6365	5835	4375	3500	2915	2185
			f_z	0.12	0.14	0.22	0.28	0.33	0.44	0.546	0.659	0.869
	16		f (mm/min)	6495	5350	7000	7130	7700	7700	7650	7695	7610
	15	40-50	v_c (m/min)	60	65	70	75	75	75	75	75	80
			n	9554	6900	5570	4775	3980	2985	2385	1990	1590
			f_z	0.099	0.15	0.2	0.25	0.3	0.4	0.5	0.598	0.79
	16		f (mm/min)	3780	4140	4455	4775	4775	4775	4775	4760	5030
	15	50-55	v_c (m/min)	35	45	50	55	55	55	55	55	55
			n	5570	4775	3980	3500	2915	2185	1750	1460	1095
			f_z	0.1	0.15	0.2	0.235	0.302	0.398	0.5	0.603	0.795
	16		f (mm/min)	2225	2865	3185	3290	3525	3485	3500	3520	3480
	15	55-60	v_c (m/min)	20	25	30	35	35	35	35	35	35
			n	3185	2650	2385	2225	1855	1390	1115	925	695
			f_z	0.078	0.101	0.132	0.182	0.25	0.33	0.42	0.5	0.61
	16		f (mm/min)	990	1070	1260	1620	1855	1835	1870	1855	1700
	15	60-65	v_c (m/min)	15	20	20	25	25	25	25	25	25
			n	2385	2120	1590	1590	1325	995	795	660	495
			f_z	0.063	0.08	0.1	0.117	0.147	0.2	0.25	0.299	0.398
	16		f (mm/min)	600	675	635	745	780	795	795	790	790

< HRc55

> HRc55

▶ For long length tools reduce feed rate by 15%.

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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

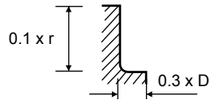
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE CUTTING CONDITION

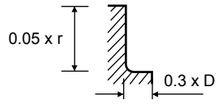
110350, 111350 (4 Flute High Feed)

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)								
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
H	15	<40	v_c (m/min)	180	205	215	235	255	250	250	250	250
			n	28660	21760	17110	14965	13530	9950	7960	6635	4975
			f_z	0.129	0.182	0.257	0.3	0.343	0.463	0.578	0.701	0.925
	16		f (mm/min)	14790	15840	17595	17960	18570	18430	18405	18600	18410
	15	40-50	v_c (m/min)	140	160	165	175	200	200	200	200	195
			n	22290	16985	13135	11145	10615	7960	6365	5305	3880
			f_z	0.111	0.147	0.231	0.284	0.329	0.438	0.547	0.66	0.897
	16		f (mm/min)	9895	9985	12135	12660	13970	13945	13935	14010	13925
	15	50-55	v_c (m/min)	95	200	140	155	170	170	170	170	165
			n	15125	21230	11145	9870	9020	6765	5410	4510	3280
			f_z	0.131	0.16	0.209	0.25	0.306	0.404	0.509	0.611	0.833
	16		f (mm/min)	7925	13585	9315	9870	11045	10935	11020	11025	10940
	15	55-60	v_c (m/min)	70	90	100	110	120	120	120	120	120
			n	11145	9550	7960	7005	6365	4775	3820	3185	2385
			f_z	0.101	0.121	0.172	0.214	0.25	0.349	0.447	0.547	0.729
	16		f (mm/min)	4500	4620	5475	5995	6365	6665	6830	6965	6965
	15	60-65	v_c (m/min)	55	65	70	75	85	85	85	85	85
			n	8755	6900	5570	4775	4510	3380	2705	2255	1690
			f_z	0.07	0.091	0.129	0.158	0.2	0.301	0.352	0.4	0.5
	16		f (mm/min)	2450	2510	2875	3015	3605	4070	3810	3605	3380

< HRc55



> HRc55



▶ For long length tools reduce feed rate by 15%.

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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

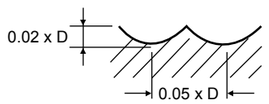
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

107350 (3 Flute B/N centre match)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	30-45	v_c (m/min)	300	305	315	340	340	340	340	340	340
			n	31845	24280	20060	18045	13535	10825	9020	6765	5410
	14		f_z	0.09	0.107	0.121	0.159	0.181	0.202	0.225	0.229	0.222
			f (mm/min)	8595	7795	7280	8605	7350	6560	6090	4645	3600
H	15	45-55	v_c (m/min)	255	255	265	285	285	285	285	285	285
			n	27070	20300	16875	15125	11345	9075	7560	5670	4535
	16		f_z	0.072	0.09	0.108	0.136	0.155	0.168	0.187	0.19	0.192
			f (mm/min)	5845	5480	5465	6170	5275	4575	4240	3230	2610
	15	55-60	v_c (m/min)	185	185	195	230	230	230	230	230	230
			n	19635	14725	12420	12205	9155	7325	6100	4575	3660
	16		f_z	0.072	0.087	0.099	0.123	0.144	0.156	0.173	0.18	0.18
			f (mm/min)	4240	3840	3685	4505	3955	3425	3165	2470	1975
	15	60-65	v_c (m/min)	175	180	185	210	210	210	210	210	210
			n	18575	14330	11780	11145	8360	6685	5570	4180	3340
	16		f_z	0.072	0.086	0.099	0.115	0.134	0.144	0.145	0.144	0.145
			f (mm/min)	4010	3695	3500	3845	3360	2885	2420	1805	1455
	15	65-70	v_c (m/min)	120	120	125	145	145	145	145	145	145
			n	12735	9550	7960	7695	5770	4615	3845	2885	2305
	16		f_z	0.072	0.087	0.099	0.108	0.125	0.144	0.144	0.144	0.144
			f (mm/min)	2750	2490	2365	2490	2165	1995	1660	1245	995



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: $n = \frac{v_c * 1000}{\pi * ø}$

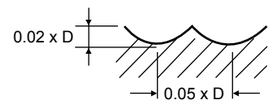
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

101950 (4 Flute B/N centre match)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	30-45	v_c (m/min)	340	340	340	340	340	340	340	340	340
			n	36090	27070	21655	18045	13535	10825	9020	6765	5410
	14		f_z	0.071	0.08	0.09	0.101	0.116	0.128	0.144	0.144	0.145
			f (mm/min)	10250	8660	7795	7290	6280	5540	5195	3895	3140
H	15	45-55	v_c (m/min)	285	285	285	285	285	285	285	285	285
			n	30255	22690	18150	15125	11345	9075	7560	5670	4535
	16		f_z	0.06	0.07	0.081	0.092	0.103	0.111	0.125	0.126	0.129
			f (mm/min)	7260	6350	5880	5565	4670	4030	3780	2855	2340
	15	55-60	v_c (m/min)	230	230	230	230	230	230	230	230	230
			n	24415	18310	14650	12205	9155	7325	6100	4575	3660
	16		f_z	0.05	0.06	0.071	0.082	0.093	0.104	0.115	0.119	0.119
			f (mm/min)	4880	4395	4160	4000	3405	3045	2805	2175	1740
	15	60-65	v_c (m/min)	210	210	210	210	210	210	210	210	210
			n	22290	16720	13375	11145	8360	6685	5570	4180	3340
	16		f_z	0.045	0.055	0.067	0.077	0.089	0.095	0.096	0.096	0.097
			f (mm/min)	4010	3675	3585	3430	2975	2540	2140	1605	1295
	15	65-70	v_c (m/min)	145	145	145	145	145	145	145	145	145
			n	15390	11545	9235	7695	5770	4615	3845	2885	2305
	16		f_z	0.04	0.05	0.062	0.072	0.082	0.094	0.096	0.096	0.097
			f (mm/min)	2460	2305	2290	2215	1890	1735	1475	1105	895



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

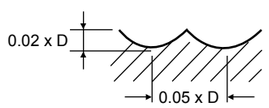
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

104350, 105350 (2 Flute B/N)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				0.4	**0.5**	**0.6**	**0.8**	**1.0**	**1.2**	**1.5**	**2.0**	**3.0**
P	13 14	**30-40**	v_c (m/min)	65	80	95	125	155	190	235	310	310
			n	51750	50955	50425	49760	49360	50425	49890	49360	32905
			f_z	0.019	0.024	0.029	0.039	0.048	0.051	0.054	0.057	0.091
			f (mm/min)	1965	2445	2925	3880	4735	5140	5385	5625	5985
H	15 16	**40-50**	v_c (m/min)	65	80	95	125	155	180	225	300	300
			n	51750	50955	50425	49760	49360	47770	47770	47770	31845
			f_z	0.017	0.021	0.025	0.033	0.042	0.045	0.047	0.05	0.083
			f (mm/min)	1760	2140	2520	3280	4145	4295	4490	4775	5285
	15 16	**50-55**	v_c (m/min)	55	70	85	115	140	160	205	250	250
			n	43790	44585	45115	45780	44585	42460	43520	39805	26535
			f_z	0.017	0.021	0.024	0.033	0.042	0.045	0.047	0.05	0.075
			f (mm/min)	1485	1870	2165	3020	3745	3820	4090	3980	3980
	15 16	**55-60**	v_c (m/min)	50	65	75	100	125	145	175	220	220
			n	39805	41400	39805	39805	39805	38480	37155	35030	23355
			f_z	0.015	0.019	0.023	0.03	0.038	0.039	0.042	0.045	0.067
			f (mm/min)	1190	1570	1830	2385	3025	3000	3120	3150	3130
	15 16	**60-65**	v_c (m/min)	45	55	65	90	110	130	155	200	200
			n	35825	35030	34500	35820	35030	34500	32905	31845	21230
			f_z	0.015	0.019	0.023	0.03	0.037	0.04	0.041	0.044	0.067
			f (mm/min)	1075	1330	1585	2150	2590	2760	2695	2800	2845
	15 16	**65-70**	v_c (m/min)	40	50	60	80	110	115	140	180	180
			n	31845	31845	31845	31845	35030	30520	29720	28660	19105
			f_z	0.014	0.017	0.022	0.029	0.033	0.038	0.039	0.04	0.061
			f (mm/min)	890	1080	1400	1845	2310	2320	2315	2290	2330



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

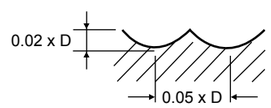
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

104350, 105350 (2 Flute B/N)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				4.0	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
P	13 14	**30-40**	v_c (m/min)	315	290	260	280	290	260	280	280
			n	25080	18470	13800	11145	9235	6900	5570	4455
			f_z	0.12	0.156	0.174	0.189	0.199	0.212	0.238	0.264
			f (mm/min)	6015	5760	4800	4210	3675	2925	2650	2350
H	15 16	**40-50**	v_c (m/min)	300	280	255	270	280	250	270	270
			n	23885	17830	13535	10745	8915	6635	5370	4295
			f_z	0.111	0.138	0.153	0.164	0.174	0.187	0.206	0.227
			f (mm/min)	5300	4920	4140	3525	3100	2480	2210	1950
	15 16	**50-55**	v_c (m/min)	250	235	205	225	235	210	225	225
			n	19900	14965	10880	8955	7480	5570	4475	3580
			f_z	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
			f (mm/min)	3980	3740	3065	2685	2395	1895	1690	1490
	15 16	**55-60**	v_c (m/min)	220	210	190	200	205	190	200	200
			n	17515	13375	10085	7960	6525	5040	3980	3185
			f_z	0.09	0.113	0.125	0.134	0.144	0.155	0.169	0.188
			f (mm/min)	3150	3020	2520	2130	1880	1560	1345	1195
	15 16	**60-65**	v_c (m/min)	200	180	165	175	180	165	175	175
			n	15920	11465	8755	6965	5730	4375	3480	2785
			f_z	0.088	0.111	0.122	0.132	0.142	0.142	0.143	0.143
			f (mm/min)	2800	2545	2135	1835	1625	1240	995	795
	15 16	**65-70**	v_c (m/min)	180	165	150	165	165	150	160	160
			n	14330	10510	7960	6565	5255	3980	3185	2545
			f_z	0.079	0.1	0.109	0.119	0.13	0.131	0.133	0.129
			f (mm/min)	2260	2100	1735	1560	1365	1040	845	655



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

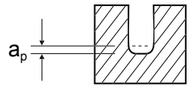
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

101850, 102350 (2 Flute Crn Rad Rib Processing)

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				0.5	**0.6**	**0.8**	**1.0**	**1.2**	**1.5**	**2.0**
P	13 14	**30-45**	a_p (mm)	0.0203	0.0179	0.0238	0.0193	0.0473	0.0609	0.0805
			v_c (m/min)	46	52	53	49	52	63	53
			n	29295	27600	21095	15605	13800	13375	8435
			f_z	0.028	0.032	0.045	0.057	0.067	0.094	0.107
			f (mm/min)	7555	1765	1895	1775	1845	2515	1805
H	15 16	**45-55**	a_p (mm)	0.013	0.0145	0.0143	0.0138	0.0285	0.0332	0.0575
			v_c (m/min)	39	40	40	35	36	36	40
			n	24840	21230	15920	11145	9550	7640	6365
			f_z	0.024	0.026	0.037	0.048	0.055	0.07	0.089
			f (mm/min)	1190	1100	1175	1070	1050	1070	1130
	15 16	**55-60**	a_p (mm)	0.0077	0.0087	0.0083	0.0102	0.0171	0.0199	0.0345
			v_c (m/min)	25	26	26	22	23	23	26
			n	15920	13800	10350	7005	6100	4880	4140
			f_z	0.015	0.016	0.022	0.03	0.035	0.044	0.053
			f (mm/min)	475	440	455	420	425	430	435



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

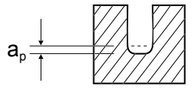
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

101850, 102350 (2 Flute Crn Rad Rib Processing)

MATERIAL GROUP		HARDNESS HRc		Size (mm)			
				3.0	**4.0**	**6.0**	**8.0**
P	13 14	**30-45**	a_p (mm)	0.08	0.09	0.1	0.1
			v_c (m/min)	65	70	85	100
			n	6900	5570	4510	3980
			f_z	0.114	0.12	0.16	0.19
			f (mm/min)	1570	1335	1440	1510
H	15 16	**45-55**	a_p (mm)	0.05	0.06	0.07	0.07
			v_c (m/min)	45	50	65	80
			n	4775	3980	3450	3185
			f_z	0.08	0.09	0.12	0.14
			f (mm/min)	760	715	825	890
	15 16	**55-60**	a_p (mm)	0.03	0.04	0.05	0.05
			v_c (m/min)	30	35	45	60
			n	3185	2785	2385	2385
			f_z	0.06	0.07	0.09	0.12
			f (mm/min)	380	390	430	570



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

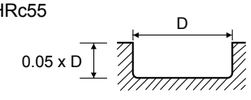
PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

100350 (2 Flute Miniature)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				0.3	**0.4**	**0.5**	**0.6**	**0.8**	**1.0**	**1.2**	**1.5**	**2.0**
P	13 14	**30-40**	v_c (m/min)	45	65	80	95	125	150	160	175	210
			n	47770	51750	50955	50425	49760	47770	42460	37155	33435
			f_z	0.002	0.002	0.004	0.005	0.006	0.008	0.009	0.011	0.013
			f (mm/min)	190	205	405	500	595	760	760	815	865
H	15 16	**40-50**	v_c (m/min)	40	55	70	85	100	120	130	145	165
			n	42460	43790	44585	45115	39805	38215	34500	30785	26270
			f_z	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.011	0.013
			f (mm/min)	170	175	265	360	475	610	620	675	680
	15 16	**50-55**	v_c (m/min)	40	50	65	75	75	80	85	100	110
			n	42460	39805	41400	39805	29855	25475	22555	21230	17515
			f_z	0.001	0.002	0.003	0.004	0.005	0.007	0.008	0.01	0.012
			f (mm/min)	85	155	245	315	295	355	360	425	420
	15 16	**55-60**	v_c (m/min)	30	40	50	55	65	65	75	80	90
			n	31845	31845	31845	29190	25875	20700	19900	16985	14330
			f_z	0.001	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.009
			f (mm/min)	60	60	125	175	205	205	235	235	255
	15 16	**60-65**	v_c (m/min)	25	30	40	45	50	50	55	60	70
			n	26535	23885	25475	23885	19900	15920	14595	12735	11145
			f_z	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
			f (mm/min)	50	45	100	95	115	125	145	150	155

< HRc55



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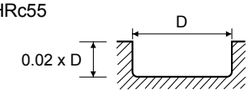


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

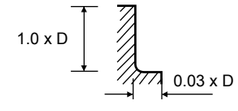
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

101650, 101750 (4 Flute Crn Rad Extended Neck)

MATERIAL GROUP		HARDNESS HRc		Size (mm)					
				3.0	**4.0**	**6.0**	**8.0**	**10.0**	**12.0**
P	13 14	**30-40**	v_c (m/min)	205	210	245	250	245	250
			n	21760	16720	13000	9950	7800	6635
			f_z	0.016	0.022	0.03	0.038	0.045	0.053
			f (mm/min)	1390	1470	1560	1510	1400	1405
H	15 16	**40-50**	v_c (m/min)	165	165	195	195	195	200
			n	17515	13135	10350	7760	6210	5305
			f_z	0.014	0.02	0.027	0.035	0.041	0.048
			f (mm/min)	980	1050	1115	1085	1015	1015
	15 16	**50-55**	v_c (m/min)	110	110	130	130	130	130
			n	11675	8755	6900	5175	4140	3450
			f_z	0.015	0.02	0.028	0.035	0.041	0.048
			f (mm/min)	700	700	770	525	675	660
	15 16	**55-60**	v_c (m/min)	90	90	100	100	100	100
			n	9550	7165	5305	3980	3185	2650
			f_z	0.011	0.015	0.021	0.026	0.03	0.036
			f (mm/min)	420	430	445	410	380	380
	15 16	**60-65**	v_c (m/min)	70	70	80	80	80	80
			n	7430	5570	4245	3185	2545	2120
			f_z	0.009	0.012	0.017	0.021	0.024	0.029
			f (mm/min)	265	265	285	265	245	245
	15 16	**65-70**	v_c (m/min)	60	60	70	70	70	70
			n	6365	4775	3715	2785	2225	1855
			f_z	0.007	0.01	0.014	0.017	0.02	0.023
			f (mm/min)	175	190	205	185	175	170



▶ For long length tools reduce feed rate by 15%.

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

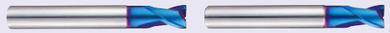
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

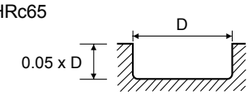
PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

101350, 101450 (2 Flute Extended Neck)  SLOTTING

MATERIAL GROUP		HRc		Size (mm)											
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.5	2.0
P	13 14	30-40	v_c (m/min)	15	30	45	65	80	95	100	125	140	150	180	210
			n	47770	47770	47770	51750	50955	50425	45495	49760	49540	47770	38215	33435
			f_z	0.001	0.001	0.002	0.002	0.004	0.005	0.006	0.006	0.007	0.008	0.011	0.013
			f (mm/min)	95	95	190	205	405	500	545	595	690	760	840	865
H	15 16	40-50	v_c (m/min)	15	30	40	55	70	85	90	100	110	120	140	165
			n	47770	47770	42460	43790	44580	45115	40945	39805	38920	38215	29720	26270
			f_z	0.001	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.011	0.013
			f (mm/min)	95	95	170	175	265	360	405	475	540	610	650	680
	15 16	50-55	v_c (m/min)	12	25	40	50	65	75	75	75	80	80	95	110
			n	38215	39805	42460	39805	41400	39805	34120	29855	28305	25475	20170	17515
			f_z	0.001	0.001	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.009	0.012
			f (mm/min)	75	80	85	155	245	315	340	295	340	355	360	420
	15 16	55-60	v_c (m/min)	10	20	30	40	50	55	60	65	65	65	80	90
			n	31845	31845	31845	31845	31845	29190	27295	25875	23000	20700	16985	14330
			f_z	0.001	0.001	0.001	0.001	0.002	0.003	0.004	0.004	0.005	0.005	0.007	0.009
			f (mm/min)	60	60	60	60	125	175	215	205	230	205	235	255
	15 16	60-65	v_c (m/min)	10	20	25	30	40	45	45	50	50	50	60	70
			n	31845	31845	26530	23885	25475	23885	20470	19900	17690	15920	12735	11145
			f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.004	0.005	0.007
			f (mm/min)	60	60	50	45	100	95	120	115	140	125	125	155
	15 16	65-70	v_c (m/min)	10	15	20	25	30	40	40	40	40	40	50	60
			n	31845	23885	21230	19900	19105	21230	18195	15920	14150	12735	10615	9550
			f_z	0.0006	0.0006	0.0006	0.0006	0.0008	0.001	0.002	0.002	0.003	0.003	0.003	0.003
			f (mm/min)	35	25	25	20	30	40	70	60	85	75	60	55

< HRc65



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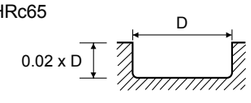


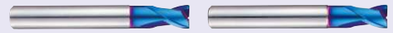
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

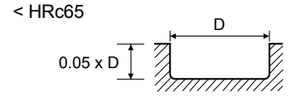
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE CUTTING CONDITION

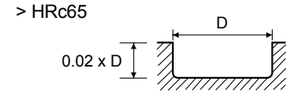
101350, 101450 (2 Flute Extended Neck)  SLOTTING

MATERIAL GROUP		HRc		Size (mm)											
				2.5	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0	
P	13 14	30-40	v_c (m/min)	205	205	210	210	245	245	245	245	245	245	245	
			n	26115	21760	19105	16720	15605	13000	9750	7800	6500	4875	3900	
			f_z	0.016	0.019	0.022	0.026	0.032	0.036	0.047	0.054	0.064	0.074	0.085	
			f (mm/min)	835	820	840	865	995	935	915	840	830	720	660	
H	15 16	40-50	v_c (m/min)	165	165	165	165	195	195	195	195	190	195	195	
			n	21015	17515	15010	13135	12420	10350	7760	6210	5040	3880	3105	
			f_z	0.016	0.02	0.023	0.027	0.032	0.037	0.046	0.055	0.065	0.074	0.085	
			f (mm/min)	670	700	690	705	795	765	710	680	655	570	525	
	15 16	50-55	v_c (m/min)	110	110	110	110	130	130	130	130	130	130	130	
			n	14010	11675	10005	8755	8280	6900	5175	4140	3450	2585	2070	
			f_z	0.015	0.018	0.021	0.025	0.03	0.035	0.043	0.051	0.059	0.07	0.082	
			f (mm/min)	420	420	420	435	495	480	445	420	405	360	335	
	15 16	55-60	v_c (m/min)	90	90	95	100	100	100	100	100	100	100	100	
			n	11465	9550	8640	7960	6365	5305	3980	3185	2650	1990	1590	
			f_z	0.011	0.014	0.016	0.019	0.022	0.026	0.032	0.038	0.045	0.053	0.061	
			f (mm/min)	250	265	275	300	280	275	255	240	235	210	190	
	15 16	60-65	v_c (m/min)	70	70	75	80	80	80	80	80	80	80	80	
			n	8915	7430	6820	6365	5095	4245	3185	2545	2120	1590	1270	
			f_z	0.009	0.011	0.013	0.015	0.018	0.021	0.026	0.03	0.037	0.042	0.048	
			f (mm/min)	160	160	175	190	180	175	165	150	155	130	120	
	15 16	65-70	v_c (m/min)	60	60	60	60	70	70	70	70	70	70	70	
			n	7640	6365	5460	4775	4455	3715	2785	2225	1855	1390	1115	
			f_z	0.005	0.008	0.01	0.012	0.014	0.017	0.02	0.025	0.03	0.034	0.038	
			f (mm/min)	75	100	105	115	125	125	110	110	110	95	85	

< HRc65



> HRc65



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

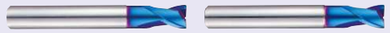
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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

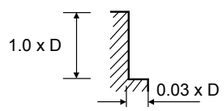
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

101350, 101450 (2 Flute Extended Neck)  **PROFILING**

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**
P	13 14	**30-40**	v_c (m/min)	150	180	210	205	205	210	210
			n	47770	38215	33435	26115	21760	19105	16720
			f_z	0.011	0.014	0.018	0.023	0.028	0.032	0.037
			f (mm/min)	1050	1070	1200	1200	1215	1220	1235
H	15 16	**40-50**	v_c (m/min)	120	140	165	165	165	165	165
			n	38215	29720	26270	21015	17515	15010	13135
			f_z	0.011	0.015	0.019	0.023	0.028	0.033	0.038
			f (mm/min)	840	890	995	965	980	990	995
	15 16	**50-55**	v_c (m/min)	80	95	110	110	110	110	110
			n	25475	20170	17515	14010	11675	10005	8755
			f_z	0.01	0.013	0.017	0.021	0.026	0.031	0.036
			f (mm/min)	510	520	595	585	605	620	630
	15 16	**55-60**	v_c (m/min)	65	80	90	90	90	95	100
			n	20700	16985	14330	11465	9550	8640	7960
			f_z	0.008	0.01	0.013	0.016	0.019	0.023	0.027
			f (mm/min)	330	340	370	365	360	395	430
	15 16	**60-65**	v_c (m/min)	50	60	70	70	70	75	80
			n	15920	12735	11145	8915	7430	6820	6365
			f_z	0.006	0.008	0.01	0.012	0.015	0.018	0.021
			f (mm/min)	190	200	220	210	220	245	265
	15 16	**65-70**	v_c (m/min)	40	50	60	60	60	60	60
			n	12735	10615	9550	7640	6365	5460	4775
			f_z	0.005	0.006	0.008	0.01	0.012	0.014	0.017
			f (mm/min)	125	125	150	150	150	150	160



▶ Profiling is not recommended for tools below 1.0mm.

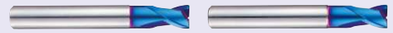
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

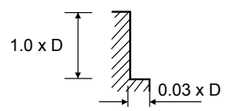
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

101350, 101450 (2 Flute Extended Neck)  **PROFILING**

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				5.0	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
P	13 14	**30-40**	v_c (m/min)	245	245	245	245	245	245	245
			n	15605	13000	9750	7800	6500	4875	3900
			f_z	0.046	0.052	0.067	0.077	0.09	0.107	0.122
			f (mm/min)	1430	1350	1305	1200	1170	1040	950
H	15 16	**40-50**	v_c (m/min)	195	195	195	195	190	195	195
			n	12420	10350	7760	6210	5040	3880	3105
			f_z	0.046	0.053	0.066	0.079	0.092	0.108	0.121
			f (mm/min)	1140	1095	1025	980	925	835	750
	15 16	**50-55**	v_c (m/min)	130	130	130	130	130	130	130
			n	8280	6900	5175	4140	3450	2585	2070
			f_z	0.043	0.05	0.061	0.072	0.084	0.1	0.116
			f (mm/min)	710	690	630	595	580	515	480
	15 16	**55-60**	v_c (m/min)	100	100	100	100	100	100	100
			n	6365	5305	3980	3185	2650	1990	1590
			f_z	0.032	0.038	0.046	0.053	0.064	0.075	0.086
			f (mm/min)	405	400	365	335	340	295	270
	15 16	**60-65**	v_c (m/min)	80	80	80	80	80	80	80
			n	5095	4245	3185	2545	2120	1590	1270
			f_z	0.025	0.03	0.037	0.043	0.052	0.059	0.067
			f (mm/min)	255	255	235	215	220	185	170
	15 16	**65-70**	v_c (m/min)	70	70	70	70	70	70	70
			n	4455	3715	2785	2225	1855	1390	1115
			f_z	0.021	0.025	0.03	0.033	0.043	0.05	0.056
			f (mm/min)	185	185	165	145	160	135	125



▶ Profiling is not recommended for tools below 1.0mm.

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: $n = \frac{v_c * 1000}{\pi * ø}$

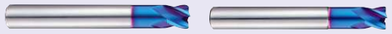
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

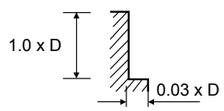
PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

103350, 101550 (4 Flute Extended Neck)



MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
P	13 14	**30-40**	v_c (m/min)	150	180	210	210	210	210	210	225
			n	47770	38215	33435	26750	22290	19105	16720	15920
			f_z	0.008	0.01	0.013	0.016	0.02	0.023	0.027	0.029
			f (mm/min)	1525	1525	1735	1710	1780	1755	1805	1845
H	15 16	**40-50**	v_c (m/min)	120	140	165	165	165	165	165	180
			n	38215	29720	26270	21015	17515	15010	13135	12735
			f_z	0.007	0.009	0.012	0.015	0.018	0.021	0.025	0.028
			f (mm/min)	1070	1070	1260	1260	1260	1260	1310	1425
	15 16	**50-55**	v_c (m/min)	80	95	110	110	110	110	110	120
			n	25475	20170	17515	14010	11675	10005	8755	8490
			f_z	0.007	0.009	0.012	0.015	0.018	0.021	0.025	0.028
			f (mm/min)	710	725	840	840	840	840	875	950
	15 16	**55-60**	v_c (m/min)	65	75	90	90	90	90	90	95
			n	20700	15920	14330	11465	9550	8185	7165	6720
			f_z	0.005	0.007	0.009	0.011	0.014	0.016	0.019	0.021
			f (mm/min)	410	445	515	500	535	520	545	565
	15 16	**60-65**	v_c (m/min)	50	60	70	70	70	70	70	75
			n	15920	12735	11145	8915	7430	6365	5570	5305
			f_z	0.004	0.005	0.007	0.009	0.011	0.013	0.015	0.016
			f (mm/min)	255	255	310	320	325	330	330	340
	15 16	**65-70**	v_c (m/min)	40	50	60	60	60	60	60	65
			n	12735	10615	9550	7640	6365	5460	4775	4600
			f_z	0.002	0.003	0.005	0.007	0.009	0.011	0.013	0.014
			f (mm/min)	100	125	190	210	225	240	245	255



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: $n = \frac{v_c * 1000}{\pi * ø}$

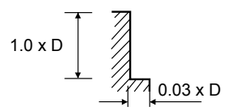
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

103350, 101550 (4 Flute Extended Neck)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				5.0	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**	
P	13 14	**30-40**	v_c (m/min)	245	245	245	250	250	250	250	
			n	15605	13000	9750	7965	6635	4975	3980	
			f_z	0.032	0.037	0.048	0.056	0.066	0.077	0.083	
			f (mm/min)	1995	1925	1870	1780	1750	1530	1320	
H	15 16	**40-50**	v_c (m/min)	195	195	195	195	195	195	195	
			n	12420	10350	7760	6210	5175	3880	3105	
			f_z	0.03	0.034	0.043	0.051	0.06	0.071	0.078	
			f (mm/min)	1490	1405	1335	1265	1240	1100	965	
	15 16	**50-55**	v_c (m/min)	130	130	130	130	130	130	130	
			n	8280	6900	5175	4140	3450	2585	2070	
			f_z	0.03	0.034	0.043	0.051	0.06	0.07	0.079	
			f (mm/min)	990	935	890	845	825	725	650	
	15 16	**55-60**	v_c (m/min)	100	100	100	100	100	100	100	
			n	6365	5305	3980	3185	2650	1990	1590	
			f_z	0.023	0.026	0.033	0.038	0.045	0.053	0.059	
			f (mm/min)	585	550	525	480	475	422	375	
	15 16	**60-65**	v_c (m/min)	80	80	80	80	80	80	80	
			n	5095	4245	3185	2545	2120	1590	1270	
			f_z	0.018	0.021	0.026	0.03	0.036	0.042	0.048	
			f (mm/min)	365	355	330	305	305	265	245	
	15 16	**65-70**	v_c (m/min)	70	70	70	70	70	70	70	
			n	4455	3715	2785	2225	1855	1390	1115	
			f_z	0.016	0.019	0.024	0.028	0.033	0.038	0.044	
			f (mm/min)	285	280	265	250	245	210	195	



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

108350 (6 Flute 45º Corner Radius)

MATERIAL GROUP		HARDNESS HRc		Size (mm)					
				6.0	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
P	13 14	**30-40**	v_c (m/min)	465	490	505	505	505	505
			n	24680	19500	16080	13400	10050	8040
			f_z	0.036	0.046	0.051	0.058	0.067	0.07
			f (mm/min)	5330	5380	4920	4660	4040	3375
H	15 16	**40-50**	v_c (m/min)	445	470	480	485	490	490
			n	23620	18710	15285	12870	9750	7800
			f_z	0.035	0.044	0.048	0.055	0.064	0.073
			f (mm/min)	4960	4935	4400	4245	3745	3415
	15 16	**50-55**	v_c (m/min)	300	300	300	300	300	300
			n	15920	11940	9550	7960	5970	4775
			f_z	0.051	0.064	0.072	0.079	0.094	0.111
			f (mm/min)	4870	4585	4125	3770	3360	3180
	15 16	**55-60**	v_c (m/min)	250	250	250	250	250	250
			n	13270	9950	7960	6635	4975	3980
			f_z	0.041	0.052	0.06	0.063	0.077	0.088
			f (mm/min)	3260	3105	2865	2505	2295	2100
	15 16	**60-65**	v_c (m/min)	200	200	200	200	200	200
			n	10615	7960	6365	5305	3980	3185
			f_z	0.033	0.042	0.047	0.05	0.052	0.053
			f (mm/min)	2100	2005	1795	1590	1240	1010
	15 16	**65-70**	v_c (m/min)	150	150	150	150	150	150
			n	7960	5970	4775	3980	2985	2385
			f_z	0.03	0.036	0.04	0.043	0.047	0.05
			f (mm/min)	1430	1290	1145	1025	840	715

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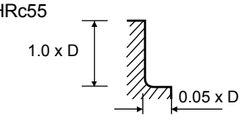

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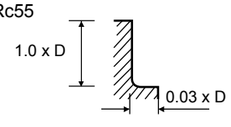


▶ The data shown is based on medial length tools. Please adjust machining conditions according to length.

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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

PULSAR BLUE DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR BLUE CUTTING CONDITION

102950 (6 Flute 45º Long Length)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				6.0	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**18.0**	**20.0**	**25.0**
P	13 14	**30-40**	v_c (m/min)	120	120	120	120	120	120	120	120	125
			n	6365	4775	3820	3185	2730	2385	2120	1910	1590
			f_z	0.039	0.052	0.063	0.07	0.081	0.09	0.095	0.099	0.11
			f (mm/min)	1490	1490	1440	1335	1325	1290	1610	1510	1400
H	15 16	**40-55**	v_c (m/min)	95	95	95	95	95	95	95	95	100
			n	5040	3780	3025	2520	2160	1890	1680	1510	1270
			f_z	0.035	0.046	0.055	0.062	0.07	0.079	0.08	0.091	0.096
			f (mm/min)	1055	1040	995	935	905	895	1075	1100	975
	15 16	**55-65**	v_c (m/min)	70	70	70	70	70	70	70	70	75
			n	3715	2785	2225	1855	1590	1390	1235	1115	955
			f_z	0.031	0.042	0.05	0.056	0.066	0.072	0.073	0.079	0.087
			f (mm/min)	690	700	665	620	630	600	720	700	665
	15 16	**65-70**	v_c (m/min)	50	50	50	50	50	50	50	50	55
			n	2650	1990	1590	1325	1135	995	885	795	700
			f_z	0.028	0.037	0.045	0.05	0.051	0.064	0.066	0.071	0.079
			f (mm/min)	445	440	430	395	345	380	465	450	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

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

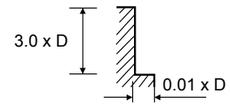
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR BLUE CUTTING CONDITION

103950 (6 Flute 45º Extra Length)

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				6.0	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**	**25.0**
P	13	**30-40**	v_c (m/min)	60	60	60	60	60	60	60
			n	3185	2385	1910	1590	1190	955	760
	14		f_z	0.04	0.05	0.06	0.07	0.081	0.086	0.089
			f (mm/min)	760	715	685	665	580	655	540
H	15	**40-55**	v_c (m/min)	60	60	60	60	60	60	60
			n	3185	2385	1910	1590	1190	955	760
	16		f_z	0.03	0.04	0.05	0.061	0.071	0.08	0.08
			f (mm/min)	570	570	570	580	505	610	485
	15	**55-65**	v_c (m/min)	50	50	50	50	50	50	50
			n	2650	1990	1590	1325	995	795	635
	16		f_z	0.03	0.04	0.05	0.06	0.07	0.08	0.08
			f (mm/min)	475	475	475	475	415	510	405



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

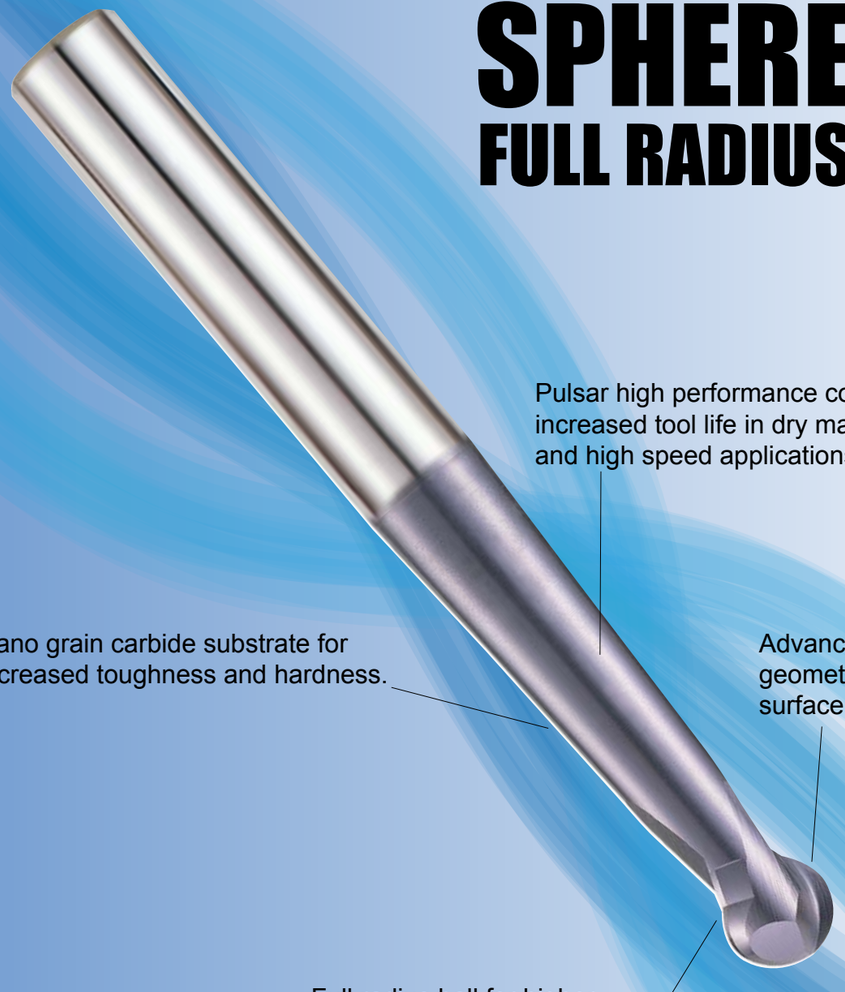
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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

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

SPHERE
FULL RADIUS



Pulsar high performance coating for increased tool life in dry machining and high speed applications.

Nano grain carbide substrate for increased toughness and hardness.

Advanced tool geometry for improved surface finish.

Full radius ball for higher speed and feed when back milling.

IDEAL FOR MATERIAL GROUPS

P H K

PULSAR
END MILLS

Designed specifically for use in dry cutting conditions

www.europatool.co.uk

APPLICATION GUIDE

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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
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CONTINUED OVERLEAF

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

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APPLICATION GUIDE

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

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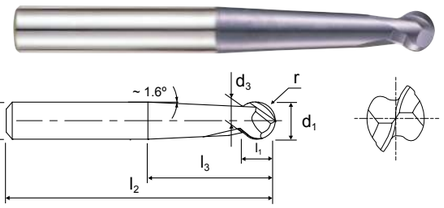
2 FLUTE SPHERE BALL NOSE FULL RADIUS

MG HM | FLUTE 2 | 30° | PLAIN



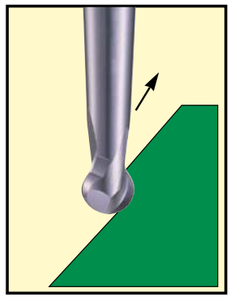
Series No. 153320

▶ cutting conditions : p.98

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1533200300	**3.0**	1.5	6	2.3	30	80	2.5
1533200400	**4.0**	2.0	6	3.1	30	80	3.3
1533200500	**5.0**	2.5	6	3.9	38	80	4.1
1533200600	**6.0**	3.0	6	4.9	28	100	4.7
1533200800	**8.0**	4.0	8	6.3	33	100	6.5
1533201000	**10.0**	5.0	10	7.9	40	100	8.2
1533201200	**12.0**	6.0	12	9.5	49	100	9.8
1533201600	**16.0**	8.0	16	12.4	59	150	13.4

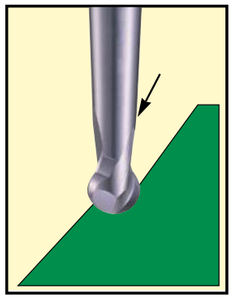
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

ADVANCED TECHNIQUE



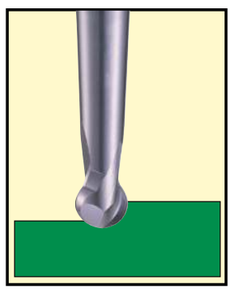
Favorable Back Milling

NORMAL TECHNIQUE

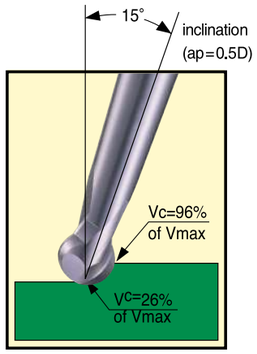


Normal Ball Nose

- Operating angle 14° ~ 16°, higher speed and feed are possible, as cutting resistance at the cutting edges is reduced.
- Excellent surface roughness and more secure milling process.
- Higher speed and feed rates are achievable when back milling.



Normal Ball Nose



Favorable Profiling

- Using 15º inclined profiling operation, increased productivity and higher speed and feed are possible.
- Decreased cutting force.
- Excellent surface roughness and finish.

●: Excellent **O**: Good

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13	14	16	23		33	34	51	52	53	71	72	73	74	83	
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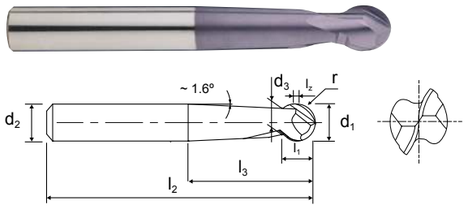
2 FLUTE SPHERE BALL NOSE ECONOMY TYPE

MG HM | FLUTE 2 | 30° | PLAIN



Series No. 152320

▶ cutting conditions : p.98

Designed with small flat for ease of regrind. Cannot be used for back milling, but is suitable for inclined profiling,

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3	l_z
1523200300	**3.0**	1.5	6.0	4.0	30.0	80.0	2.5	1.5
1523200400	**4.0**	2.0		5.0	30.0		3.3	
1523200500	**5.0**	2.5		6.0	43.0		4.1	2
1523200600	**6.0**	3.0		7.0	30.0	100.0	4.7	
1523200800	**8.0**	4.0	8.0	9.0	36.0		6.5	3
1523201000	**10.0**	5.0	10.0	11.0	43.0		8.2	
1523201200	**12.0**	6.0	12.0	13.0	52.0		9.8	
1523201600	**16.0**	8.0	16.0	15.0	61.0	150.0	13.4	

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: Good

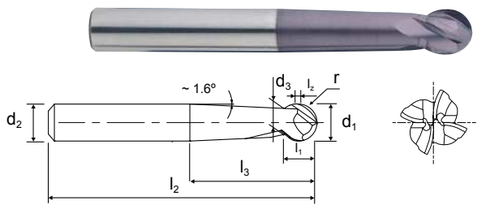
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●			O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	●	●			O	O									

4 FLUTE SPHERE BALL NOSE ECONOMY TYPE

MG HM | 30° | FLUTE 4 | PLAIN

Series No. 154320

▶ cutting conditions : p.99



Designed with small flat for ease of regrind. Cannot be used for back milling, but is suitable for inclined profiling,

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3	l_z
1543200300	**3.0**	1.5	6.0	4.0	30.0	80.0	2.5	1.5
1543200400	**4.0**	2.0		5.0	30.0		3.3	
1543200500	**5.0**	2.5		6.0	43.0		4.1	2
1543200600	**6.0**	3.0		7.0	30.0	100.0	4.7	
1543200800	**8.0**	4.0	8.0	9.0	36.0		6.5	3
1543201000	**10.0**	5.0	10.0	11.0	43.0		8.2	
1543201200	**12.0**	6.0	12.0	13.0	52.0		9.8	
1543201600	**16.0**	8.0	16.0	15.0	61.0	150.0	13.4	

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: Good

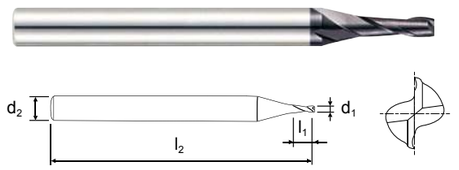
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●			O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	●	●			O	O									

2 FLUTE MINIATURE

MG < .5㎛ | 30° | FLUTE 2 | PLAIN

Series No. 100320

▶ cutting conditions : p.107



High precision milling in medical, optical, electronics and aero space industries.
Excellent performance on hardened steel

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1003200040	**0.4**	3	0.8	40
1003200050	**0.5**	3	1.0	40
1003200060	**0.6**	3	1.2	40
1003200070	**0.7**	3	1.4	40
1003200080	**0.8**	3	1.6	40
1003200090	**0.9**	3	2.0	40
1003200100	**1.0**	4	2.5	40
1003200110	**1.1**	4	2.5	40
1003200120	**1.2**	4	4.0	40
1003200130	**1.3**	4	4.0	40
1003200140	**1.4**	4	4.0	40
1003200150	**1.5**	4	4.0	40

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

●: Excellent **O**: 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	
●	●	●													

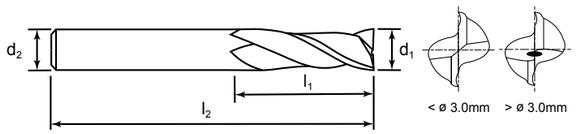
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

2 FLUTE SHORT LENGTH

MG < .5㎛ | 30° | N | FLUTE 2 | PLAIN | FLAT

Series No. 100120, 100320

▶ cutting conditions : p.100



Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1003200100**	**1.0**	4	2.5	40
-	**1003200150**	**1.5**		4.0	
-	**1003200200**	**2.0**		6.0	
-	**1003200250**	**2.5**		8.0	
1001200300	**1003200300**	**3.0**	6	8.0	45
1001200350	**1003200350**	**3.5**		10.0	
1001200400	**1003200400**	**4.0**		11.0	
1001200450	**1003200450**	**4.5**		11.0	
1001200500	**1003200500**	**5.0**		13.0	50
1001200550	**1003200550**	**5.5**		13.0	
1001200600	**1003200600**	**6.0**		13.0	
1001200650	**1003200650**	**6.5**	8	16.0	60
1001200700	**1003200700**	**7.0**		16.0	
1001200750	**1003200750**	**7.5**		16.0	
1001200800	**1003200800**	**8.0**		19.0	
1001200850	**1003200850**	**8.5**	10	19.0	70
1001200900	**1003200900**	**9.0**		19.0	
1001200950	**1003200950**	**9.5**		19.0	
1001201000	**1003201000**	**10.0**		22.0	

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

●: Excellent **O**: Good

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

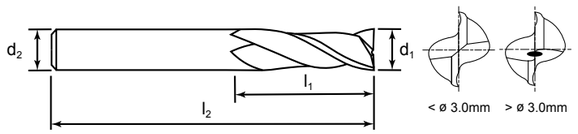
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

2 FLUTE SHORT LENGTH

MG < .5㎛ | 30° | N | FLUTE 2 | PLAIN | FLAT

Series No. 100120, 100320

▶ cutting conditions : p.100



Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1001201050	**1003201050**	**10.5**	12	22.0	75
1001201100	**1003201100**	**11.0**		22.0	
1001201150	**1003201150**	**11.5**		22.0	
1001201200	**1003201200**	**12.0**		26.0	
1001201300	**1003201300**	**13.0**		26.0	85
1001201400	**1003201400**	**14.0**	14	26.0	
1001201500	**1003201500**	**15.0**	16	26.0	90
1001201600	**1003201600**	**16.0**		32.0	100
1001201700	**1003201700**	**17.0**		32.0	
1001201800	**1003201800**	**18.0**	18	32.0	
1001201900	**1003201900**	**19.0**	20	32.0	
1001202000	**1003202000**	**20.0**		38.0	105
1001202200	**1003202200**	**22.0**		38.0	
1001202400	**1003202400**	**24.0**	25	45.0	120
1001202500	**1003202500**	**25.0**		45.0	

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

●: Excellent **O**: Good

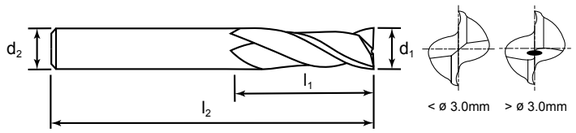
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●	O	O	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O			O	O									

2 FLUTE LONG LENGTH

MG < .5㎛ | 30° | N | FLUTE 2 | PLAIN | FLAT

Series No. 102120, 102320

▶ cutting conditions : p.101



Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1023200200**	**2.0**	4	8.0	40
1021200300	**1023200300**	**3.0**	6	12.0	50
1021200400	**1023200400**	**4.0**		15.0	
1021200500	**1023200500**	**5.0**		20.0	60
1021200600	**1023200600**	**6.0**		20.0	
1021200800	**1023200800**	**8.0**	8	25.0	70
1021201000	**1023201000**	**10.0**	10	30.0	90
1021201200	**1023201200**	**12.0**	12	30.0	
1021201400	**1023201400**	**14.0**	16	40.0	110
1021201600	**1023201600**	**16.0**		50.0	
1021201800	**1023201800**	**18.0**	20	50.0	
1021202000	**1023202000**	**20.0**		55.0	
1021202500	**1023202500**	**25.0**	25	75.0	140

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

●: Excellent **O**: Good

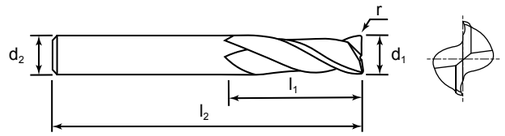
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●			O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O			O	O									

2 FLUTE LONG LENGTH CORNER RADIUS

MG < .5㎛ | 30° | N | FLUTE 2 | PLAIN | FLAT

Series No. 155120, 155320

▶ cutting conditions : p.102



Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1551209011	**1553209011**	**4.0**	0.5	6	15.0	50
1551209012	**1553209012**	**5.0**	0.5		20.0	60
1551209013	**1553209013**	**6.0**	0.3		20.0	
1551200600	**1553200600**	**6.0**	0.5		20.0	
1551209001	**1553209001**	**6.0**	1.0		20.0	
1551209014	**1553209014**	**8.0**	0.3	8	25.0	70
1551200800	**1553200800**	**8.0**	0.5		25.0	
1551209002	**1553209002**	**8.0**	1.0		25.0	
1551209003	**1553209003**	**8.0**	1.5		25.0	
1551209004	**1553209004**	**8.0**	2.0		25.0	
1551209016	**1553209016**	**10.0**	0.3	10	30.0	90
1551201000	**1553201000**	**10.0**	0.5		30.0	
1551209005	**1553209005**	**10.0**	1.0		30.0	
1551209006	**1553209006**	**10.0**	1.5		30.0	
1551209007	**1553209007**	**10.0**	2.0		30.0	
1551201200	**1553201200**	**12.0**	0.5	12	30.0	
1551209008	**1553209008**	**12.0**	1.0		30.0	
1551209009	**1553209009**	**12.0**	1.5		30.0	
1551209010	**1553209010**	**12.0**	2.0		30.0	
1551201600	**1553201600**	**16.0**	0.5	16	50.0	110
1551209017	**1553209017**	**16.0**	1.0		50.0	
1551209018	**1553209018**	**16.0**	1.5		50.0	
1551209019	**1553209019**	**16.0**	2.0		50.0	
1551202000	**1553202000**	**20.0**	0.5	20	55.0	
1551209020	**1553209020**	**20.0**	1.0		55.0	
1551209021	**1553209021**	**20.0**	1.5		55.0	
1551209022	**1553209022**	**20.0**	2.0		55.0	

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

●: Excellent **O**: Good

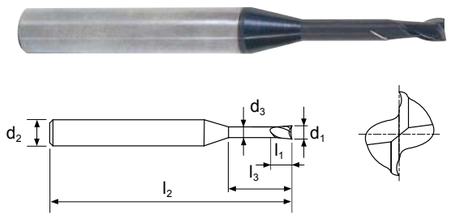
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●													
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O													

2 FLUTE RIB PROCESSING

MG < .5㎛ | 30° | FLUTE 2 | PLAIN

Series No. 107320, 108320

▶ cutting conditions : p.108



Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

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
1073200080	**0.8**	4	1.2	6	45	0.75
1083200080	**0.8**	4	1.2	8	45	0.75
1073200100	**1.0**	4	1.5	6	45	0.97
1083200100	**1.0**	4	1.5	8	45	0.95
1073200102	**1.0**	4	1.5	12	45	0.93
1073200120	**1.2**	4	1.8	8	45	1.15
1083200120	**1.2**	4	1.8	12	45	1.13
1073200140	**1.4**	4	2.1	12	45	1.33
1073200150	**1.5**	4	2.3	8	45	1.45
1083200150	**1.5**	4	2.3	10	45	1.45
1073200152	**1.5**	4	2.3	12	45	1.43
1073200153	**1.5**	4	2.3	16	50	1.41
1073200160	**1.6**	4	2.4	12	45	1.53
1073200180	**1.8**	4	2.7	12	45	1.73
1073200200	**2.0**	4	3.0	12	45	1.93
1083200200	**2.0**	4	3.0	16	50	1.91
1073200250	**2.5**	4	3.7	12	45	2.40
1083200250	**2.5**	4	3.7	16	55	2.40
1073200300	**3.0**	6	4.5	14	50	2.85
1083200300	**3.0**	6	4.5	18	55	2.85

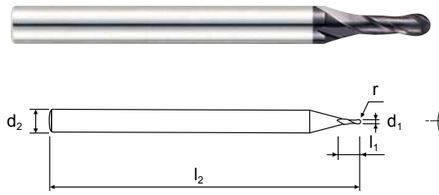
MILL DIA. TOLERANCE	SHANK DIA. TOLERANCE
0~-0.015	h6

●: Excellent **O**: Good

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

2 FLUTE MINIATURE BALL NOSE

MG < .5㎛ | 30° | FLUTE 2 | PLAIN



Series No. 105320

▶ cutting conditions : p.107

High precision milling in medical, optical,
electronics and aerospace industries.
Excellent performance on hardened steel

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1053200060	**0.6**	0.30	3	1.1	40
1053200070	**0.7**	0.35	3	1.5	40
1053200080	**0.8**	0.40	3	2.0	40
1053200090	**0.9**	0.45	3	2.2	40
1053200100	**1.0**	0.50	3	2.5	40
1053200110	**1.1**	0.55	3	3.0	40
1053200120	**1.2**	0.60	3	3.0	40
1053200130	**1.3**	0.65	3	3.5	40
1053200140	**1.4**	0.70	3	3.5	40
1053200150	**1.5**	0.75	3	4.0	40

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

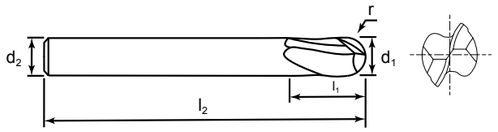
●: Excellent **O**: Good

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

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

2 FLUTE STUB CUT LENGTH BALL NOSE >HRc55

MG < .5㎛ | 15° | FLUTE 2 | PLAIN | FLAT



Series No. 116120, 116320

▶ cutting conditions : p.106

Suitable for HRc55~HRc65 high hardened materials.
Strong cutting edges and higher tool rigidity.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1163200100**	**1.0**	0.5	4	1.0	50
-	**1163200120**	**1.2**	0.6		1.2	
-	**1163200150**	**1.5**	0.75		1.5	
1161200200	**1163200200**	**2.0**	1.0	6	2.0	
1161200300	**1163200300**	**3.0**	1.5		3.0	60
1161200400	**1163200400**	**4.0**	2.0		4.0	70
1161200500	**1163200500**	**5.0**	2.5		5.0	80
1161200600	**1163200600**	**6.0**	3.0		6.0	90
1161200700	**1163200700**	**7.0**	3.5	8	7.0	
1161200800	**1163200800**	**8.0**	4.0		8.0	100
1161200900	**1163200900**	**9.0**	4.5	10	9.0	
1161201000	**1163201000**	**10.0**	5.0		10.0	
1161201200	**1163201200**	**12.0**	6.0	12	12.0	110
1161201400	**1163201400**	**14.0**	7.0	14	14.0	
1161201600	**1163201600**	**16.0**	8.0	16	16.0	140
1161201800	**1163201800**	**18.0**	9.0	18	18.0	
1161202000	**1163202000**	**20.0**	10.0	20	20.0	160
1161202500	**1163202500**	**25.0**	12.5	25	25.0	180

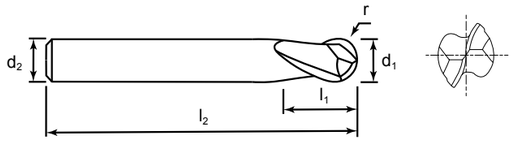
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: Good

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

2 FLUTE SHORT LENGTH BALL NOSE

MG < .5㎛ | 30° | N | FLUTE 2 | PLAIN | FLAT



Series No. 118120, 118320

▶ cutting conditions : p.103

Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1181200300	**1183200300**	**3.0**	1.5	6	4.0	50
1181200400	**1183200400**	**4.0**	2.0		5.0	54
1181200500	**1183200500**	**5.0**	2.5		6.0	
1181200600	**1183200600**	**6.0**	3.0		7.0	
1181200700	**1183200700**	**7.0**	3.5	8	8.0	58
1181200800	**1183200800**	**8.0**	4.0		9.0	
1181200900	**1183200900**	**9.0**	4.5	10	10.0	66
1181201000	**1183201000**	**10.0**	5.0		11.0	
1181201200	**1183201200**	**12.0**	6.0	12	12.0	73
1181201400	**1183201400**	**14.0**	7.0	14	14.0	75
1181201600	**1183201600**	**16.0**	8.0	16	16.0	82
1181201800	**1183201800**	**18.0**	9.0	18	18.0	84
1181202000	**1183202000**	**20.0**	10.0	20	20.0	92

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.020	h6

●: Excellent **O**: Good

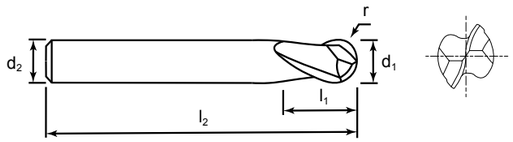
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●			O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O			O	O									

2 FLUTE LONG LENGTH BALL NOSE

MG < .5μm | 30° | N | FLUTE 2 | PLAIN | FLAT

Series No. 112120, 112320

▶ cutting conditions : p.104



Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1123200100**	**1.0**	0.5	4	2.5	50
-	**1123200120**	**1.2**	0.6		3.0	
-	**1123200150**	**1.5**	0.75		4.0	
1121200200	**1123200200**	**2.0**	1.0	6	5.0	
1121200300	**1123200300**	**3.0**	1.5		8.0	60
1121200400	**1123200400**	**4.0**	2.0		8.0	70
1121200500	**1123200500**	**5.0**	2.5		10.0	80
1121200600	**1123200600**	**6.0**	3.0		12.0	90
1121200700	**1123200700**	**7.0**	3.5	8	14.0	
1121200800	**1123200800**	**8.0**	4.0		14.0	100
1121200900	**1123200900**	**9.0**	4.5	10	18.0	
1121201000	**1123201000**	**10.0**	5.0		18.0	
1121201200	**1123201200**	**12.0**	6.0	12	22.0	110
1121201400	**1123201400**	**14.0**	7.0	14	26.0	
1121201600	**1123201600**	**16.0**	8.0	16	30.0	140
1121201800	**1123201800**	**18.0**	9.0	18	34.0	
1121202000	**1123202000**	**20.0**	10.0	20	38.0	160
1121202500	**1123202500**	**25.0**	12.5	25	50.0	180

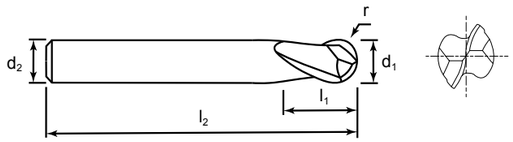
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.020	h6

●: Excellent **O**: Good

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

2 FLUTE LONG REACH BALL NOSE

MG < .5μm | 30° | N | FLUTE 2 | PLAIN



Series No. 114320

▶ cutting conditions : p.105

Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1143200200	**2.0**	1.0	3	6.0	80
1143200300	**3.0**	1.5		8.0	100
1143200400	**4.0**	2.0	4	8.0	
1143200500	**5.0**	2.5	6	10.0	120
1143200600	**6.0**	3.0		10.0	
1143200800	**8.0**	4.0	8	14.0	140
1143201000	**10.0**	5.0	10	18.0	180
1143201200	**12.0**	6.0	12	22.0	200
1143201600	**16.0**	8.0	16	30.0	250
1143202000	**20.0**	10.0	20	38.0	

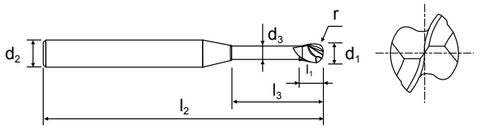
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.020	h6

●: Excellent **O**: Good

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

2 FLUTE RIB PROCESSING BALL NOSE

MG < .5㎛ | 30° | FLUTE 2 | PLAIN



Series No. 143320

▶ cutting conditions : p.109

Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1433200060	**0.6**	0.3	3	0.9	6	35	0.55
1433200080	**0.8**	0.4	4	1.2	6	45	0.75
1433200081	**0.8**	0.4	4	1.2	8	45	0.75
1433200100	**1.0**	0.5	4	1.5	6	45	0.97
1433200101	**1.0**	0.5	4	1.5	8	45	0.95
1433200102	**1.0**	0.5	4	1.5	12	45	0.93
1433200120	**1.2**	0.6	4	1.8	8	45	1.15
1433200121	**1.2**	0.6	4	1.8	12	45	1.13
1433200140	**1.4**	0.7	4	2.1	12	45	1.33
1433200150	**1.5**	0.75	4	2.3	8	45	1.45
1433200151	**1.5**	0.75	4	2.3	12	50	1.43
1433200152	**1.5**	0.75	4	2.3	16	50	1.41
1433200160	**1.6**	0.8	4	2.4	16	50	1.51
1433200180	**1.8**	0.9	4	2.7	16	50	1.71
1433200200	**2.0**	1.0	4	3.0	8	45	1.95
1433200201	**2.0**	1.0	4	3.0	16	50	1.91
1433200202	**2.0**	1.0	4	3.0	20	55	1.89
1433200300	**3.0**	1.5	6	4.5	16	55	2.85
1433200301	**3.0**	1.5	6	4.5	20	60	2.85
1433200400	**4.0**	2.0	6	6.0	16	60	3.85
1433200401	**4.0**	2.0	6	6.0	20	65	3.85

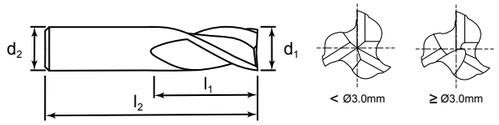
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.02	±0.010	h6

●: Excellent **O**: Good

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

3 FLUTE MINIATURE

MG < .5㎛ | 30° | N | FLUTE 3 | PLAIN | FLAT



Series No. 103120, 103320

▶ cutting conditions : p.110-111

The miniature end mill is universally adopted as the most cost effective system for small milling cutters and has the advantages of 2 flute and 4 flute end mills.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1033200100**	**1.0**	4	2.0	35
-	**1033200200**	**2.0**		4.0	
1031200300	**1033200300**	**3.0**	6	5.0	36
1031200400	**1033200400**	**4.0**		7.0	38
1031200500	**1033200500**	**5.0**		8.0	39
1031200600	**1033200600**	**6.0**		8.0	
1031200800	**1033200800**	**8.0**	8	11.0	43
1031201000	**1033201000**	**10.0**	10	13.0	50
1031201200	**1033201200**	**12.0**	12	15.0	55
1031201400	**1033201400**	**14.0**	14	15.0	58
1031201600	**1033201600**	**16.0**	16	18.0	62
1031201800	**1033201800**	**18.0**	18	20.0	70
1031202000	**1033202000**	**20.0**	20	22.0	75

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

●: Excellent **O**: Good

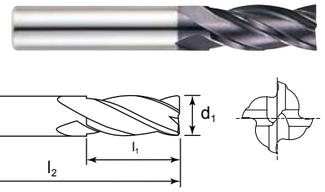
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●	O	O											
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O													

4 FLUTE SHORT LENGTH

MG < .5µm | 30° | N | FLUTE 4 | PLAIN | FLAT

Series No. 109120, 109320

▶ cutting conditions : p.112



Designed to machine tool steels, alloy steels, mould steels and other hardened materials.
4 flutes allow for better workpiece finishes.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1093200200**	**2.0**	4	6.0	40
-	**1093200250**	**2.5**		8.0	
1091200300	**1093200300**	**3.0**	6	8.0	45
1091200350	**1093200350**	**3.5**		10.0	
1091200400	**1093200400**	**4.0**		11.0	
1091200450	**1093200450**	**4.5**		11.0	
1091200500	**1093200500**	**5.0**		13.0	50
1091200550	**1093200550**	**5.5**		13.0	
1091200600	**1093200600**	**6.0**		13.0	
1091200650	**1093200650**	**6.5**	8	16.0	60
1091200700	**1093200700**	**7.0**		16.0	
1091200750	**1093200750**	**7.5**		16.0	
1091200800	**1093200800**	**8.0**		19.0	
1091200850	**1093200850**	**8.5**	10	19.0	70
1091200900	**1093200900**	**9.0**		19.0	
1091200950	**1093200950**	**9.5**		19.0	
1091201000	**1093201000**	**10.0**		22.0	

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

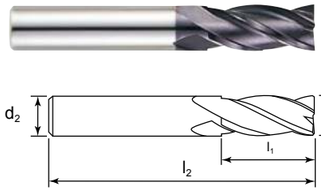
●: Excellent **O**: Good

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

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

4 FLUTE SHORT LENGTH

MG < .5µm | 30° | N | FLUTE 4 | PLAIN | FLAT



Series No. 109120, 109320

▶ cutting conditions : p.112

Designed to machine tool steels, alloy steels, mould steels and other hardened materials.
4 flutes allow for better workpiece finishes.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1091201050	**1093201050**	**10.5**	12	22.0	75
1091201100	**1093201100**	**11.0**		22.0	
1091201150	**1093201150**	**11.5**		22.0	
1091201200	**1093201200**	**12.0**		26.0	
1091201300	**1093201300**	**13.0**		26.0	85
1091201400	**1093201400**	**14.0**	14	26.0	
1091201500	**1093201500**	**15.0**	16	26.0	90
1091201600	**1093201600**	**16.0**		32.0	100
1091201700	**1093201700**	**17.0**		32.0	
1091201800	**1093201800**	**18.0**	18	32.0	
1091201900	**1093201900**	**19.0**	20	32.0	
1091202000	**1093202000**	**20.0**		38.0	105
1091202200	**1093202200**	**22.0**		38.0	
1091202400	**1093202400**	**24.0**	25	45.0	120
1091202500	**1093202500**	**25.0**		45.0	

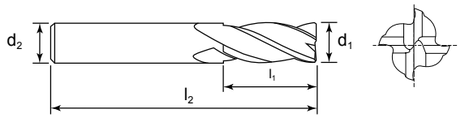
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

4 FLUTE LONG LENGTH

MG < .5㎛ | 30° | N | FLUTE 4 | PLAIN | FLAT



Series No. 111120, 111320

▶ cutting conditions : p.113

Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
4 flutes allow for better workpiece finishes.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1113200200**	**2.0**	4	8.0	40
1111200300	**1113200300**	**3.0**	6	12.0	50
1111200400	**1113200400**	**4.0**		15.0	
1111200500	**1113200500**	**5.0**		20.0	60
1111200600	**1113200600**	**6.0**		20.0	
1111200800	**1113200800**	**8.0**	8	25.0	70
1111201000	**1113201000**	**10.0**	10	30.0	90
1111201200	**1113201200**	**12.0**	12	30.0	
1111201400	**1113201400**	**14.0**	16	40.0	110
1111201600	**1113201600**	**16.0**		50.0	
1111201800	**1113201800**	**18.0**	20	50.0	
1111202000	**1113202000**	**20.0**		55.0	
1111202500	**1113202500**	**25.0**	25	75.0	140

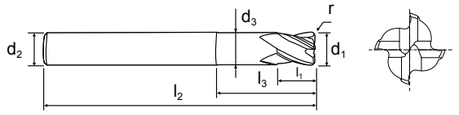
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

4 FLUTE STUB CUT LENGTH CORNER RADIUS

MG < .5㎛ | 30° | N | FLUTE 4 | PLAIN | FLAT



Series No. 156120, 156320

▶ cutting conditions : p.115

Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1561200200	**1563200200**	**2.0**	0.2	6	2.5	5.0	50	1.9
1561200250	**1563200250**	**2.5**	0.25		3.0	6.0		2.4
1561200300	**1563200300**	**3.0**	0.3		4.0	7.0		2.8
1561200350	**1563200350**	**3.5**	0.35		4.5	8.0		3.2
1561200400	**1563200400**	**4.0**	0.4		5.0	9.0		3.7
1561209001	**1563209001**	**4.0**	0.5		5.0	9.0		3.7
1561200500	**1563200500**	**5.0**	0.5		6.0	12.0		4.6
1561209002	**1563209002**	**6.0**	0.5		7.0	14.0	55	5.6
1561200600	**1563200600**	**6.0**	0.6		7.0	14.0	55	5.6
1561200800	**1563200800**	**8.0**	0.8	8	10.0	18.0	60	7.4
1561201000	**1563201000**	**10.0**	1.0	10	12.0	25.0	70	9.4
1561201200	**1563201200**	**12.0**	1.2	12	15.0	30.0	80	11.4
1561201600	**1563201600**	**16.0**	1.6	16	18.0	35.0	90	15.4

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

●: Excellent **O**: Good

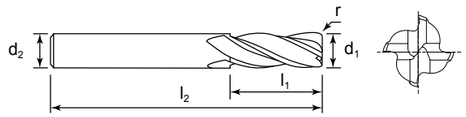
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●													
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O													

4 FLUTE LONG LENGTH CORNER RADIUS

MG < .5㎛ | 30° | N | FLUTE 4 | PLAIN | FLAT

Series No. 157120, 157320

▶ cutting conditions : p.114



Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1571200300	**1573200300**	**3.0**	0.3	6	12.0	50
1571200400	**1573200400**	**4.0**	0.3	6	15.0	50
1571209012	**1573209012**	**4.0**	0.5		15.0	
1571200500	**1573200500**	**5.0**	0.3	6	20.0	60
1571209013	**1573209013**	**5.0**	0.5		20.0	
1571209011	**1573209011**	**6.0**	0.3	6	20.0	60
1571200600	**1573200600**	**6.0**	0.5		20.0	
1571209001	**1573209001**	**6.0**	1.0		20.0	
1571200800	**1573200800**	**8.0**	0.5	8	25.0	70
1571209002	**1573209002**	**8.0**	1.0		25.0	
1571209003	**1573209003**	**8.0**	1.5		25.0	
1571209004	**1573209004**	**8.0**	2.0		25.0	
1571201000	**1573201000**	**10.0**	0.5	10	30.0	90
1571209005	**1573209005**	**10.0**	1.0		30.0	
1571209006	**1573209006**	**10.0**	1.5		30.0	
1571209007	**1573209007**	**10.0**	2.0		30.0	
1571201200	**1573201200**	**12.0**	0.5	12	30.0	
1571209008	**1573209008**	**12.0**	1.0		30.0	
1571209009	**1573209009**	**12.0**	1.5		30.0	
1571209010	**1573209010**	**12.0**	2.0		30.0	
1571201600	**1573201600**	**16.0**	0.5	16	50.0	110
1571209020	**1573209020**	**16.0**	1.0		50.0	
1571209021	**1573209021**	**16.0**	2.0		50.0	

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

●: Excellent **O**: Good

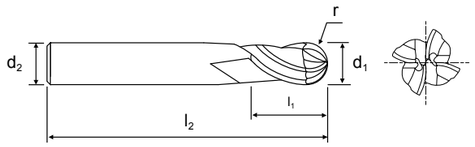
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●	O	O	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O			O	O									

4 FLUTE LONG LENGTH BALL NOSE

MG < .5㎛ | 30° | N | FLUTE 4 | PLAIN | FLAT

Series No. 115120, 115320

▶ cutting conditions : p.116



Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Can be used with copy milling machines.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
-	**1153200100**	**1.0**	0.5	4	2.5	50
-	**1153200150**	**1.5**	0.75		4	
1151200200	**1153200200**	**2.0**	1.0	6	5	
1151200300	**1153200300**	**3.0**	1.5		8	60
1151200400	**1153200400**	**4.0**	2.0		8	70
1151200500	**1153200500**	**5.0**	2.5		10	80
1151200600	**1153200600**	**6.0**	3.0		12	90
1151200700	**1153200700**	**7.0**	3.5	8	14	
1151200800	**1153200800**	**8.0**	4.0		14	100
1151200900	**1153200900**	**9.0**	4.5	10	18	
1151201000	**1153201000**	**10.0**	5.0		18	
1151201200	**1153201200**	**12.0**	6.0	12	22	110
1151201400	**1153201400**	**14.0**	7.0	14	26	
1151201600	**1153201600**	**16.0**	8.0	16	30	140
1151201800	**1153201800**	**18.0**	9.0	18	34	
1151202000	**1153202000**	**20.0**	10.0	20	38	160
1151202500	**1153202500**	**25.0**	12.5	25	50	180

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: Good

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

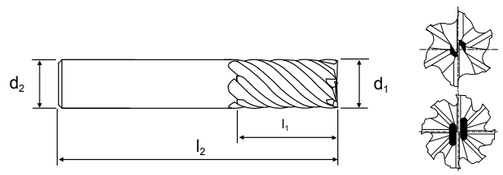
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

6 & 8 FLUTE LONG LENGTH 45º HELIX

MG < .5㎛ | 45° | N | FLUTE 6&8 | PLAIN | FLAT

Series No. 149120, 149320

▶ cutting conditions : p.118



Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Used for high speed, high feed finish milling.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTES z
1491200600	**1493200600**	**6.0**	6	13.0	57	6
1491200700	**1493200700**	**7.0**	8	16.0	63	6
1491200800	**1493200800**	**8.0**		19.0		6
1491200900	**1493200900**	**9.0**	10	19.0	72	6
1491201000	**1493201000**	**10.0**		22.0		6
1491201200	**1493201200**	**12.0**	12	26.0	83	6
1491201400	**1493201400**	**14.0**	14	26.0		6
1491201600	**1493201600**	**16.0**	16	32.0	92	6
1491201800	**1493201800**	**18.0**	18	32.0		8
1491202000	**1493202000**	**20.0**	20	38.0	104	8
1491202500	**1493202500**	**25.0**	25	44.0		8

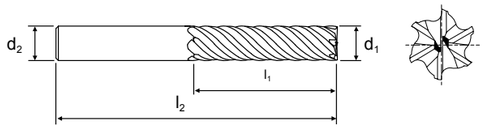
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

6 FLUTE EXTRA LONG LENGTH 45º HELIX

MG < .5㎛ | 45° | N | FLUTE 6 | PLAIN | FLAT



Series No. 150120, 150320

▶ cutting conditions : p.117

Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Used for high speed, high feed finish milling.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTES z
1501200600	**1503200600**	**6.0**	6	26.0	70	6
1501200800	**1503200800**	**8.0**	8	36.0	90	6
1501201000	**1503201000**	**10.0**	10	46.0	100	6
1501201200	**1503201200**	**12.0**	12	56.0	110	6
1501201600	**1503201600**	**16.0**	16	66.0	130	6
1501202000	**1503202000**	**20.0**	20	76.0	140	6
1501202500	**1503202500**	**25.0**	25	92.0	180	6

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

●: Excellent **O**: Good

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

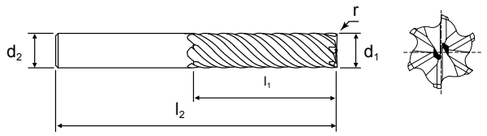
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

6 FLUTE LONG LENGTH 45° HELIX CORNER RADIUS

MG < .5µm | 45° | N | FLUTE 6 | PLAIN | FLAT

Series No. 158120, 158320

▶ cutting conditions : p.119



Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Used for high speed, high feed finish milling.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTES z
1581200600	**1583200600**	**6.0**	0.5	6	13.0	70	6
1581200800	**1583200800**	**8.0**	0.5	8	19.0	90	6
1581201000	**1583201000**	**10.0**	0.5	10	22.0	100	6
1581209001	**1583209001**	**10.0**	1.0		22.0		6
1581201200	**1583201200**	**12.0**	0.5	12	26.0	110	6
1581209002	**1583209002**	**12.0**	1.0		26.0		6
1581201600	**1583201600**	**16.0**	1.0	16	32.0	130	6
1581209003	**1583209003**	**16.0**	1.5		32.0		6
1581202000	**1583202000**	**20.0**	1.0	20	38.0	140	6
1581209004	**1583209004**	**20.0**	1.5		38.0		6
1581209005	**1583209005**	**20.0**	2.0		38.0		6

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

●: Excellent **O**: Good

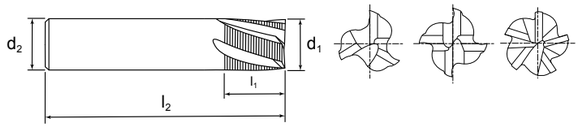
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●			O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O			O	O									

MULTI FLUTE ROUGHING SHORT LENGTH 20º HELIX

MG < .5µm | 20° | HR | FLUTE 3-5 | FINE | PLAIN | FLAT

Series No. 148120, 148320

▶ cutting conditions : p.120



Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Used for high speed, high feed milling.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTES z
1481200600	**1483200600**	**6.0**	6	7.0	54	3
1481200700	**1483200700**	**7.0**	8	8.0	58	3
1481200800	**1483200800**	**8.0**		9.0		3
1481200900	**1483200900**	**9.0**	10	13.0	66	4
1481201000	**1483201000**	**10.0**		14.0		4
1481201200	**1483201200**	**12.0**	12	16.0	73	4
1481201400	**1483201400**	**14.0**	14	18.0	75	4
1481201600	**1483201600**	**16.0**	16	22.0	82	4
1481201800	**1483201800**	**18.0**	18	24.0	84	4
1481202000	**1483202000**	**20.0**	20	26.0	92	4
1481202500	**1483202500**	**25.0**	25	25.0	110	5

Tolerances according to DIN 7160 & 7161

Tolerance range in µm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 − 48	0 − 58	0 − 70	0 − 84
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

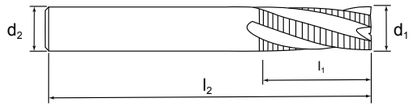
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●	O	O	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	●	O			O	O									

MULTI FLUTE ROUGHING LONG LENGTH 20º HELIX

MG < .5μm | 20° | HR | FLUTE 3-5 | FINE | PLAIN | FLAT

Series No. 147120, 147320

▶ cutting conditions : p.120



Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Used for high speed, high feed milling.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTES z
1471200600	**1473200600**	**6.0**	6	16.0	57	3
1471200700	**1473200700**	**7.0**	8	16.0	63	3
1471200800	**1473200800**	**8.0**		16.0		3
1471200900	**1473200900**	**9.0**	10	19.0	72	4
1471201000	**1473201000**	**10.0**		22.0		4
1471201200	**1473201200**	**12.0**	12	26.0	83	4
1471201400	**1473201400**	**14.0**	14	26.0		4
1471201600	**1473201600**	**16.0**	16	32.0	92	4
1471201800	**1473201800**	**18.0**	18	32.0		4
1471202000	**1473202000**	**20.0**	20	38.0	104	4
1471202500	**1473202500**	**25.0**	25	45.0	121	5

Tolerances according to DIN 7160 & 7161

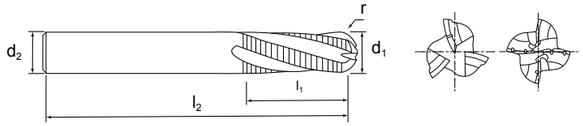
Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 − 48	0 − 58	0 − 70	0 − 84
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

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

3 & 4 FLUTE ROUGHING LONG LENGTH BALL NOSE

MG < .5μm | 20° | HR | FLUTE 3-4 | FINE | PLAIN | FLAT



Series No. 145120, 145320

▶ cutting conditions : p.121

Designed to machine tool steels, alloy steels, mould steels and other hardened materials. Used for high speed, high feed milling.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTES z
1451200600	**1453200600**	**6.0**	3.0	6	16.0	57	3
1451200800	**1453200800**	**8.0**	4.0	8	16.0	63	3
1451201000	**1453201000**	**10.0**	5.0	10	22.0	72	4
1451201200	**1453201200**	**12.0**	6.0	12	26.0	83	4
1451201400	**1453201400**	**14.0**	7.0	14	26.0		4
1451201600	**1453201600**	**16.0**	8.0	16	32.0	92	4
1451201800	**1453201800**	**18.0**	9.0	18	32.0		4
1451202000	**1453202000**	**20.0**	10.0	20	38.0	104	4

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 − 48	0 − 58	0 − 70	0 − 84
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13
RADIUS r	±0.02	±0.02	±0.02	±0.02

●: Excellent **O**: Good

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

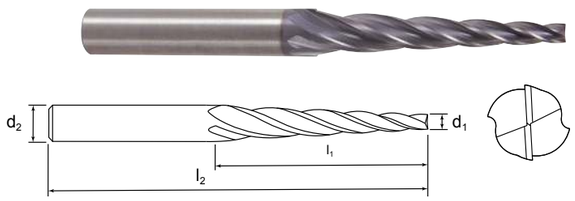
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

4 FLUTE TAPER 25º HELIX RIB PROCESSING

MG < .5㎛ | 25° | FLUTE 4 | PLAIN

Series No. 120320

▶ cutting conditions : p.122



Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

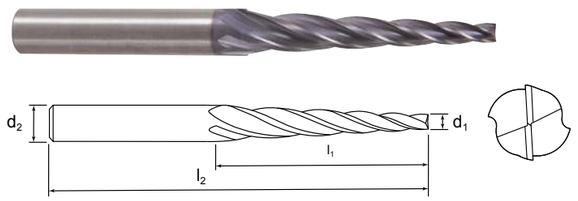
EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	TAPER ANGLE (per side)	OVERALL LENGTH l_2
1203200100	**1.0**	4	8.0	30'	45
1203200101	**1.0**	4	12.0	30'	45
1203200102	**1.0**	4	8.0	1°	45
1203200103	**1.0**	4	12.0	1°	45
1203200104	**1.0**	4	8.0	1° 30'	45
1203200105	**1.0**	4	12.0	1° 30'	45
1203200106	**1.0**	4	8.0	2°	45
1203200107	**1.0**	4	12.0	2°	45
1203200120	**1.2**	4	8.0	30'	45
1203200121	**1.2**	4	12.0	30'	45
1203200122	**1.2**	4	8.0	1°	45
1203200123	**1.2**	4	12.0	1°	45
1203200124	**1.2**	4	8.0	1° 30'	45
1203200125	**1.2**	4	12.0	1° 30'	45
1203200126	**1.2**	4	8.0	2°	45
1203200127	**1.2**	4	12.0	2°	45

MILL DIA TOLERANCE(mm)	TAPER ANGLE TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	±5'	0~-0.008

●: Excellent **O**: Good

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

4 FLUTE TAPER 25º HELIX RIB PROCESSING



MG < .5㎛ | 25° | FLUTE 4 | PLAIN

Series No. 120320

▶ cutting conditions : p.122

Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	TAPER ANGLE (per side)	OVERALL LENGTH l_2
1203200150	**1.5**	4	8.0	30'	45
1203209001	**1.5**	4	12.0	30'	45
1203209002	**1.5**	4	16.0	30'	50
1203209003	**1.5**	4	8.0	1°	45
1203209004	**1.5**	4	12.0	1°	45
1203209005	**1.5**	4	16.0	1°	50
1203209006	**1.5**	4	8.0	1° 30'	45
1203209007	**1.5**	4	12.0	1° 30'	45
1203209008	**1.5**	4	16.0	1° 30'	50
1203209009	**1.5**	4	8.0	2°	45
1203209010	**1.5**	4	12.0	2°	45
1203209011	**1.5**	4	16.0	2°	50
1203200200	**2.0**	4	12.0	30'	45
1203200201	**2.0**	4	16.0	30'	50
1203200202	**2.0**	4	12.0	1°	45
1203200203	**2.0**	4	16.0	1°	50
1203200204	**2.0**	4	12.0	1° 30'	45
1203200205	**2.0**	4	16.0	1° 30'	50
1203200206	**2.0**	4	12.0	2°	45
1203200207	**2.0**	4	16.0	2°	50

MILL DIA TOLERANCE(mm)	TAPER ANGLE TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	±5'	0~-0.008

●: Excellent **O**: Good

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

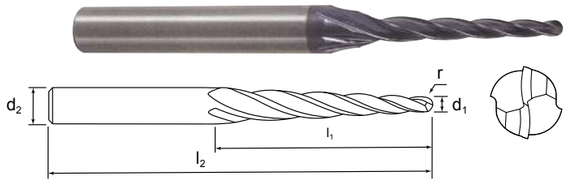
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

4 FLUTE TAPER 25º HELIX BALL NOSE RIB PROCESSING

MG < .5㎛ | 25° | FLUTE 4 | PLAIN

Series No. 130320

▶ cutting conditions : p.123



Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	TAPER ANGLE (per side)	OVERALL LENGTH l_2
1303200100	**1.0**	0.5	4	8.0	30'	45
1303200101	**1.0**	0.5	4	12.0	30'	45
1303200102	**1.0**	0.5	4	8.0	1°	45
1303200103	**1.0**	0.5	4	12.0	1°	45
1303200104	**1.0**	0.5	4	8.0	1° 30'	45
1303200105	**1.0**	0.5	4	12.0	1° 30'	45
1303200106	**1.0**	0.5	4	8.0	2°	45
1303200107	**1.0**	0.5	4	12.0	2°	45
1303200120	**1.2**	0.6	4	8.0	30'	45
1303200121	**1.2**	0.6	4	12.0	30'	45
1303200122	**1.2**	0.6	4	8.0	1°	45
1303200123	**1.2**	0.6	4	12.0	1°	45
1303200124	**1.2**	0.6	4	8.0	1° 30'	45
1303200125	**1.2**	0.6	4	12.0	1° 30'	45
1303200126	**1.2**	0.6	4	8.0	2°	45
1303200127	**1.2**	0.6	4	12.0	2°	45
1303200150	**1.5**	0.75	4	8.0	30'	45
1303209001	**1.5**	0.75	4	12.0	30'	45
1303209002	**1.5**	0.75	4	16.0	30'	50
1303209003	**1.5**	0.75	4	8.0	1°	45

MILL DIA TOLERANCE(mm)	TAPER ANGLE TOLERANCE	SHANK DIA TOLERANCE	RADIUS r TOLERANCE
0~-0.015	±5'	0~-0.008	±0.01

●: Excellent **O**: Good

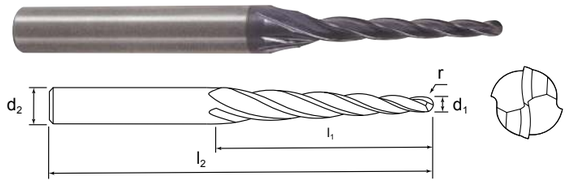
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O	●			O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	●	O			O	O									

4 FLUTE TAPER 25º HELIX BALL NOSE RIB PROCESSING

MG < .5㎛ | 25° | FLUTE 4 | PLAIN

Series No. 130320

▶ cutting conditions : p.123



Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE PLAIN	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	TAPER ANGLE (per side)	OVERALL LENGTH l_2
1303209004	**1.5**	0.75	4	12.0	1°	45
1303209005	**1.5**	0.75	4	16.0	1°	50
1303209006	**1.5**	0.75	4	8.0	1° 30'	45
1303209007	**1.5**	0.75	4	12.0	1° 30'	45
1303209008	**1.5**	0.75	4	16.0	1° 30'	50
1303209009	**1.5**	0.75	4	8.0	2°	45
1303209010	**1.5**	0.75	4	12.0	2°	45
1303209011	**1.5**	0.75	4	16.0	2°	50
1303200200	**2.0**	1.0	4	12.0	30'	45
1303200201	**2.0**	1.0	4	16.0	30'	50
1303200202	**2.0**	1.0	4	12.0	1°	45
1303200203	**2.0**	1.0	4	16.0	1°	50
1303200204	**2.0**	1.0	4	12.0	1° 30'	45
1303200205	**2.0**	1.0	4	16.0	1° 30'	50
1303200206	**2.0**	1.0	4	12.0	2°	45
1303200207	**2.0**	1.0	4	16.0	2°	50

MILL DIA TOLERANCE(mm)	TAPER ANGLE TOLERANCE	SHANK DIA TOLERANCE	RADIUS r TOLERANCE
0~-0.015	±5'	0~-0.008	±0.01

●: Excellent **O**: Good

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

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

EUROPA TOOL

Clarkson

sborn

PULSAR
CUTTING DATA

PULSAR CUTTING CONDITION

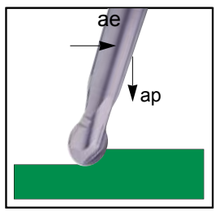
152320, 153320 (2 Flute Sphere)

MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	13	< 30-40	v_c (m/min)	310	315	315	300	300	315	300	275
	14		n	33000	25000	20000	16000	12000	10000	8000	5500
			f_z	0.039	0.044	0.05	0.056	0.067	0.07	0.081	0.1
			f (mm/min)	2600	2200	2000	1800	1600	1400	1300	1100
H	15	45-65	v_c (m/min)	115	115	110	115	115	110	115	100
	16		n	12000	9000	7000	6000	4500	3500	3000	2000
			f_z	0.038	0.044	0.05	0.054	0.061	0.071	0.075	0.1
			f (mm/min)	900	800	700	650	550	500	450	400
K	31		v_c (m/min)	330	325	330	320	325	330	340	300
	32		n	35000	26000	21000	17000	13000	10500	9000	6000
	33		f_z	0.04	0.044	0.05	0.056	0.065	0.069	0.078	0.1
	34		f (mm/min)	2800	2300	2100	1900	1700	1450	1400	1200

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	13	< 30-40	v_c (m/min)	415	415	425	415	425	410	415	400
	14		n	44000	33000	27000	22000	17000	13000	11000	8000
			f_z	0.04	0.045	0.048	0.055	0.062	0.073	0.082	0.094
			f (mm/min)	3500	3000	2600	2400	2100	1900	1800	1500
H	15	45-65	v_c (m/min)	160	165	155	150	150	155	150	165
	16		n	17000	13000	10000	8000	6000	5000	4000	3300
			f_z	0.041	0.046	0.055	0.059	0.071	0.075	0.088	0.091
			f (mm/min)	1400	1200	1100	950	850	750	700	600
K	31		v_c (m/min)	445	440	440	435	450	440	450	450
	32		n	47000	35000	28000	23000	18000	14000	12000	9000
	33		f_z	0.039	0.046	0.05	0.057	0.064	0.071	0.075	0.089
	34		f (mm/min)	3700	3200	2800	2600	2300	2000	1800	1600

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

▶ ap = 0.05 x D
▶ ae = 0.02 x D



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.

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

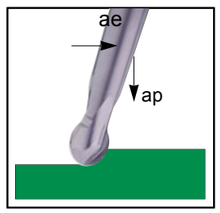
154320 (4 Flute Sphere)

MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	13	< 30-40	v_c (m/min)	310	315	315	300	300	315	300	375
	14		n	33000	25000	20000	16000	12000	10000	8000	5500
			f_z	0.038	0.042	0.05	0.055	0.063	0.063	0.078	0.1
			f (mm/min)	5000	4200	4000	3500	3000	2500	2500	2200
H	15	45-65	v_c (m/min)	115	115	110	115	115	110	115	100
	16		n	12000	9000	7000	6000	4500	3500	3000	2000
			f_z	0.035	0.04	0.05	0.054	0.061	0.071	0.079	0.1
			f (mm/min)	1700	1400	1400	1300	1100	1000	950	800
K	31		v_c (m/min)	330	325	330	320	325	330	340	300
	32		n	35000	26000	21000	17000	13000	10500	9000	6000
	33		f_z	0.039	0.042	0.048	0.059	0.067	0.071	0.078	0.117
	34		f (mm/min)	5400	4300	4000	4000	3500	3000	2800	2800

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	13	< 30-40	v_c (m/min)	415	415	425	415	425	410	415	400
	14		n	44000	33000	27000	22000	17000	13000	11000	8000
			f_z	0.039	0.044	0.049	0.056	0.063	0.071	0.08	0.094
			f (mm/min)	6800	5800	5300	4900	4300	3700	3500	3000
H	15	45-65	v_c (m/min)	160	165	155	150	150	155	150	165
	16		n	17000	13000	10000	8000	6000	5000	4000	3300
			f_z	0.035	0.04	0.048	0.053	0.061	0.07	0.072	0.083
			f (mm/min)	2300	2100	2100	1900	1700	1400	1300	1100
K	31		v_c (m/min)	445	440	440	435	450	440	450	450
	32		n	47000	35000	28000	23000	18000	14000	12000	9000
	33		f_z	0.038	0.044	0.05	0.055	0.064	0.07	0.077	0.086
	34		f (mm/min)	7100	6100	5600	5100	4600	3900	3700	3100

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

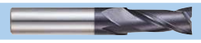
▶ ap = 0.05 x D
▶ ae = 0.02 x D



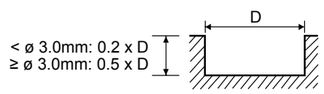
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR CUTTING CONDITION

100120, 100320 (2 Flute Short)



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
P	11 12	< 30	v_c (m/min)	60	65	75	80	85	85	80	85	90	85	85
			n	9250	7150	6050	5050	4450	3360	2600	2200	1760	1350	1090
			f_z	0.01	0.015	0.025	0.032	0.039	0.057	0.063	0.064	0.063	0.063	0.06
			f (mm/min)	190	210	300	320	350	380	330	280	220	170	130
	13 14	30-45	v_c (m/min)	40	40	45	45	50	50	50	50	55	55	55
			n	6050	4450	3700	3020	2690	2020	1600	1350	1090	850	670
			f_z	0.01	0.016	0.024	0.031	0.041	0.05	0.05	0.048	0.05	0.047	0.052
			f (mm/min)	120	140	180	190	220	200	160	130	110	80	70
H	15 16	45-55	v_c (m/min)	25	25	30	30	30	35	35	35	35	35	35
			n	4030	2690	2350	1860	1600	1350	1090	930	720	550	430
			f_z	0.004	0.007	0.009	0.013	0.017	0.028	0.028	0.03	0.028	0.027	0.023
			f (mm/min)	35	40	40	50	55	75	60	55	40	30	20
	15 16	55-65	v_c (m/min)	15	20	20	20	20	20	20	20	20	20	20
			n	2300	1900	1480	1260	1100	840	680	560	440	320	260
			f_z	0.008	0.011	0.014	0.016	0.018	0.024	0.026	0.031	0.023	0.031	0.029
			f (mm/min)	35	40	40	40	40	40	35	35	20	20	15
M	21 22		v_c (m/min)	30	35	40	40	45	40	40	40	45	40	45
			n	5050	3700	3100	2530	2270	1680	1350	1090	850	670	550
			f_z	0.009	0.016	0.024	0.032	0.04	0.054	0.059	0.06	0.065	0.06	0.055
			f (mm/min)	90	120	150	160	180	180	160	130	110	80	60
K	31		v_c (m/min)	60	65	75	80	85	85	80	85	90	85	85
	32		n	9250	7150	6050	5050	4450	3360	2600	2200	1760	1350	1090
	33		f_z	0.01	0.015	0.025	0.032	0.039	0.057	0.063	0.064	0.063	0.063	0.06
	34		f (mm/min)	190	210	300	320	350	380	330	280	220	170	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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

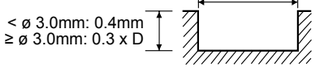
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

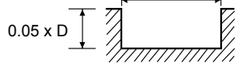
102120, 102320 (2 Flute Long)

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
P	11 12	< 30	v_c (m/min)	50	50	55	55	60	60	65	60	70	65	65
			n	7560	5290	4280	3660	3160	2400	2020	1640	1390	1010	820
			f_z	0.005	0.008	0.012	0.017	0.024	0.033	0.04	0.038	0.041	0.042	0.044
			f (mm/min)	70	85	100	125	150	160	160	125	115	85	70
	13 14	30-45	v_c (m/min)	40	40	45	45	50	50	50	50	55	50	50
			n	6050	4280	3410	2900	2520	1900	1640	1390	1070	820	630
			f_z	0.005	0.008	0.012	0.017	0.025	0.033	0.038	0.041	0.042	0.037	0.037
			f (mm/min)	60	70	85	100	125	125	125	115	90	60	45
H	15 16	45-55	v_c (m/min)	25	25	25	30	30	30	30	30	35	30	30
			n	3780	2640	2150	1900	1640	1260	1010	840	670	500	380
			f_z	0.004	0.007	0.009	0.012	0.018	0.024	0.03	0.027	0.03	0.03	0.03
			f (mm/min)	30	35	40	45	60	60	60	45	40	30	20
K	31		v_c (m/min)	50	50	55	55	60	60	65	60	70	65	65
	32		n	7560	5290	4280	3660	3160	2400	2020	1640	1390	1010	820
	33		f_z	0.005	0.008	0.012	0.017	0.024	0.033	0.04	0.038	0.041	0.042	0.044
	34		f (mm/min)	70	85	100	125	150	160	160	125	115	85	70

< HRc45



> HRc45



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

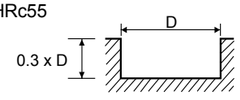
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR CUTTING CONDITION

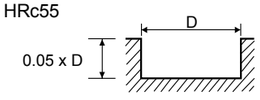
155120, 155320 (2 Flute Long, Corner Radius)

MATERIAL GROUP		HRc		Size (mm) 4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	11	< 30	v_c (m/min)	65	70	75	75	80	80	85	80
	12		n	5360	4580	3950	3000	2520	2060	1740	1260
			f_z	0.016	0.023	0.032	0.045	0.054	0.051	0.055	0.056
			f (mm/min)	170	210	250	270	270	210	190	140
	13	30-45	v_c (m/min)	45	45	50	50	50	50	55	50
	14		n	3410	2900	2520	1900	1640	1390	1070	820
			f_z	0.012	0.017	0.025	0.033	0.038	0.041	0.042	0.037
			f (mm/min)	85	100	125	125	125	115	90	60
H	15	45-55	v_c (m/min)	25	30	30	30	30	30	35	30
	16		n	2150	1900	1640	1260	1010	840	670	500
			f_z	0.009	0.013	0.018	0.024	0.03	0.03	0.03	0.03
			f (mm/min)	40	50	60	60	60	50	40	30
	15	55-65	v_c (m/min)	20	20	20	20	20	20	20	20
	16		n	1470	1260	1160	840	670	550	440	340
			f_z	0.007	0.01	0.015	0.021	0.026	0.023	0.023	0.022
			f (mm/min)	20	25	35	35	35	25	20	15
K	31		v_c (m/min)	65	70	75	75	80	80	85	80
	32		n	5360	4580	3950	3000	2520	2060	1740	1260
	33		f_z	0.016	0.023	0.032	0.045	0.054	0.051	0.055	0.056
	34		f (mm/min)	170	210	250	270	270	210	190	140

< HRc55



> HRc55



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

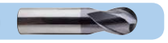
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

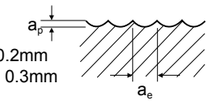
PULSAR CUTTING CONDITION

118120, 118320 (2 Flute Short, Ball Nose)



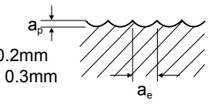
MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	95	105	115	130	145	160	175	190	205
	14		n	10000	8400	7300	6900	5770	5090	4640	3780	3260
			f_z	0.023	0.032	0.04	0.06	0.08	0.1	0.12	0.14	0.16
			f (mm/min)	460	530	580	830	920	1020	1110	1060	1040
H	15	45-65	v_c (m/min)	45	55	60	60	62	65	65	70	70
	16		n	4520	4200	3680	3180	2470	2040	1750	1350	1110
			f_z	0.017	0.021	0.024	0.03	0.045	0.055	0.07	0.091	0.113
			f (mm/min)	150	180	180	190	220	225	245	245	250
K	31		v_c (m/min)	125	130	145	160	180	200	220	240	260
	32		n	13100	10500	9140	8490	7160	6370	5840	4770	4140
	33		f_z	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
	34		f (mm/min)	680	740	820	1020	1290	1530	1750	1720	1660

< HRc45



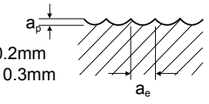
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.2 x D

> HRc45



a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.1 x D

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	200	265	330	395	420	440	460	480	500
	14		n	21000	21000	21000	21000	16700	14000	12200	9550	7960
			f_z	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			f (mm/min)	2000	2940	3600	4000	4000	3900	3900	3450	3180
H	15	45-65	v_c (m/min)	160	170	190	200	210	220	230	240	250
	16		n	17000	13660	12000	10500	8360	7000	6100	4770	3980
			f_z	0.031	0.042	0.05	0.06	0.075	0.086	0.095	0.105	0.116
			f (mm/min)	1040	1160	1200	1250	1250	1200	1160	1000	920
K	31		v_c (m/min)	200	265	330	395	420	440	460	480	500
	32		n	21000	21000	21000	21000	16700	14000	12200	9550	7960
	33		f_z	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
	34		f (mm/min)	2000	2940	3600	4000	4000	3900	3900	3450	3180



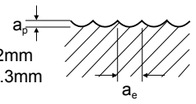
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x D

PULSAR CUTTING CONDITION

112120, 112320 (2 Flute Long, Ball Nose)

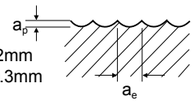
MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	40	65	95	105	115	130	145	160	175	190	205
			n	12720	10700	10000	8400	7300	6900	5770	5090	4640	3780	3260
	14		f_z	0.008	0.023	0.023	0.032	0.04	0.06	0.08	0.1	0.12	0.14	0.16
			f (mm/min)	200	490	460	530	580	830	920	1020	1110	1060	1040
H	15	45-65	v_c (m/min)	20	30	45	55	60	60	62	65	65	70	70
			n	5800	4680	4520	4200	3680	3180	2470	2040	1750	1350	1110
	16		f_z	0.008	0.016	0.017	0.021	0.024	0.03	0.045	0.055	0.07	0.091	0.113
			f (mm/min)	90	150	150	180	180	190	220	225	245	245	250
K	31		v_c (m/min)	50	90	125	130	145	160	180	200	220	240	260
	32		n	15760	14400	13100	10500	9140	8490	7160	6370	5840	4770	4140
	33		f_z	0.008	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
	34		f (mm/min)	250	750	680	740	820	1020	1290	1530	1750	1720	1660

< HRc45



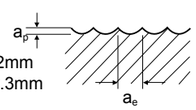
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.2 x D

> HRc45



a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.1 x D

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	80	130	200	265	330	395	420	440	460	480	500
			n	25000	21000	21000	21000	21000	21000	16700	14000	12200	9550	7960
	14		f_z	0.026	0.035	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
			f (mm/min)	1300	1480	2000	2940	3600	4000	4000	3900	3900	3450	3180
H	15	45-65	v_c (m/min)	80	130	160	170	190	200	210	220	230	240	250
			n	25000	21000	17000	13660	12000	10500	8360	7000	6100	4770	3980
	16		f_z	0.016	0.022	0.031	0.042	0.05	0.06	0.075	0.086	0.095	0.105	0.116
			f (mm/min)	800	940	1040	1160	1200	1250	1250	1200	1160	1000	920
K	31		v_c (m/min)	80	130	200	265	330	395	420	440	460	480	500
	32		n	25000	21000	21000	21000	21000	21000	16700	14000	12200	9550	7960
	33		f_z	0.026	0.035	0.048	0.07	0.086	0.095	0.12	0.139	0.16	0.181	0.2
	34		f (mm/min)	1300	1480	2000	2940	3600	4000	4000	3900	3900	3450	3180



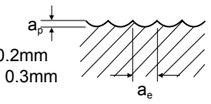
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x D

PULSAR CUTTING CONDITION

114320 (2 Flute Long Reach, Ball Nose)

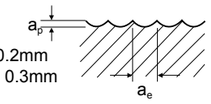
MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)									
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	60	75	85	90	105	115	130	140	150	165
			n	9250	8000	6720	5840	5500	4600	4070	3700	3000	2600
	14		f_z	0.014	0.023	0.031	0.039	0.055	0.08	0.101	0.12	0.142	0.16
			f (mm/min)	260	370	420	460	600	740	820	890	850	830
H	15	45-65	v_c (m/min)	25	35	40	45	50	50	50	55	55	55
			n	3870	3620	3360	2940	2550	2000	1650	1400	1100	890
	16		f_z	0.012	0.017	0.021	0.024	0.029	0.044	0.055	0.07	0.089	0.112
			f (mm/min)	90	120	140	140	150	175	180	195	195	200
K	31		v_c (m/min)	80	100	105	115	130	145	160	175	190	205
	32		n	12600	10500	8400	7310	6800	5700	5100	4700	3800	3300
	33		f_z	0.017	0.026	0.035	0.045	0.06	0.09	0.12	0.149	0.182	0.202
	34		f (mm/min)	420	540	590	660	820	1030	1220	1400	1380	1330

< HRc45



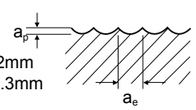
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.2 x D

> HRc45



a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.1 x D

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)									
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	105	160	210	265	315	335	350	370	380	400
			n	16800	16800	16800	16800	16800	13400	11200	9800	7600	6400
	14		f_z	0.036	0.048	0.07	0.086	0.095	0.119	0.138	0.158	0.181	0.199
			f (mm/min)	1200	1600	2350	2880	3200	3200	3100	3100	2750	2550
H	15	45-65	v_c (m/min)	105	130	135	150	160	170	175	185	190	200
			n	16800	13600	10930	9600	8400	6700	5600	4900	3800	3200
	16		f_z	0.022	0.031	0.043	0.05	0.06	0.075	0.086	0.095	0.105	0.116
			f (mm/min)	750	830	930	960	1000	1000	960	930	800	740
K	31		v_c (m/min)	105	160	210	265	315	335	350	370	380	400
	32		n	16800	16800	16800	16800	16800	13400	11200	9800	7600	6400
	33		f_z	0.036	0.048	0.07	0.086	0.095	0.119	0.138	0.158	0.181	0.199
	34		f (mm/min)	1200	1600	2350	2880	3200	3200	3100	3100	2750	2550



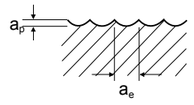
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x D

PULSAR CUTTING CONDITION

116120, 116320 (2 Flute Stub, Ball Nose, >HRc55)

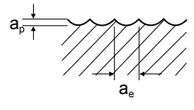
MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
H	15	45-50	v_c (m/min)	65	90	120	135	150	160	175	190	205	220	220
			n	20000	14500	12700	10600	9400	8600	7000	6050	5450	4350	3500
			f_z	0.012	0.028	0.043	0.052	0.059	0.067	0.0775	0.083	0.092	0.1	0.099
	16		f (mm/min)	460	800	1100	1100	1100	1150	1050	1000	1000	870	690
	15	50-55	v_c (m/min)	65	90	115	130	140	155	170	180	195	210	205
			n	20000	14200	12300	10300	9050	8250	6700	5800	5200	4150	3300
	16		f_z	0.01	0.026	0.043	0.051	0.058	0.067	0.075	0.083	0.092	0.1	0.098
			f (mm/min)	400	740	1050	1050	1050	1100	1000	960	960	830	650
	15	55-60	v_c (m/min)	65	85	110	125	135	150	160	170	185	195	200
			n	20000	13850	11800	9800	8600	7850	6350	5450	4900	3900	3150
	16		f_z	0.009	0.027	0.042	0.051	0.055	0.061	0.075	0.083	0.092	0.105	0.1
			f (mm/min)	350	760	1000	1000	950	950	950	900	900	820	630
	15	60-70	v_c (m/min)	65	70	80	85	90	90	95	100	105	110	105
			n	20000	11300	8400	6650	5600	4850	3800	3200	2750	2150	1700
	16		f_z	0.006	0.021	0.039	0.049	0.061	0.072	0.086	0.097	0.111	0.062	0.065
			f (mm/min)	240	465	660	650	680	700	650	620	610	265	220

a_p: ø1.0mm - 4.0mm = 0.05 x D
a_p: ø5.0mm - 8.0mm = 0.25mm
a_p: ø10.0mm - 20.0mm = 0.3mm
a_e: 0.1 x D



MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
H	15	45-50	v_c (m/min)	65	90	120	135	150	160	175	190	205	220	220
			n	20000	14500	12700	10600	9400	8600	7000	6050	5450	4350	3500
			f_z	0.019	0.045	0.069	0.08	0.088	0.102	0.111	0.12	0.13	0.141	0.143
	16		f (mm/min)	770	1300	1750	1700	1650	1750	1550	1450	1420	1230	1000
	15	50-55	v_c (m/min)	65	90	115	130	140	155	170	180	195	210	205
			n	20000	14200	12300	10300	9050	8250	6700	5800	5200	4150	3300
	16		f_z	0.018	0.043	0.068	0.079	0.087	0.101	0.109	0.117	0.128	0.136	0.136
			f (mm/min)	700	1230	1670	1620	1570	1670	1460	1360	1330	1130	900
	15	55-70	v_c (m/min)	65	85	110	125	135	150	160	170	185	195	200
			n	20000	13850	11800	9800	8600	7850	6350	5450	4900	3900	3150
	16		f_z	0.01	0.025	0.036	0.044	0.05	0.055	0.07	0.08	0.08	0.062	0.065
			f (mm/min)	410	700	860	860	860	865	890	870	785	485	410

a_p: ø1.0mm - 4.0mm = 0.05 x D
a_p: ø5.0mm - 8.0mm = 0.25mm
a_p: ø10.0mm - 20.0mm = 0.3mm
a_e: 0.05 x D



PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

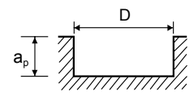
PULSAR CUTTING CONDITION

100320 (2 Flute Miniature)

MATERIAL GROUP		HARDNESS HRc		Size (mm)											
				0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
P	13	30-45	v_c (m/min)	40	45	50	55	60	60	65	65	60	60	55	55
			n	30000	28500	26500	25000	24000	21000	20000	18500	16000	14500	12500	12000
	14		f_z	0.002	0.002	0.002	0.003	0.003	0.004	0.004	0.004	0.005	0.005	0.006	0.006
			f (mm/min)	90	115	100	150	150	160	160	150	160	150	150	150
H	15	45-55	v_c (m/min)	30	35	35	40	45	45	45	45	45	45	40	40
			n	23000	22000	18500	1800	18000	16000	15000	13000	12000	11000	9000	9000
	16		f_z	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.004
			f (mm/min)	50	45	40	40	65	65	75	75	75	70	70	70

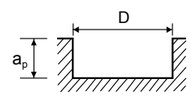
< HRc45

a_p: < ø1.0mm = 0.15 x D
a_p: ≥ ø1.0mm = 0.25 x D



> HRc45

a_p: < ø1.0mm = 0.02 x D
a_p: ≥ ø1.0mm = 0.05 x D

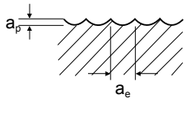


105320 (2 Flute Miniature, Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)									
				0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
P	13	30-45	v_c (m/min)	55	60	70	75	80	85	90	95	100	110
			n	30000	27000	27000	26500	25000	24500	24000	23500	23000	23000
	14		f_z	0.009	0.009	0.01	0.011	0.011	0.011	0.012	0.012	0.013	0.013
			f (mm/min)	510	490	560	560	560	540	570	550	590	600
H	15	45-55	v_c (m/min)	55	60	70	75	80	85	90	95	100	110
			n	30000	27000	27000	26500	25000	24500	24000	23500	23000	23000
	16		f_z	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.008	0.008
			f (mm/min)	360	330	330	320	340	340	350	320	360	370
K	31		v_c (m/min)	55	60	70	75	80	85	90	95	100	110
	32		n	30000	27000	27000	26500	25000	24500	24000	23500	23000	23000
	33		f_z	0.009	0.009	0.01	0.011	0.011	0.011	0.012	0.012	0.013	0.013
	34		f (mm/min)	510	490	560	560	560	540	570	550	590	600

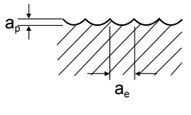
< HRc45

a_p: < ø1.0mm = 0.05 X D
a_p: ≥ ø1.0mm = 0.075 x D
a_e: 0.15 x D



> HRc45

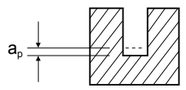
a_p: 0.05 x D
a_e: < ø1.0mm = 0.1 x D
a_e: ≥ ø1.0mm = 0.15 x D



PULSAR CUTTING CONDITION

107320, 108320 (2 Flute Rib Processing)

MATERIAL GROUP		HARDNESS HRc		Size (mm)									
				0.8	**1.0**	**1.2**	**1.4**	**1.5**	**1.6**	**1.8**	**2.0**	**2.5**	**3.0**
P	11	**< 30**	a_p (mm)	0.025	0.065	0.075	0.095	0.1	0.11	0.12	0.135	0.175	0.195
			v_c (m/min)	78	79	79	79	78	80	84	83	85	85
	12		n	31000	25000	21000	18000	16500	16000	15000	13000	11000	9000
			f_z	0.007	0.01	0.014	0.016	0.017	0.018	0.019	0.021	0.023	0.031
			f (mm/min)	435	500	580	580	560	570	560	550	500	500
	13	**30-45**	a_p (mm)	0.023	0.064	0.074	0.093	0.098	0.1	0.11	0.12	0.16	0.19
			v_c (m/min)	55	56	55	56	57	58	59	60	60	60
	14		n	22000	18000	15000	13000	12000	11500	10500	9500	7500	6300
			f_z	0.006	0.009	0.012	0.015	0.016	0.017	0.018	0.02	0.022	0.03
			f (mm/min)	260	320	350	380	380	390	370	380	330	380
H	15	**45-55**	a_p (mm)	0.011	0.013	0.015	0.018	0.021	0.023	0.024	0.026	0.033	0.042
			v_c (m/min)	34	35	36	36	36	36	37	37	38	37
	16		n	13500	11000	9500	8000	7500	7000	6500	5500	4500	4000
			f_z	0.003	0.004	0.005	0.006	0.007	0.007	0.008	0.008	0.01	0.012
			f (mm/min)	80	90	95	95	100	100	100	95	95	95
K	31		a_p (mm)	0.025	0.065	0.075	0.095	0.1	0.11	0.12	0.135	0.175	0.195
	32		v_c (m/min)	78	79	79	79	78	80	84	83	85	85
			n	31000	25000	21000	18000	16500	16000	15000	13000	11000	9000
	33		f_z	0.007	0.01	0.014	0.016	0.017	0.018	0.019	0.021	0.023	0.031
	34		f (mm/min)	435	500	580	580	560	570	560	550	500	500



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

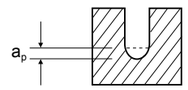
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

143320 (2 Flute Rib Processing, Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)									
				0.6	**0.8**	**1.0**	**1.2**	**1.4**	**1.5**	**1.6**	**1.8**	**2.0**	**3.0**	**4.0**
P	11	**< 30**	a_p (mm)	0.04	0.054	0.067	0.077	0.093	0.102	0.11	0.12	0.135	0.19	0.27
			v_c (m/min)	66	99	103	102	103	102	104	109	108	111	122
	12		n	35000	39500	33000	27000	23500	21500	20500	19500	17000	12000	10000
			f_z	0.006	0.006	0.007	0.009	0.009	0.011	0.012	0.012	0.014	0.021	0.025
			f (mm/min)	420	450	450	480	420	475	500	450	480	500	500
	13	**30-45**	a_p (mm)	0.04	0.054	0.067	0.077	0.093	0.102	0.11	0.12	0.135	0.19	0.27
			v_c (m/min)	48	64	73	73	72	73	74	76	77	78	85
	14		n	25000	25000	23000	19000	16500	15500	15000	13500	12500	8500	7000
			f_z	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.009	0.01	0.014	0.018
			f (mm/min)	200	200	230	230	230	250	265	250	245	230	250
H	15	**45-55**	a_p (mm)	0.008	0.01	0.013	0.015	0.018	0.021	0.022	0.024	0.026	0.041	0.052
			v_c (m/min)	30	40	46	47	46	45	47	48	49	49	55
	16		n	16000	16000	14500	12500	10500	9500	9000	8500	7500	5500	4500
			f_z	0.005	0.005	0.006	0.007	0.009	0.009	0.01	0.011	0.012	0.018	0.021
			f (mm/min)	160	160	175	175	190	170	185	185	185	185	185
K	31		a_p (mm)	0.04	0.054	0.067	0.077	0.093	0.102	0.11	0.12	0.135	0.19	0.27
	32		v_c (m/min)	66	99	103	102	103	102	104	109	108	111	122
			n	35000	39500	33000	27000	23500	21500	20500	19500	17000	12000	10000
	33		f_z	0.006	0.006	0.007	0.009	0.009	0.011	0.012	0.012	0.014	0.021	0.025
	34		f (mm/min)	420	450	450	480	420	475	500	450	480	500	500



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

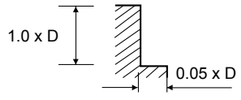
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR CUTTING CONDITION

103120, 103320 (3 Flute Miniature) **PROFILING**

MATERIAL GROUP		HRc		Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	11 12	< 30	v_c (m/min)	50	75	85	95	100	105	105	100	105	110	105
			n	15500	11560	8920	7560	6300	5560	4200	3260	2740	2200	1680
			f_z	0.004	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048
			f (mm/min)	190	210	240	430	450	500	530	460	390	310	240
	13 14	30-45	v_c (m/min)	30	50	50	60	60	65	65	65	65	75	65
			n	9550	7560	5560	4620	3780	3360	2520	2000	1680	1360	1060
			f_z	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.046	0.044	0.047	0.046
			f (mm/min)	115	140	150	260	270	310	290	230	190	150	120
H	15 16	45-55	v_c (m/min)	20	30	30	35	35	40	40	45	45	45	45
			n	6360	5040	3360	2940	2320	2000	1680	1360	1160	900	680
			f_z	0.001	0.002	0.004	0.005	0.008	0.01	0.016	0.017	0.017	0.017	0.015
			f (mm/min)	20	30	40	445	55	60	80	70	60	45	30
	15 16	55-65	v_c (m/min)	-	-	20	20	20	20	20	20	20	20	20
			n	-	-	1900	1480	1260	1100	840	680	560	440	320
			f_z	-	-	0.008	0.01	0.012	0.014	0.018	0.017	0.021	0.015	0.021
			f (mm/min)	-	-	45	45	45	45	45	35	35	20	20
M	21 22		v_c (m/min)	25	40	45	50	50	55	55	55	50	55	55
			n	7960	6300	4620	3880	3160	2840	2100	1680	1360	1060	840
			f_z	0.004	0.006	0.009	0.018	0.024	0.029	0.042	0.046	0.044	0.047	0.046
			f (mm/min)	100	115	125	210	230	250	265	230	180	150	115



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

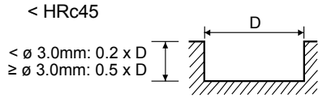
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

103120, 103320 (3 Flute Miniature) **SLOTTING**

MATERIAL GROUP		HRc		Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	11 12	< 30	v_c (m/min)	50	75	85	95	100	105	105	100	105	110	105
			n	15500	11560	8920	7560	6300	5560	4200	3260	2740	2200	1680
			f_z	0.003	0.005	0.007	0.012	0.015	0.019	0.027	0.031	0.03	0.03	0.03
			f (mm/min)	140	170	190	270	280	310	340	300	250	200	150
	13 14	30-45	v_c (m/min)	30	50	50	60	60	65	65	65	65	75	65
			n	9550	7560	5560	4620	3780	3360	2520	2000	1680	1360	1060
			f_z	0.003	0.005	0.008	0.012	0.015	0.02	0.024	0.023	0.024	0.025	0.022
			f (mm/min)	90	110	130	160	170	200	180	140	120	100	70
H	15 16	45-55	v_c (m/min)	20	30	30	35	35	40	40	45	45	45	45
			n	6360	5040	3360	2940	2320	2000	1680	1360	1160	900	680
			f_z	0.001	0.002	0.003	0.004	0.006	0.008	0.013	0.013	0.014	0.013	0.012
			f (mm/min)	20	30	35	35	45	50	65	55	50	35	25
	15 16	55-65	v_c (m/min)	-	-	20	20	20	20	20	20	20	20	20
			n	-	-	1900	1480	1260	1100	840	680	560	440	320
			f_z	-	-	0.007	0.008	0.009	0.011	0.014	0.015	0.018	0.015	0.021
			f (mm/min)	-	-	40	35	35	35	35	30	30	20	20
M	21 22		v_c (m/min)	25	40	45	50	50	55	55	55	50	55	55
			n	7960	6300	4620	3880	3160	2840	2100	1680	1360	1060	840
			f_z	0.002	0.004	0.008	0.011	0.015	0.019	0.025	0.029	0.029	0.031	0.028
			f (mm/min)	50	80	110	130	140	160	160	145	120	100	70

< HRc45



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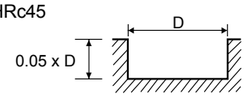


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

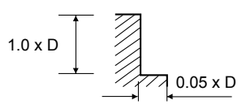
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR CUTTING CONDITION

109120, 109320 (4 Flute Short Length)

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
P	11 12	< 30	v_c (m/min)	75	85	95	100	105	105	100	105	110	105	105
			n	11560	8920	7560	6300	5560	4200	3260	2740	2200	1680	1360
			f_z	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.048	0.046
			f (mm/min)	280	320	570	600	660	710	610	520	410	320	250
	13 14	30-45	v_c (m/min)	50	50	60	60	65	65	65	65	70	65	65
			n	7560	5560	4620	3780	3360	2520	2000	1680	1360	1060	840
			f_z	0.006	0.009	0.019	0.024	0.031	0.038	0.038	0.037	0.037	0.038	0.039
			f (mm/min)	170	200	350	360	410	380	300	250	200	160	130
H	15 16	45-55	v_c (m/min)	30	30	35	35	40	40	45	45	45	45	40
			n	5040	3360	2940	2320	2000	1680	1360	1160	900	680	540
			f_z	0.002	0.004	0.005	0.008	0.01	0.016	0.017	0.017	0.017	0.015	0.014
			f (mm/min)	50	60	60	70	80	110	90	80	60	40	30
	15 16	55-65	v_c (m/min)	-	20	20	20	20	20	20	20	20	20	20
			n	-	1900	1480	1260	1100	840	680	560	440	320	260
			f_z	-	0.007	0.008	0.01	0.011	0.015	0.015	0.018	0.014	0.02	0.019
			f (mm/min)	-	50	50	50	50	50	40	40	25	25	20
M	21 22		v_c (m/min)	40	45	50	50	55	55	55	50	55	55	55
			n	6300	4620	3880	3160	2840	2100	1680	1360	1100	840	680
			f_z	0.006	0.009	0.018	0.024	0.029	0.042	0.045	0.044	0.045	0.045	0.044
			f (mm/min)	140	170	280	300	330	350	300	240	200	150	120



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: $n = \frac{v_c * 1000}{\pi * ø}$

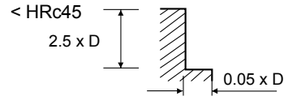
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

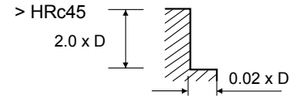
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR CUTTING CONDITION

111120, 111320 (4 Flute Long Length)

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
P	11 12	< 30	v_c (m/min)	55	60	65	65	70	70	75	70	80	75	75
			n	8820	6170	5000	4270	3680	2800	2350	1920	1620	1180	955
			f_z	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.049	0.049	0.047
			f (mm/min)	200	230	280	360	430	460	460	360	320	230	180
	13 14	30-45	v_c (m/min)	30	35	35	40	40	40	45	45	45	45	45
			n	5040	3570	2840	2420	2100	1580	1370	1160	890	680	570
			f_z	0.004	0.007	0.01	0.014	0.021	0.028	0.033	0.034	0.035	0.033	0.033
			f (mm/min)	80	100	115	140	180	180	180	160	125	90	75
H	15 16	45-55	v_c (m/min)	20	20	20	25	25	25	25	25	30	25	25
			n	3150	2200	1790	1580	1370	1050	840	700	560	420	320
			f_z	0.004	0.006	0.008	0.011	0.016	0.021	0.027	0.025	0.027	0.027	0.025
			f (mm/min)	45	55	60	70	90	90	90	70	60	45	30
	15 16	55-65	v_c (m/min)	-	20	20	20	20	20	20	20	20	20	20
			n	-	1890	1470	1260	1160	840	670	560	440	340	255
			f_z	-	0.004	0.006	0.008	0.011	0.015	0.019	0.018	0.02	0.018	0.018
			f (mm/min)	-	30	35	40	50	50	50	40	35	25	20





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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

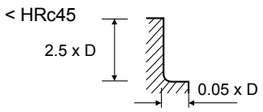
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

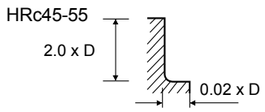
157120, 157320 (4 Flute Long Length, Corner Radius)

MATERIAL GROUP		HRc		Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	11	< 30	v_c (m/min)	60	65	70	75	75	80	80	85
	12		n	6620	5360	4580	3950	3000	2520	2060	1740
			f_z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023
			f (mm/min)	170	210	215	215	230	230	180	160
	13	30-45	v_c (m/min)	40	45	45	50	50	50	50	55
	14		n	4280	3410	2900	2520	1900	1640	1390	1070
			f_z	0.008	0.011	0.016	0.018	0.024	0.027	0.029	0.029
			f (mm/min)	130	150	180	180	180	180	160	125
H	15	45-55	v_c (m/min)	25	25	30	30	30	30	30	35
	16		n	2640	2150	1900	1640	1260	1010	840	670
			f_z	0.006	0.008	0.011	0.013	0.017	0.021	0.021	0.022
			f (mm/min)	65	70	85	85	85	85	70	60
	15	55-65	v_c (m/min)	20	20	20	20	20	20	20	20
	16		n	1870	1470	1260	1160	840	670	550	440
			f_z	0.004	0.006	0.008	0.011	0.015	0.019	0.018	0.02
			f (mm/min)	30	35	40	50	50	50	40	35
K	31		v_c (m/min)	60	65	70	75	75	80	80	85
	32		n	6620	5360	4580	3950	3000	2520	2060	1740
	33		f_z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023
	34		f (mm/min)	170	210	215	215	230	230	180	160

< HRc45



HRc45-55



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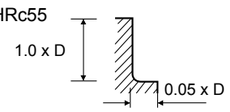


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

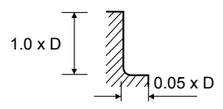
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR CUTTING CONDITION

156120, 156320 (4 Flute Stub Length, Corner Radius)

MATERIAL GROUP		HRc		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	11	< 30	v_c (m/min)	85	100	115	120	125	125	125	125	135
	12		n	13870	10700	9070	7560	6670	5040	3910	3290	2640
			f_z	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.046
			f (mm/min)	340	385	685	720	790	850	730	625	490
	13	30-45	v_c (m/min)	55	65	70	70	75	75	75	75	80
	14		n	9070	6670	5540	4540	4030	3020	2400	2020	1630
			f_z	0.006	0.009	0.019	0.024	0.030	0.038	0.038	0.037	0.037
			f (mm/min)	205	240	420	430	490	455	360	300	240
H	15	45-55	v_c (m/min)	40	40	45	45	45	50	50	50	55
	16		n	6050	4030	3530	2780	2400	2020	1630	1390	1080
			f_z	0.002	0.004	0.005	0.008	0.01	0.016	0.017	0.017	0.016
			f (mm/min)	60	70	70	85	95	130	110	95	70
	15	55-65	v_c (m/min)	-	20	20	25	25	25	25	25	25
	16		n	-	2280	1780	1510	1320	1010	820	670	530
			f_z	-	0.008	0.01	0.012	0.013	0.017	0.018	0.022	0.017
			f (mm/min)	-	70	70	70	70	70	60	60	35
K	31		v_c (m/min)	85	100	115	120	125	125	125	125	135
	32		n	13870	10700	9070	7560	6670	5040	3910	3290	2640
	33		f_z	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.046
	34		f (mm/min)	340	385	685	720	790	850	730	625	490



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

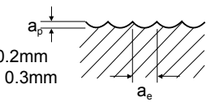
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

115120, 115320 (4 Flute Long, Ball Nose)

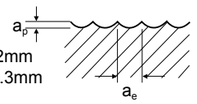
MATERIAL GROUP		HARDNESS HRc	NORMAL SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	40	75	95	105	115	130	145	160	175	190	205
			n	12720	11560	10000	8400	7300	6900	5770	5090	4640	3780	3260
			f_z	0.006	0.01	0.017	0.024	0.03	0.045	0.06	0.075	0.059	0.106	0.12
	14		f (mm/min)	300	480	690	800	870	1250	1380	1530	1650	1600	1560
H	15	45-65	v_c (m/min)	20	30	45	55	60	60	60	65	65	70	70
			n	5800	4840	4520	4200	3680	3180	2470	2040	1750	1350	1110
			f_z	0.006	0.008	0.012	0.016	0.018	0.022	0.033	0.042	0.053	0.069	0.084
	16		f (mm/min)	130	160	220	270	270	280	330	340	370	370	375
K	31		v_c (m/min)	50	100	125	130	145	160	180	200	220	240	260
	32		n	15760	15760	13100	10500	9140	8490	7160	6370	5840	4770	4140
	33		f_z	0.006	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136	0.151
	34		f (mm/min)	380	800	1020	1110	1230	1530	1950	2300	2600	2600	2500

< HRc45



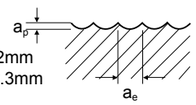
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.2 x D

> HRc45



a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.1 x D

MATERIAL GROUP		HARDNESS HRc	HIGH SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 30-40	v_c (m/min)	80	130	200	265	330	395	420	440	460	480	500
			n	25000	21000	21000	21000	21000	21000	16700	14000	12200	9550	7960
			f_z	0.02	0.026	0.036	0.052	0.064	0.071	0.09	0.104	0.12	0.136	0.15
	14		f (mm/min)	1950	220	3000	4400	5400	6000	6000	5850	5850	5180	4770
H	15	45-65	v_c (m/min)	80	130	160	170	190	200	210	220	230	240	250
			n	25000	21000	17000	13660	12000	10500	8360	7000	6100	4770	3980
			f_z	0.012	0.017	0.023	0.032	0.038	0.045	0.056	0.064	0.071	0.079	0.087
	16		f (mm/min)	1200	1400	1560	1750	1800	1880	1880	1800	1740	1500	1380
K	31		v_c (m/min)	80	130	200	265	330	395	420	440	460	480	500
	32		n	2500	21000	21000	21000	21000	21000	16700	14000	12200	9550	7960
	33		f_z	0.02	0.026	0.036	0.052	0.064	0.071	0.09	0.104	0.12	0.136	0.15
	34		f (mm/min)	1950	220	3000	4400	5400	6000	6000	5850	5850	5180	4770



a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x D

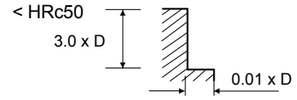
PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

150120, 150320 (6 Flute Extra Length, 45º Helix)

MATERIAL GROUP		HRc		Size (mm)						
				6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	11	< 40	v_c (m/min)	40	40	40	40	40	40	40
	12		n	2230	1670	1330	1110	840	670	540
	13		f_z	0.035	0.045	0.055	0.06	0.065	0.07	0.074
	14		f (mm/min)	470	450	440	400	33	280	240
H	15	40-50	v_c (m/min)	30	30	30	30	30	30	30
			n	1670	1250	1000	840	630	500	400
			f_z	0.035	0.044	0.05	0.054	0.061	0.067	0.071
	16		f (mm/min)	350	330	300	270	230	200	170
	15	50-60	v_c (m/min)	25	25	25	25	25	25	25
			n	1390	1050	840	690	530	420	340
			f_z	0.03	0.038	0.046	0.051	0.053	0.06	0.064
	16		f (mm/min)	250	240	230	210	170	150	130
	15	60-65	v_c (m/min)	20	20	20	20	20	20	20
			n	1110	840	680	560	420	320	270
			f_z	0.03	0.036	0.039	0.045	0.052	0.063	0.059
	16		f (mm/min)	200	180	160	150	130	120	95

< HRc50



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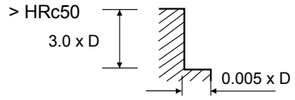


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

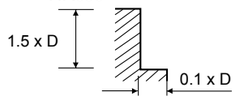
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR CUTTING CONDITION

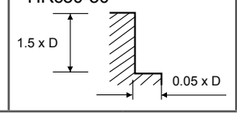
149120, 149320 (6&8 Flute Long, 45º Helix)

MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	11	< 30	v_c (m/min)	105	105	105	105	105	105	120
	12		n	5560	4200	3360	2840	2100	1680	1500
	13		f_z	0.06	0.079	0.099	0.099	0.1	0.075	0.075
	14		f (mm/min)	2000	2000	2000	1680	1260	1010	900
H	15	30-50	v_c (m/min)	75	75	75	75	75	75	85
	16		n	3880	2940	2320	2000	1480	1160	1100
			f_z	0.059	0.078	0.098	0.097	0.099	0.074	0.068
			f (mm/min)	1370	1370	1370	1160	880	690	600
	15	50-60	v_c (m/min)	30	30	30	30	30	30	35
	16		n	1580	1160	1000	840	640	500	430
			f_z	0.022	0.03	0.035	0.036	0.034	0.028	0.026
			f (mm/min)	210	210	210	180	130	110	90
	15	> 60	v_c (m/min)	20	20	20	20	20	20	20
	16		n	1100	840	680	560	420	320	260
			f_z	0.02	0.026	0.032	0.033	0.028	0.023	0.024
			f (mm/min)	130	130	130	110	70	60	50

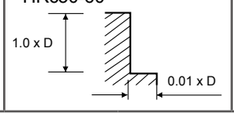
< HRc30



HRc30-50



HRc50-60



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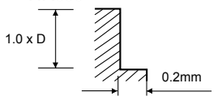
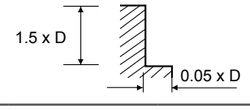
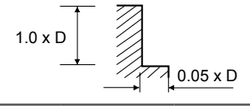


MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
H	15	< 50	v_c (m/min)	315	315	315	315	315	315	355
	16		n	16800	12600	9980	8400	6300	5040	4500
			f_z	0.06	0.081	0.1	0.1	0.1	0.076	0.075
			f (mm/min)	6090	6090	5990	5040	3780	3050	2700
	15	50-60	v_c (m/min)	160	160	160	160	160	160	175
	16		n	8400	6300	5040	4200	3160	2520	2200
			f_z	0.061	0.081	0.101	0.1	0.1	0.073	0.074
			f (mm/min)	3050	3050	3050	2520	1890	1470	1300
	15	> 60	v_c (m/min)	80	80	80	80	80	80	90
	16		n	4200	3160	2520	2100	1580	1260	1120
			f_z	0.058	0.078	0.097	0.1	0.1	0.075	0.075
			f (mm/min)	1470	1470	1470	1260	950	760	670

< HRc50



HRc50-60



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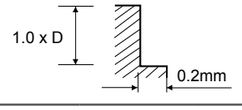
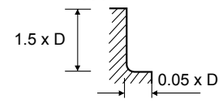


PULSAR CUTTING CONDITION

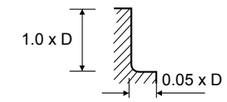
158120, 158320 (6 Flute Long, 45º Helix, Corner Radius)

MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
H	15	< 50	v_c (m/min)	315	315	315	315	315	315
	16		n	16800	12600	9980	8400	6300	5040
			f_z	0.06	0.081	0.1	0.1	0.1	0.101
			f (mm/min)	6090	6090	5990	5040	3780	3050
	15	50-60	v_c (m/min)	160	160	160	160	160	160
	16		n	8400	6300	5040	4200	3160	2520
			f_z	0.061	0.081	0.101	0.1	0.1	0.097
			f (mm/min)	3050	3050	3050	2520	1890	1470
	15	> 60	v_c (m/min)	80	80	80	80	80	80
	16		n	4200	3160	2520	2100	1580	1260
			f_z	0.058	0.078	0.097	0.1	0.1	0.101
			f (mm/min)	1470	1470	1470	1260	950	760

< HRc50



HRc50-60



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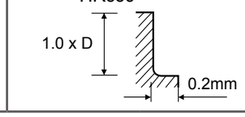


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

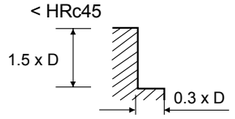
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR CUTTING CONDITION

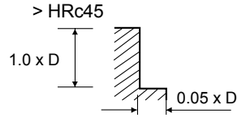
148120, 148320, 147120, 147320 (Multiflute Short & Long Roughing)

MATERIAL GROUP		HRc		Size (mm)						
				6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	11	< 30	v_c (m/min)	295	290	290	300	300	300	340
			n	15600	11600	9200	8000	6000	4800	4300
	12		f_z	0.05	0.067	0.063	0.075	0.1	0.113	0.1
			f (mm/min)	2320	2320	2320	2400	2400	2160	2150
	13	30-45	v_c (m/min)	235	230	240	225	240	225	250
			n	12400	9200	7600	6000	4800	3600	3200
	14		f_z	0.023	0.03	0.028	0.033	0.04	0.039	0.039
			f (mm/min)	840	840	840	800	760	560	620
H	15	45-55	v_c (m/min)	65	60	65	65	60	65	70
			n	3400	2400	2000	1680	1200	1000	900
	16		f_z	0.025	0.033	0.036	0.039	0.033	0.038	0.036
			f (mm/min)	260	240	290	260	160	150	160
	15	55-65	v_c (m/min)	45	45	40	45	40	40	45
			n	2400	1800	1300	1200	800	660	600
	16		f_z	0.026	0.033	0.037	0.04	0.034	0.038	0.033
			f (mm/min)	190	180	190	190	110	100	100
M	21		v_c (m/min)	160	160	160	160	165	150	170
			n	8400	6300	5100	4200	3300	2400	2160
	22		f_z	0.023	0.03	0.028	0.034	0.039	0.038	0.038
			f (mm/min)	570	570	570	570	510	360	410
K	31		v_c (m/min)	295	290	290	300	300	300	340
	32		n	15600	11600	9200	8000	6000	4800	4300
	33		f_z	0.05	0.067	0.063	0.075	0.1	0.113	0.1
	34		f (mm/min)	2320	2320	2320	2400	2400	2160	2150

< HRc45



> HRc45



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

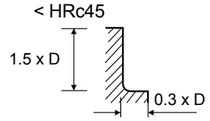
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR CUTTING CONDITION

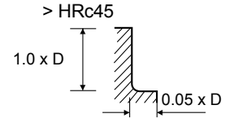
145120, 145320 (3&4 Flute Long, Roughing, Ball Nose)

MATERIAL GROUP		HRc		Size (mm)					
				6.0	8.0	10.0	12.0	16.0	20.0
P	11	< 30	v_c (m/min)	300	300	3000	295	300	300
			n	8000	6800	6000	5200	4800	4700
	12		f_z	0.075	0.088	0.1	0.112	0.113	0.112
			f (mm/min)	2400	2400	2400	2320	2160	2140
	13	30-38	v_c (m/min)	225	230	240	250	225	225
			n	6000	5200	4800	4400	3600	3500
	14		f_z	0.033	0.04	0.04	0.041	0.039	0.038
			f (mm/min)	800	840	760	720	560	540
H	15	38-45	v_c (m/min)	160	160	165	155	150	150
			n	4200	3600	3300	2700	2400	2300
	16		f_z	0.034	0.04	0.039	0.039	0.038	0.037
			f (mm/min)	570	570	510	420	360	350
	15	45-55	v_c (m/min)	65	60	60	60	65	60
			n	1680	1400	1200	1100	1000	950
	16		f_z	0.039	0.036	0.033	0.034	0.038	0.036
			f (mm/min)	260	200	160	150	150	140
	15	55-65	v_c (m/min)	45	40	40	40	40	40
			n	1200	900	800	700	660	630
	16		f_z	0.04	0.036	0.034	0.036	0.038	0.038
			f (mm/min)	190	130	110	100	100	100
K	31		v_c (m/min)	300	300	3000	295	300	300
	32		n	8000	6800	6000	5200	4800	4700
	33		f_z	0.075	0.088	0.1	0.112	0.113	0.112
	34		f (mm/min)	2400	2400	2400	2320	2160	2140

< HRc45



> HRc45



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

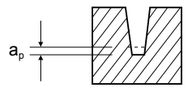
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

120320 (4 Flute Taper, 25º Helix, Rib Processing)

MATERIAL GROUP		HARDNESS HRc		Size (mm)			
				1.0	1.2	1.5	2.0
P	11	< 30	a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
	12		n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
			f (mm/min)	700	700	700	700
	13	30-45	a_p (mm)	0.025	0.032	0.04	0.05
			v_c (m/min)	45	50	45	50
	14		n	15000	13000	10000	8000
			f_z	0.008	0.01	0.013	0.016
			f (mm/min)	500	500	500	500
H	15	45-55	a_p (mm)	0.015	0.018	0.022	0.03
			v_c (m/min)	30	30	30	30
	16		n	10000	8000	6500	5000
			f_z	0.008	0.009	0.012	0.015
			f (mm/min)	300	300	300	300
K	31		a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
	32		n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
	33		f (mm/min)	700	700	700	700
	34						



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

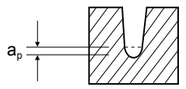
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DESIGNED SPECIFICALLY FOR USE IN DRY CUTTING CONDITIONS

PULSAR CUTTING CONDITION

130320 (4 Flute Taper, 25º Helix, Rib Processing, Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)			
				1.0	1.2	1.5	2.0
P	11	< 30	a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
	12		n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
			f (mm/min)	700	700	700	700
	13	30-45	a_p (mm)	0.025	0.032	0.04	0.05
			v_c (m/min)	45	50	45	50
	14		n	15000	13000	10000	8000
			f_z	0.008	0.01	0.013	0.016
			f (mm/min)	500	500	500	500
H	15	45-55	a_p (mm)	0.015	0.018	0.022	0.03
			v_c (m/min)	30	30	30	30
	16		n	10000	8000	6500	5000
			f_z	0.008	0.009	0.012	0.015
			f (mm/min)	300	300	300	300
K	31		a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
	32		n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
	33		f (mm/min)	700	700	700	700
	34						



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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

HEAVY CUT
4-FL MULTI HELIX

DMX high performance coating for increased tool life in dry machining and high speed applications.

Micro grain carbide substrate for increased toughness and hardness.

Multiple helix flute geometry >3.0mm for reduced wear and vibration.

Special gash land geometry on end teeth and protected corner to allow high depths of cut.

IDEAL FOR MATERIAL GROUPS

P H K

PULSAR DMX
END MILLS

Designed for high speed cutting of pre-hardened steels up to HRc55

www.europatool.co.uk

APPLICATION GUIDE

●: Excellent **O**: 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
●	●	●	●	●	o	o	o		o	o	o	o																	
●	●	●	●	●	o				o	o	o	o																	
●	●	●	●	●	o				o	o	o	o																	
●	●	●	●	●	o	o	o		o	o	o	o																	
●	●	●	●	●	o				o	o	o	o																	
●	●	●	●	●	o				o	o	o	o																	
●	●	●	●	●	o				o	o	o	o																	
●	●	●	●	●	o	o	o		o	o	o	o																	
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●	●	●	●	●	o				o	o	o	o																	

2 FLUTE END MILLS

Code	Item	Description	Page No.
116365		Standard Length ø0.2mm - 20.0mm	P.128-129
118365		Long Length ø1.0mm - 12.0mm	P.130-132
108365		Standard Length Corner Radius ø2.0mm - 16.0mm	P.133
120365		Extended Neck ø0.4mm - 6.0mm	P.134-135
110365		Extended Neck Corner Radius ø0.2mm - 10.0mm	P.136-140
100365		Standard Length Ball Nose ø0.1mm - 20.0mm	P.142-143
102365		Extended Neck Ball Nose ø0.2mm - 12.0mm	P.144-145

4 FLUTE END MILLS

Code	Item	Description	Page No.
104365		Standard Length Heavy Cut ø1.0mm - 20.0mm	P.147
122365		Standard Length ø1.0mm - 20.0mm	P.146
124365		Long Length ø1.0mm - 25.0mm	P.148-149
112365		Standard Length Corner Radius ø3.0mm - 16.0mm	P.150-151
126365		Extended Neck ø1.0mm - 10.0mm	P.156
114365		Extended Neck Corner Radius ø1.0mm - 12.0mm	P.152-155

6 FLUTE END MILLS

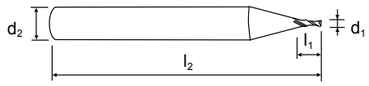
Code	Item	Description	Page No.
106365		Standard Length 45º Helix ø6.0mm - 20.0mm	P.141
		Cutting Data	P.157

INDEX

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

2 FLUTE STANDARD LENGTH

MG HM | 30º | FLUTE 2 | PLAIN



Series No. 116365

▶ cutting conditions : p.168-171

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Sharp edge geometry at end tooth increases cutting performance.

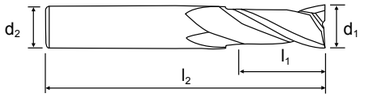
EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1163650020	**0.2**	4	0.4	40
1163650030	**0.3**	4	0.6	40
1163650040	**0.4**	4	0.8	40
1163650050	**0.5**	4	1.0	40
1163650060	**0.6**	4	1.2	40
1163650070	**0.7**	4	1.4	40
1163650080	**0.8**	4	1.6	40
1163650090	**0.9**	4	1.8	40
1163650100	**1.0**	6	2.5	50
1163650120	**1.2**	6	3.0	50
1163650150	**1.5**	6	4.0	50
1163650200	**2.0**	6	6.0	50
1163650250	**2.5**	6	7.0	50
1163650300	**3.0**	6	8.0	50
1163650350	**3.5**	6	10.0	50
1163650400	**4.0**	6	10.0	50
1163650450	**4.5**	6	14.0	50
1163650500	**5.0**	6	15.0	60
1163650600	**6.0**	6	15.0	60

MILL DIA TOLERANCE		SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	h6
above ø6.0	0~-0.015	

●: Excellent **O**: Good

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

2 FLUTE STANDARD LENGTH



MG HM | 30º | FLUTE 2 | PLAIN

Series No. 116365

▶ cutting conditions : p.168-171

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Sharp edge geometry at end tooth increases cutting performance.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1163650650	**6.5**	8	18.0	60
1163650700	**7.0**	8	20.0	60
1163650800	**8.0**	8	20.0	70
1163650850	**8.5**	10	22.0	70
1163650900	**9.0**	10	22.0	70
1163650950	**9.5**	10	24.0	70
1163651000	**10.0**	10	25.0	75
1163651050	**10.5**	12	26.0	75
1163651100	**11.0**	12	30.0	75
1163651200	**12.0**	12	30.0	80
1163651300	**13.0**	12	35.0	100
1163651400	**14.0**	14	35.0	100
1163651401	**14.0**	16	35.0	100
1163651500	**15.0**	16	38.0	100
1163651600	**16.0**	16	40.0	100
1163652000	**20.0**	20	45.0	100

MILL DIA TOLERANCE		SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	h6
above ø6.0	0~-0.015	

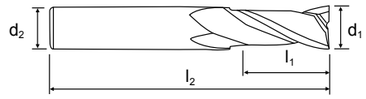
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

2 FLUTE LONG LENGTH

MG HM | 30º | FLUTE 2 | PLAIN



Series No. 118365

▶ cutting conditions : p.172

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

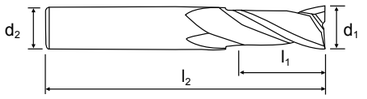
EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1183650100	**1.0**	6	3.0	60
1183650101	**1.0**	6	4.0	60
1183650102	**1.0**	6	6.0	60
1183650103	**1.0**	6	8.0	60
1183650104	**1.0**	6	10.0	60
1183650150	**1.5**	6	6.0	60
1183650151	**1.5**	6	8.0	60
1183650152	**1.5**	6	10.0	60
1183650153	**1.5**	6	12.0	60
1183650154	**1.5**	6	16.0	60
1183650200	**2.0**	6	8.0	60
1183650201	**2.0**	6	10.0	60
1183650202	**2.0**	6	12.0	60
1183650203	**2.0**	6	16.0	60
1183650250	**2.5**	6	16.0	60
1183650300	**3.0**	6	10.0	70
1183650301	**3.0**	6	12.0	70
1183650302	**3.0**	6	16.0	70
1183650303	**3.0**	6	20.0	70
1183650304	**3.0**	6	26.0	70

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

●: Excellent **O**: Good

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

2 FLUTE LONG LENGTH



MG HM | 30º | FLUTE 2 | PLAIN

Series No. 118365

▶ cutting conditions : p.172

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1183650400	**4.0**	6	12.0	70
1183650401	**4.0**	6	16.0	70
1183650402	**4.0**	6	20.0	70
1183650403	**4.0**	6	26.0	70
1183650404	**4.0**	6	30.0	70
1183650500	**5.0**	6	20.0	70
1183650501	**5.0**	6	25.0	70
1183650502	**5.0**	6	30.0	80
1183650503	**5.0**	6	40.0	100
1183650600	**6.0**	6	15.0	60
1183650601	**6.0**	6	15.0	80
1183650602	**6.0**	6	20.0	70
1183650603	**6.0**	6	20.0	90
1183650604	**6.0**	6	25.0	75
1183650605	**6.0**	6	30.0	80
1183650606	**6.0**	6	30.0	100
1183650607	**6.0**	6	30.0	150
1183650608	**6.0**	6	35.0	90
1183650609	**6.0**	6	40.0	90
1183650610	**6.0**	6	45.0	150

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

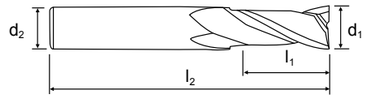
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

2 FLUTE LONG LENGTH

MG HM | 30° | FLUTE 2 | PLAIN



Series No. 118365

▶ cutting conditions : p.172

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

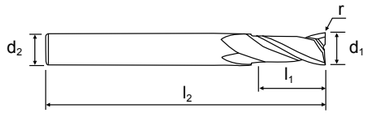
EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1183650800	**8.0**	8	25.0	80
1183650801	**8.0**	8	30.0	80
1183650802	**8.0**	8	35.0	90
1183650803	**8.0**	8	40.0	90
1183650804	**8.0**	8	40.0	120
1183650805	**8.0**	8	45.0	100
1183650806	**8.0**	8	50.0	100
1183651000	**10.0**	10	30.0	80
1183651001	**10.0**	10	30.0	100
1183651002	**10.0**	10	35.0	90
1183651003	**10.0**	10	40.0	90
1183651004	**10.0**	10	40.0	120
1183651005	**10.0**	10	45.0	100
1183651006	**10.0**	10	50.0	100
1183651007	**10.0**	10	60.0	110
1183651200	**12.0**	12	35.0	90
1183651201	**12.0**	12	40.0	100
1183651202	**12.0**	12	45.0	130
1183651203	**12.0**	12	50.0	100
1183651204	**12.0**	12	55.0	110
1183651205	**12.0**	12	60.0	110

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

●: Excellent **O**: Good

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

2 FLUTE STANDARD LENGTH CORNER RADIUS



MG HM | 30° | FLUTE 2 | PLAIN | R ±0.010 < ø 6.0 | R ±0.015 > ø 6.0

Series No. 108365

▶ cutting conditions : p.162

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1083650200	**2.0**	0.5	6	6.0	50
1083650300	**3.0**	0.5	6	8.0	60
1083650400	**4.0**	0.5	6	10.0	70
1083650500	**5.0**	0.5	6	13.0	90
1083650600	**6.0**	0.5	6	15.0	60
1083650601	**6.0**	1.0	6	15.0	60
1083650800	**8.0**	0.5	8	20.0	70
1083650801	**8.0**	1.0	8	20.0	70
1083650802	**8.0**	2.0	8	20.0	100
1083651000	**10.0**	0.5	10	25.0	100
1083651001	**10.0**	1.0	10	25.0	100
1083651002	**10.0**	2.0	10	25.0	100
1083651200	**12.0**	0.5	12	30.0	110
1083651201	**12.0**	1.0	12	30.0	110
1083651202	**12.0**	2.0	12	30.0	110
1083651601	**16.0**	1.0	16	32.0	150
1083651602	**16.0**	2.0	16	32.0	150

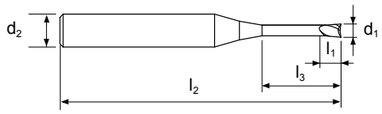
MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

●: Excellent **O**: Good

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

2 FLUTE EXTENDED NECK

MG HM | 30º | FLUTE 2 | PLAIN



Series No. 120365

▶ cutting conditions : p.174-175

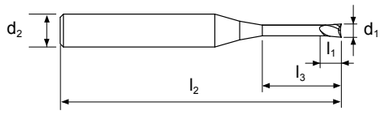
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Sizes under 1.0mm have double neck for increased rigidity.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1203650040	**0.4**	4	0.6	2.0	40
1203650041	**0.4**	4	0.6	3.0	40
1203650042	**0.4**	4	0.6	4.0	40
1203650043	**0.4**	4	0.6	5.0	40
1203650050	**0.5**	4	0.7	2.0	45
1203650051	**0.5**	4	0.7	4.0	45
1203650052	**0.5**	4	0.7	6.0	45
1203650060	**0.6**	4	0.9	2.0	45
1203650061	**0.6**	4	0.9	4.0	45
1203650062	**0.6**	4	0.9	6.0	45
1203650080	**0.8**	4	1.2	4.0	45
1203650081	**0.8**	4	1.2	6.0	45
1203650100	**1.0**	4	1.5	4.0	50
1203650101	**1.0**	4	1.5	6.0	50
1203650102	**1.0**	4	1.5	8.0	50
1203650103	**1.0**	4	1.5	10.0	50
1203650104	**1.0**	4	1.5	12.0	50
1203650105	**1.0**	4	1.5	16.0	50
1203650106	**1.0**	4	1.5	20.0	50
1203650120	**1.2**	4	1.8	6.0	50
1203650121	**1.2**	4	1.8	8.0	50
1203650140	**1.4**	4	2.1	6.0	50
1203650141	**1.4**	4	2.1	8.0	50
1203650150	**1.5**	4	2.3	6.0	50
1203650151	**1.5**	4	2.3	8.0	50
1203650152	**1.5**	4	2.3	10.0	50
1203650153	**1.5**	4	2.3	12.0	50
1203650154	**1.5**	4	2.3	16.0	50
1203650155	**1.5**	4	2.3	20.0	50

●: Excellent **O**: Good

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

2 FLUTE EXTENDED NECK



MG HM | 30º | FLUTE 2 | PLAIN

Series No. 120365

▶ cutting conditions : p.174-175

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Sizes under 1.0mm have double neck for increased rigidity.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1203650180	**1.8**	4	2.7	8.0	50
1203650181	**1.8**	4	2.7	10.0	50
1203650182	**1.8**	4	2.7	12.0	50
1203650200	**2.0**	4	3.0	6.0	50
1203650201	**2.0**	4	3.0	8.0	50
1203650202	**2.0**	4	3.0	10.0	50
1203650203	**2.0**	4	3.0	12.0	50
1203650204	**2.0**	4	3.0	14.0	50
1203650205	**2.0**	4	3.0	16.0	50
1203650206	**2.0**	4	3.0	20.0	50
1203650250	**2.5**	4	4.0	8.0	50
1203650251	**2.5**	4	4.0	12.0	50
1203650252	**2.5**	4	4.0	16.0	50
1203650253	**2.5**	4	4.0	20.0	50
1203650300	**3.0**	6	4.5	12.0	60
1203650301	**3.0**	6	4.5	14.0	60
1203650302	**3.0**	6	4.5	16.0	60
1203650303	**3.0**	6	4.5	18.0	60
1203650304	**3.0**	6	4.5	20.0	60
1203650400	**4.0**	6	6.0	16.0	60
1203650401	**4.0**	6	6.0	20.0	60
1203650402	**4.0**	6	6.0	30.0	70
1203650403	**5.0**	6	8.0	20.0	60
1203650500	**5.0**	6	8.0	30.0	70
1203650501	**5.0**	6	8.0	35.0	75
1203650502	**5.0**	6	8.0	40.0	80
1203650503	**5.0**	6	8.0	50.0	90
1203650600	**6.0**	6	9.0	20.0	60
1203650601	**6.0**	6	9.0	30.0	70

MILL DIA TOLERANCE		SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	h6
above ø6.0	0~-0.015	

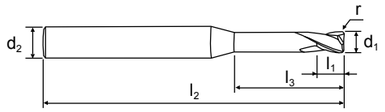
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

2 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | 30° | FLUTE 2 | PLAIN | ±0.010 < ø 6.0 | ±0.015 > ø 6.0



Series No. 110365

▶ cutting conditions : p.164-165

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

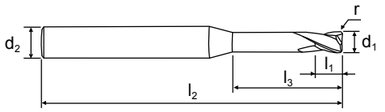
EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1103650020	**0.2**	0.02	4	0.3	1.0	40
1103650021	**0.2**	0.05	4	0.3	1.0	40
1103650030	**0.3**	0.02	4	0.5	1.0	40
1103650031	**0.3**	0.02	4	0.5	2.0	40
1103650032	**0.3**	0.05	4	0.5	1.0	40
1103650033	**0.3**	0.05	4	0.5	2.0	40
1103650040	**0.4**	0.05	4	0.6	1.0	40
1103650041	**0.4**	0.05	4	0.6	2.0	40
1103650042	**0.4**	0.05	4	0.6	2.5	40
1103650043	**0.4**	0.1	4	0.6	1.0	40
1103650044	**0.4**	0.1	4	0.6	2.0	40
1103650050	**0.5**	0.05	4	0.7	1.0	45
1103650051	**0.5**	0.05	4	0.7	2.0	45
1103650052	**0.5**	0.05	4	0.7	4.0	45
1103650053	**0.5**	0.1	4	0.7	2.0	45
1103650054	**0.5**	0.1	4	0.7	3.0	45
1103650060	**0.6**	0.05	4	0.9	3.0	45
1103650061	**0.6**	0.05	4	0.9	6.0	45
1103650062	**0.6**	0.1	4	0.9	2.0	45
1103650063	**0.6**	0.1	4	0.9	4.0	45
1103650064	**0.6**	0.1	4	0.9	6.0	45
1103650065	**0.6**	0.2	4	0.9	2.0	45
1103650066	**0.6**	0.2	4	0.9	4.0	45
1103650067	**0.6**	0.2	4	0.9	6.0	45
1103650080	**0.8**	0.05	4	1.2	2.0	45
1103650081	**0.8**	0.05	4	1.2	4.0	45
1103650082	**0.8**	0.05	4	1.2	6.0	45
1103650083	**0.8**	0.1	4	1.2	2.0	45

MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

●: Excellent **O**: Good

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

2 FLUTE EXTENDED NECK CORNER RADIUS



MG HM | 30° | FLUTE 2 | PLAIN | ±0.010 < ø 6.0 | ±0.015 > ø 6.0

Series No. 110365

▶ cutting conditions : p.164-165

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1103650084	**0.8**	0.1	4	1.2	4.0	45
1103650085	**0.8**	0.1	4	1.2	6.0	45
1103650086	**0.8**	0.1	4	1.2	8.0	45
1103650087	**0.8**	0.2	4	1.2	4.0	45
1103650088	**0.8**	0.2	4	1.2	6.0	45
1103650089	**0.8**	0.2	4	1.2	8.0	45
1103650100	**1.0**	0.05	4	1.5	3.0	50
1103650101	**1.0**	0.05	4	1.5	4.0	50
1103650102	**1.0**	0.05	4	1.5	6.0	50
1103650103	**1.0**	0.1	4	1.5	3.0	50
1103650104	**1.0**	0.1	4	1.5	4.0	50
1103650105	**1.0**	0.1	4	1.5	6.0	50
1103650106	**1.0**	0.1	4	1.5	8.0	50
1103650107	**1.0**	0.2	4	1.5	4.0	50
1103650108	**1.0**	0.2	4	1.5	6.0	50
1103650109	**1.0**	0.2	4	1.5	8.0	50
1103650110	**1.0**	0.2	4	1.5	10.0	50
1103650111	**1.0**	0.3	4	1.5	4.0	50
1103650112	**1.0**	0.3	4	1.5	6.0	50
1103650113	**1.0**	0.3	4	1.5	8.0	50
1103650114	**1.0**	0.3	4	1.5	10.0	50
1103650120	**1.2**	0.05	4	1.8	4.0	50
1103650121	**1.2**	0.05	4	1.8	6.0	50
1103650122	**1.2**	0.05	4	1.8	8.0	50
1103650123	**1.2**	0.1	4	1.8	4.0	50
1103650124	**1.2**	0.1	4	1.8	6.0	50
1103650125	**1.2**	0.1	4	1.8	8.0	50
1103650126	**1.2**	0.2	4	1.8	4.0	50

MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

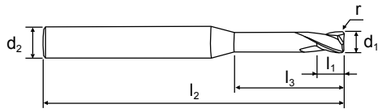
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

2 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | 30° | FLUTE 2 | PLAIN | ±0.010 < ø 6.0 | ±0.015 > ø 6.0



Series No. 110365

▶ cutting conditions : p.164-165

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1103650127	**1.2**	0.2	4	1.8	6.0	50
1103650128	**1.2**	0.2	4	1.8	8.0	50
1103650129	**1.2**	0.3	4	1.8	4.0	50
1103650130	**1.2**	0.3	4	1.8	6.0	50
1103650131	**1.2**	0.3	4	1.8	8.0	50
1103650150	**1.5**	0.05	4	2.3	4.0	50
1103650151	**1.5**	0.05	4	2.3	6.0	50
1103650152	**1.5**	0.05	4	2.3	8.0	50
1103650153	**1.5**	0.1	4	2.3	6.0	50
1103650154	**1.5**	0.1	4	2.3	8.0	50
1103650155	**1.5**	0.2	4	2.3	4.0	50
1103650156	**1.5**	0.2	4	2.3	6.0	50
1103650157	**1.5**	0.2	4	2.3	8.0	50
1103650158	**1.5**	0.2	4	2.3	10.0	50
1103650159	**1.5**	0.3	4	2.3	4.0	50
1103650160	**1.5**	0.3	4	2.3	6.0	50
1103650161	**1.5**	0.3	4	2.3	8.0	50
1103650162	**1.5**	0.3	4	2.3	10.0	50
1103650200	**2.0**	0.1	4	3.0	6.0	50
1103650201	**2.0**	0.1	4	3.0	8.0	50
1103650202	**2.0**	0.1	4	3.0	10.0	50
1103650203	**2.0**	0.1	4	3.0	12.0	50
1103650204	**2.0**	0.2	4	3.0	6.0	50
1103650205	**2.0**	0.2	4	3.0	8.0	50
1103650206	**2.0**	0.2	4	3.0	10.0	50
1103650207	**2.0**	0.2	4	3.0	12.0	50
1103650208	**2.0**	0.3	4	3.0	6.0	50
1103650209	**2.0**	0.3	4	3.0	8.0	50

MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

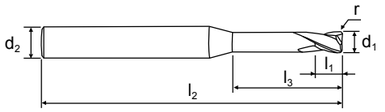
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

2 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | 30° | FLUTE 2 | PLAIN | ±0.010 < ø 6.0 | ±0.015 > ø 6.0



Series No. 110365

▶ cutting conditions : p.164-165

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1103650210	**2.0**	0.3	4	3.0	10.0	50
1103650211	**2.0**	0.3	4	3.0	12.0	50
1103650212	**2.0**	0.5	4	3.0	6.0	50
1103650213	**2.0**	0.5	4	3.0	8.0	50
1103650214	**2.0**	0.5	4	3.0	10.0	50
1103650215	**2.0**	0.5	4	3.0	12.0	50
1103650300	**3.0**	0.1	6	4.5	10.0	50
1103650301	**3.0**	0.1	6	4.5	12.0	50
1103650302	**3.0**	0.2	6	4.5	8.0	50
1103650303	**3.0**	0.2	6	4.5	10.0	50
1103650304	**3.0**	0.2	6	4.5	12.0	50
1103650305	**3.0**	0.2	6	4.5	16.0	60
1103650306	**3.0**	0.2	6	4.5	20.0	60
1103650307	**3.0**	0.3	6	4.5	8.0	50
1103650308	**3.0**	0.3	6	4.5	10.0	50
1103650309	**3.0**	0.3	6	4.5	12.0	50
1103650310	**3.0**	0.3	6	4.5	16.0	60
1103650311	**3.0**	0.3	6	4.5	20.0	60
1103650312	**3.0**	0.5	6	4.5	8.0	50
1103650313	**3.0**	0.5	6	4.5	10.0	50
1103650314	**3.0**	0.5	6	4.5	12.0	50
1103650315	**3.0**	0.5	6	4.5	16.0	60
1103650316	**3.0**	0.5	6	4.5	20.0	60
1103650317	**3.0**	1.0	6	4.5	8.0	50
1103650318	**3.0**	1.0	6	4.5	10.0	50
1103650319	**3.0**	1.0	6	4.5	12.0	50
1103650320	**3.0**	1.0	6	4.5	16.0	60
1103650321	**3.0**	1.0	6	4.5	20.0	60

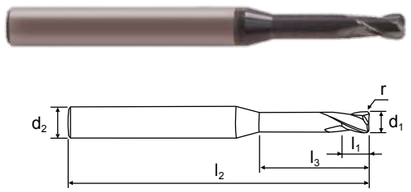
MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

●: Excellent **O**: Good

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

2 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | 30º | FLUTE 2 | PLAIN | ±0.010 < ø 6.0 | ±0.015 > ø 6.0



Series No. 110365

▶ cutting conditions : p.164-165

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1103650400	**4.0**	0.1	6	6.0	10.0	50
1103650401	**4.0**	0.1	6	6.0	12.0	50
1103650402	**4.0**	0.1	6	6.0	16.0	60
1103650403	**4.0**	0.2	6	6.0	10.0	50
1103650404	**4.0**	0.2	6	6.0	12.0	50
1103650405	**4.0**	0.2	6	6.0	16.0	60
1103650406	**4.0**	0.2	6	6.0	20.0	60
1103650407	**4.0**	0.2	6	6.0	26.0	65
1103650408	**4.0**	0.3	6	6.0	12.0	50
1103650409	**4.0**	0.3	6	6.0	16.0	60
1103650410	**4.0**	0.3	6	6.0	20.0	60
1103650411	**4.0**	0.3	6	6.0	26.0	65
1103650412	**4.0**	0.5	6	6.0	10.0	50
1103650413	**4.0**	0.5	6	6.0	12.0	50
1103650414	**4.0**	0.5	6	6.0	16.0	60
1103650415	**4.0**	0.5	6	6.0	20.0	60
1103650416	**4.0**	0.5	6	6.0	26.0	65
1103650417	**4.0**	1.0	6	6.0	10.0	50
1103650418	**4.0**	1.0	6	6.0	16.0	60
1103650419	**4.0**	1.0	6	6.0	20.0	60
1103650600	**6.0**	0.5	6	9.0	20.0	60
1103650601	**6.0**	1.0	6	9.0	20.0	60
1103650800	**8.0**	0.5	8	12.0	25.0	70
1103650801	**8.0**	1.0	8	12.0	25.0	70
1103651000	**10.0**	0.5	10	15.0	30.0	75
1103651001	**10.0**	1.0	10	15.0	30.0	75

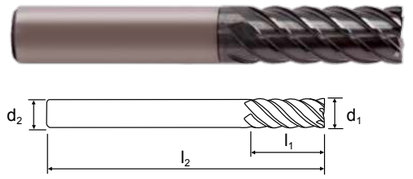
MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

●: Excellent **O**: Good

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

6 FLUTE STANDARD LENGTH 45º HELIX

MG HM | 45º | FLUTE 6 | PLAIN



Series No. 106365

▶ cutting conditions : p.173

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
45º helix for improved surface finish.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1063650600	**6.0**	6	15.0	60
1063650800	**8.0**	8	20.0	70
1063651000	**10.0**	10	25.0	75
1063651200	**12.0**	12	30.0	80
1063651600	**16.0**	16	40.0	100
1063652000	**20.0**	20	45.0	100

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

●: Excellent **O**: Good

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

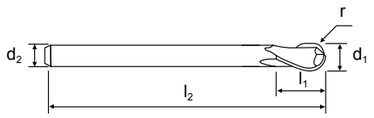
2 FLUTE STANDARD LENGTH BALL NOSE

NG HM | 30° | FLUTE 2 | PLAIN | R ±0.005 < ø 6.0 | R ±0.010 > ø 6.0

Series No. 100365

▶ cutting conditions : p.158-159

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.



EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1003650010	**0.1**	0.05	4	0.2	40
1003650020	**0.2**	0.1	4	0.4	40
1003650030	**0.3**	0.15	4	0.6	40
1003650040	**0.4**	0.2	4	0.8	40
1003650050	**0.5**	0.25	4	1.0	40
1003650060	**0.6**	0.3	4	1.2	40
1003650080	**0.8**	0.4	4	1.6	40
1003650100	**1.0**	0.5	6	2.5	50
1003650150	**1.5**	0.75	6	4.0	50
1003650200	**2.0**	1.0	6	5.0	50
1003650250	**2.5**	1.25	6	6.0	60
1003650300	**3.0**	1.5	6	4.5	40
1003650301	**3.0**	1.5	6	6.0	60
1003650400	**4.0**	2.0	6	8.0	70
1003650401	**4.0**	2.0	6	8.0	100
1003650500	**5.0**	2.5	6	7.5	60
1003650501	**5.0**	2.5	6	10.0	80
1003650600	**6.0**	3.0	6	9.0	50
1003650601	**6.0**	3.0	6	12.0	90
1003650602	**6.0**	3.0	6	12.0	130

MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.005	h6
above ø6.0	0~-0.015	±0.010	

●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

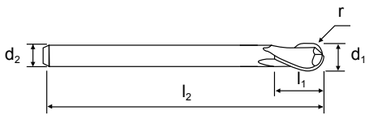
2 FLUTE STANDARD LENGTH BALL NOSE

NG HM | 30° | FLUTE 2 | PLAIN | R ±0.005 < ø 6.0 | R ±0.010 > ø 6.0

Series No. 100365

▶ cutting conditions : p.158-159

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.



EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1003650800	**8.0**	4.0	8	12.0	50
1003650801	**8.0**	4.0	8	12.0	90
1003650802	**8.0**	4.0	8	14.0	100
1003650803	**8.0**	4.0	8	14.0	150
1003651000	**10.0**	5.0	10	15.0	60
1003651001	**10.0**	5.0	10	15.0	90
1003651002	**10.0**	5.0	10	18.0	100
1003651003	**10.0**	5.0	10	18.0	130
1003651004	**10.0**	5.0	10	18.0	150
1003651005	**10.0**	5.0	10	18.0	180
1003651200	**12.0**	6.0	12	18.0	80
1003651201	**12.0**	6.0	12	18.0	100
1003651202	**12.0**	6.0	12	22.0	110
1003651203	**12.0**	6.0	12	22.0	200
1003651600	**16.0**	8.0	16	30.0	150
1003652000	**20.0**	10.0	20	38.0	150

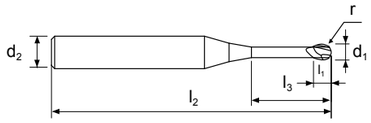
MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

●: Excellent **O**: Good

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

2 FLUTE EXTENDED NECK BALL NOSE

NG HM | 30° | FLUTE 2 | PLAIN | R ±0.005 < ø 6.0 | R ±0.010 > ø 6.0



Series No. 102365

▶ cutting conditions : p.160-161

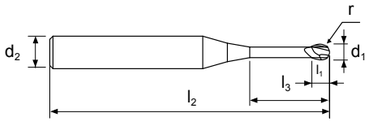
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1023650020	**0.2**	0.1	4	0.2	1.0	40
1023650030	**0.3**	0.15	4	0.3	1.0	40
1023650040	**0.4**	0.2	4	0.4	1.0	40
1023650050	**0.5**	0.25	4	0.5	2.0	45
1023650051	**0.5**	0.25	4	0.5	4.0	45
1023650052	**0.5**	0.25	4	0.5	6.0	45
1023650053	**0.5**	0.25	4	0.5	8.0	45
1023650060	**0.6**	0.3	4	0.6	2.0	45
1023650061	**0.6**	0.3	4	0.6	4.0	45
1023650062	**0.6**	0.3	4	0.6	6.0	45
1023650063	**0.6**	0.3	4	0.6	8.0	45
1023650080	**0.8**	0.4	4	0.8	2.0	45
1023650081	**0.8**	0.4	4	0.8	4.0	45
1023650082	**0.8**	0.4	4	0.8	6.0	45
1023650083	**0.8**	0.4	4	0.8	10.0	45
1023650100	**1.0**	0.5	4	1.0	3.0	50
1023650101	**1.0**	0.5	4	1.0	4.0	50
1023650102	**1.0**	0.5	4	1.0	5.0	50
1023650103	**1.0**	0.5	4	1.0	6.0	50
1023650104	**1.0**	0.5	4	1.0	8.0	50
1023650105	**1.0**	0.5	4	1.0	10.0	50
1023650106	**1.0**	0.5	4	1.0	12.0	50
1023650107	**1.0**	0.5	4	1.0	16.0	50
1023650108	**1.0**	0.5	4	1.0	20.0	50
1023650120	**1.2**	0.6	4	1.2	8.0	50
1023650150	**1.5**	0.75	4	1.5	6.0	50
1023650151	**1.5**	0.75	4	1.5	8.0	50
1023650152	**1.5**	0.75	4	1.5	10.0	50
1023650153	**1.5**	0.75	4	1.5	12.0	50
1023650154	**1.5**	0.75	4	1.5	16.0	50
1023650155	**1.5**	0.75	4	1.5	20.0	50

●: Excellent **O**: Good

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

2 FLUTE EXTENDED NECK BALL NOSE



NG HM | 30° | FLUTE 2 | PLAIN | R ±0.005 < ø 6.0 | R ±0.010 > ø 6.0

Series No. 102365

▶ cutting conditions : p.160-161

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1023650200	**2.0**	1.0	4	2.0	6.0	50
1023650201	**2.0**	1.0	4	2.0	8.0	50
1023650202	**2.0**	1.0	4	2.0	10.0	50
1023650203	**2.0**	1.0	4	2.0	12.0	50
1023650204	**2.0**	1.0	4	2.0	14.0	50
1023650205	**2.0**	1.0	4	2.0	16.0	50
1023650206	**2.0**	1.0	4	2.0	20.0	50
1023650207	**2.0**	1.0	4	2.0	30.0	70
1023650300	**3.0**	1.5	6	3.0	8.0	50
1023650301	**3.0**	1.5	6	3.0	10.0	50
1023650302	**3.0**	1.5	6	3.0	12.0	50
1023650303	**3.0**	1.5	6	3.0	16.0	60
1023650304	**3.0**	1.5	6	3.0	20.0	60
1023650305	**3.0**	1.5	6	3.0	30.0	70
1023650306	**3.0**	1.5	6	3.0	35.0	70
1023650400	**4.0**	2.0	6	4.0	10.0	50
1023650401	**4.0**	2.0	6	4.0	12.0	50
1023650402	**4.0**	2.0	6	4.0	16.0	60
1023650403	**4.0**	2.0	6	4.0	20.0	60
1023650404	**4.0**	2.0	6	4.0	30.0	70
1023650405	**4.0**	2.0	6	4.0	35.0	70
1023650500	**5.0**	2.5	6	6.0	30.0	70
1023650600	**6.0**	3.0	6	8.0	20.0	60
1023650601	**6.0**	3.0	6	8.0	30.0	60
1023650800	**8.0**	4.0	8	10.0	25.0	70
1023651000	**10.0**	5.0	10	12.0	30.0	75
1023651001	**10.0**	5.0	10	18.0	30.0	100
1023651200	**12.0**	6.0	12	14.0	32.0	80
1023651201	**12.0**	6.0	12	22.0	32.0	100

MILL DIA TOLERANCE		RADIUS TOLERANCE	SHANK DIA TOLERANCE
up to ø6.0	0~-0.012	±0.010	h6
above ø6.0	0~-0.015	±0.015	

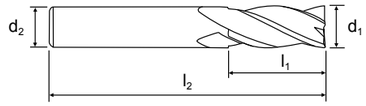
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

4 FLUTE STANDARD LENGTH

MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN



Series No. 122365

▶ cutting conditions : p.178-180

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

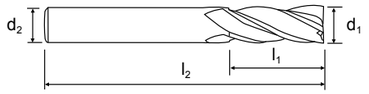
EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1223650100	**1.0**	6	2.5	50
1223650150	**1.5**	6	4.0	50
1223650200	**2.0**	6	6.0	50
1223650250	**2.5**	6	7.0	50
1223650300	**3.0**	6	8.0	50
1223650350	**3.5**	6	10.0	50
1223650400	**4.0**	6	10.0	50
1223650450	**4.5**	6	14.0	50
1223650500	**5.0**	6	15.0	60
1223650550	**5.5**	6	15.0	60
1223650600	**6.0**	6	15.0	60
1223650650	**6.5**	8	18.0	60
1223650700	**7.0**	8	20.0	60
1223650750	**7.5**	8	20.0	60
1223650800	**8.0**	8	20.0	70
1223650850	**8.5**	10	22.0	70
1223650900	**9.0**	10	22.0	70
1223650950	**9.5**	10	24.0	70
1223651000	**10.0**	10	25.0	75
1223651100	**11.0**	12	30.0	75
1223651200	**12.0**	12	30.0	80
1223651400	**14.0**	14	35.0	100
1223651401	**14.0**	16	35.0	100
1223651600	**16.0**	16	40.0	100
1223651800	**18.0**	18	45.0	100
1223652000	**20.0**	20	45.0	100

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

●: Excellent **O**: Good

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

4 FLUTE STANDARD LENGTH HEAVY CUT



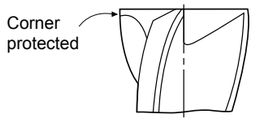
MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN

Series No. 104365

▶ cutting conditions : p.178-180

New coating and new geometry give outstanding cutting ability and wear resistance.
Multiple helix geometry 3.0mm and above.
Special gash land geometry on end teeth and protected corner to allow high depths of cut.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1043650100	**1.0**	6	2.5	50
1043650120	**1.2**	6	3.0	50
1043650150	**1.5**	6	4.0	50
1043650200	**2.0**	6	6.0	50
1043650250	**2.5**	6	7.0	50
1043650300	**3.0**	6	8.0	50
1043650400	**4.0**	6	10.0	50
1043650500	**5.0**	6	15.0	60
1043650600	**6.0**	6	15.0	60
1043650800	**8.0**	8	20.0	70
1043651000	**10.0**	10	25.0	75
1043651200	**12.0**	12	30.0	80
1043651600	**16.0**	16	32.0	100
1043652000	**20.0**	20	45.0	100



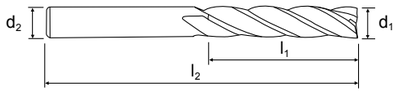
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

4 FLUTE LONG LENGTH

MG HM | 30º | FLUTE 4 | PLAIN



Series No. 124365

▶ cutting conditions : p.176-177

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1243650100	**1.0**	6	3.0	60
1243650101	**1.0**	6	4.0	60
1243650102	**1.0**	6	6.0	60
1243650150	**1.5**	6	6.0	60
1243650200	**2.0**	6	8.0	60
1243650201	**2.0**	6	10.0	60
1243650202	**2.0**	6	12.0	60
1243650203	**2.0**	6	14.0	60
1243650250	**2.5**	6	10.0	60
1243650251	**2.5**	6	12.0	60
1243650300	**3.0**	6	10.0	70
1243650301	**3.0**	6	12.0	70
1243650302	**3.0**	6	16.0	70
1243650303	**3.0**	6	20.0	70
1243650304	**3.0**	6	26.0	70
1243650305	**3.0**	6	30.0	70
1243650400	**4.0**	6	12.0	70
1243650401	**4.0**	6	16.0	70
1243650402	**4.0**	6	20.0	70
1243650403	**4.0**	6	26.0	70
1243650404	**4.0**	6	30.0	70
1243650500	**5.0**	6	20.0	70
1243650501	**5.0**	6	25.0	70
1243650502	**5.0**	6	30.0	80
1243650600	**6.0**	6	15.0	60
1243650601	**6.0**	6	20.0	70
1243650602	**6.0**	6	25.0	75
1243650603	**6.0**	6	30.0	80

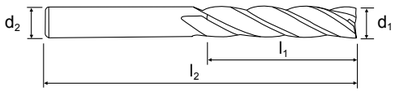
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

4 FLUTE LONG LENGTH



MG HM | 30º | FLUTE 4 | PLAIN

Series No. 124365

▶ cutting conditions : p.176-177

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1243650604	**6.0**	6	35.0	90
1243650605	**6.0**	6	40.0	90
1243650606	**6.0**	6	40.0	120
1243650800	**8.0**	8	25.0	80
1243650801	**8.0**	8	30.0	80
1243650802	**8.0**	8	35.0	90
1243650803	**8.0**	8	40.0	90
1243650804	**8.0**	8	45.0	100
1243650805	**8.0**	8	50.0	100
1243651000	**10.0**	10	30.0	80
1243651001	**10.0**	10	30.0	100
1243651002	**10.0**	10	35.0	90
1243651003	**10.0**	10	40.0	90
1243651004	**10.0**	10	45.0	10
1243651005	**10.0**	10	50.0	10
1243651200	**12.0**	12	35.0	90
1243651201	**12.0**	12	40.0	100
1243651202	**12.0**	12	45.0	130
1243651203	**12.0**	12	50.0	100
1243651204	**12.0**	12	55.0	110
1243651205	**12.0**	12	60.0	110
1243651400	**14.0**	16	50.0	110
1243651600	**16.0**	16	50.0	110
1243651601	**16.0**	16	60.0	120
1243651602	**16.0**	16	70.0	130
1243652000	**20.0**	20	60.0	130
1243652500	**25.0**	25	90.0	150

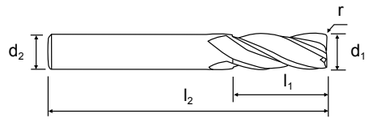
MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

4 FLUTE STANDARD LENGTH CORNER RADIUS

MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN | R ±0.02



Series No. 112365

▶ cutting conditions : p.163

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

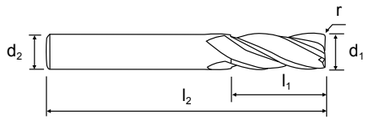
EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1123650300	**3.0**	0.3	6	8.0	60
1123650301	**3.0**	0.5	6	8.0	60
1123650400	**4.0**	0.3	6	10.0	70
1123650401	**4.0**	0.5	6	10.0	70
1123650402	**4.0**	1.0	6	10.0	70
1123650500	**5.0**	0.3	6	13.0	90
1123650501	**5.0**	0.5	6	13.0	90
1123650600	**6.0**	0.3	6	15.0	90
1123650601	**6.0**	0.5	6	15.0	90
1123650602	**6.0**	1.0	6	15.0	90
1123650800	**8.0**	0.3	8	20.0	70
1123650801	**8.0**	0.5	8	20.0	70
1123650802	**8.0**	1.0	8	20.0	70
1123650803	**8.0**	0.5	8	20.0	100
1123650804	**8.0**	1.0	8	20.0	100
1123650805	**8.0**	1.5	8	20.0	100
1123650806	**8.0**	2.0	8	20.0	100
1123651000	**10.0**	0.3	10	25.0	100
1123651001	**10.0**	0.5	10	25.0	100
1123651002	**10.0**	1.0	10	25.0	100
1123651003	**10.0**	1.5	10	25.0	100
1123651004	**10.0**	2.0	10	25.0	100

MILL DIA TOLERANCE(mm)	RADIUS TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.02	h6

●: Excellent **O**: Good

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

4 FLUTE STANDARD LENGTH CORNER RADIUS



MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN | R ±0.02

Series No. 112365

▶ cutting conditions : p.163

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1123651200	**12.0**	0.5	12	30.0	80
1123651201	**12.0**	1.0	12	30.0	80
1123651202	**12.0**	0.5	12	30.0	110
1123651203	**12.0**	1.0	12	30.0	110
1123651204	**12.0**	1.5	12	30.0	110
1123651205	**12.0**	2.0	12	30.0	110
1123651600	**16.0**	0.5	16	32.0	150
1123651601	**16.0**	1.0	16	32.0	150
1123651602	**16.0**	1.5	16	32.0	150
1123651603	**16.0**	2.0	16	32.0	150

MILL DIA TOLERANCE(mm)	RADIUS TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.02	h6

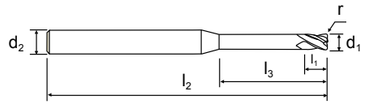
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

4 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN | R ±0.02



Series No. 114365

▶ cutting conditions : p.166

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

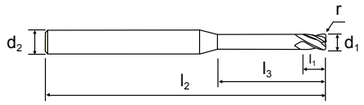
EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1143650100	**1.0**	0.1	4	1.5	4.0	50
1143650101	**1.0**	0.1	4	1.5	6.0	50
1143650102	**1.0**	0.1	4	1.5	8.0	50
1143650103	**1.0**	0.2	4	1.5	4.0	50
1143650104	**1.0**	0.2	4	1.5	6.0	50
1143650105	**1.0**	0.2	4	1.5	8.0	50
1143650106	**1.0**	0.3	4	1.5	4.0	50
1143650107	**1.0**	0.3	4	1.5	6.0	50
1143650108	**1.0**	0.3	4	1.5	8.0	50
1143650120	**1.2**	0.1	4	1.8	4.0	50
1143650121	**1.2**	0.1	4	1.8	6.0	50
1143650122	**1.2**	0.1	4	1.8	8.0	50
1143650123	**1.2**	0.2	4	1.8	4.0	50
1143650124	**1.2**	0.2	4	1.8	6.0	50
1143650125	**1.2**	0.2	4	1.8	8.0	50
1143650126	**1.2**	0.3	4	1.8	4.0	50
1143650127	**1.2**	0.3	4	1.8	6.0	50
1143650128	**1.2**	0.3	4	1.8	8.0	50
1143650150	**1.5**	0.1	4	2.3	6.0	50
1143650151	**1.5**	0.1	4	2.3	8.0	50
1143650152	**1.5**	0.1	4	2.3	10.0	50
1143650153	**1.5**	0.1	4	2.3	12.0	50
1143650154	**1.5**	0.2	4	2.3	6.0	50
1143650155	**1.5**	0.2	4	2.3	8.0	50
1143650156	**1.5**	0.2	4	2.3	10.0	50
1143650157	**1.5**	0.2	4	2.3	12.0	50

MILL DIA TOLERANCE(mm)	RADIUS TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.02	h6

●: Excellent **O**: Good

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

4 FLUTE EXTENDED NECK CORNER RADIUS



MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN | R ±0.02

Series No. 114365

▶ cutting conditions : p.166

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1143650158	**1.5**	0.3	4	2.3	6.0	50
1143650159	**1.5**	0.3	4	2.3	8.0	50
1143650160	**1.5**	0.3	4	2.3	10.0	50
1143650161	**1.5**	0.3	4	2.3	12.0	50
1143650162	**1.5**	0.5	4	2.3	6.0	50
1143650163	**1.5**	0.5	4	2.3	8.0	50
1143650164	**1.5**	0.5	4	2.3	10.0	50
1143650165	**1.5**	0.5	4	2.3	12.0	50
1143650200	**2.0**	0.1	4	3.0	6.0	50
1143650201	**2.0**	0.1	4	3.0	8.0	50
1143650202	**2.0**	0.1	4	3.0	10.0	50
1143650203	**2.0**	0.1	4	3.0	12.0	50
1143650204	**2.0**	0.2	4	3.0	6.0	50
1143650205	**2.0**	0.2	4	3.0	8.0	50
1143650206	**2.0**	0.2	4	3.0	10.0	50
1143650207	**2.0**	0.2	4	3.0	12.0	50
1143650208	**2.0**	0.3	4	3.0	6.0	50
1143650209	**2.0**	0.3	4	3.0	8.0	50
1143650210	**2.0**	0.3	4	3.0	10.0	50
1143650211	**2.0**	0.3	4	3.0	12.0	50
1143650212	**2.0**	0.5	4	3.0	6.0	50
1143650213	**2.0**	0.5	4	3.0	8.0	50
1143650214	**2.0**	0.5	4	3.0	10.0	50
1143650215	**2.0**	0.5	4	3.0	12.0	50
1143650300	**3.0**	0.1	6	4.5	8.0	50
1143650301	**3.0**	0.1	6	4.5	10.0	50
1143650302	**3.0**	0.1	6	4.5	12.0	50
1143650303	**3.0**	0.1	6	4.5	16.0	60

MILL DIA TOLERANCE(mm)	RADIUS TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.02	h6

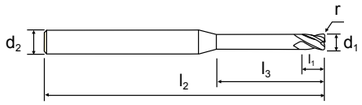
●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

4 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN | R ±0.02



Series No. 114365

▶ cutting conditions : p.166

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

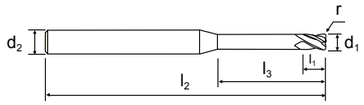
EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1143650304	**3.0**	0.2	6	4.5	10.0	50
1143650305	**3.0**	0.2	6	4.5	12.0	50
1143650306	**3.0**	0.2	6	4.5	16.0	60
1143650307	**3.0**	0.2	6	4.5	20.0	60
1143650308	**3.0**	0.3	6	4.5	8.0	50
1143650309	**3.0**	0.3	6	4.5	10.0	50
1143650310	**3.0**	0.3	6	4.5	12.0	50
1143650311	**3.0**	0.3	6	4.5	16.0	60
1143650312	**3.0**	0.3	6	4.5	20.0	60
1143650313	**3.0**	0.5	6	4.5	8.0	50
1143650314	**3.0**	0.5	6	4.5	10.0	50
1143650315	**3.0**	0.5	6	4.5	12.0	50
1143650316	**3.0**	0.5	6	4.5	16.0	60
1143650317	**3.0**	0.5	6	4.5	20.0	60
1143650318	**3.0**	1.0	6	4.5	8.0	50
1143650319	**3.0**	1.0	6	4.5	10.0	50
1143650320	**3.0**	1.0	6	4.5	12.0	50
1143650321	**3.0**	1.0	6	4.5	16.0	60
1143650400	**4.0**	0.1	6	6.0	10.0	50
1143650401	**4.0**	0.1	6	6.0	12.0	50
1143650402	**4.0**	0.1	6	6.0	16.0	60
1143650403	**4.0**	0.1	6	6.0	20.0	60
1143650404	**4.0**	0.2	6	6.0	10.0	50
1143650405	**4.0**	0.2	6	6.0	12.0	50
1143650406	**4.0**	0.2	6	6.0	16.0	60
1143650407	**4.0**	0.2	6	6.0	20.0	60
1143650408	**4.0**	0.2	6	6.0	26.0	65

MILL DIA TOLERANCE(mm)	RADIUS TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.02	h6

●: Excellent **O**: Good

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

4 FLUTE EXTENDED NECK CORNER RADIUS



MG HM | M-HELIX ≥ ø 3.0 | FLUTE 4 | PLAIN | R ±0.02

Series No. 114365

▶ cutting conditions : p.166

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1143650409	**4.0**	0.3	6	6.0	10.0	50
1143650410	**4.0**	0.3	6	6.0	12.0	50
1143650411	**4.0**	0.3	6	6.0	16.0	60
1143650412	**4.0**	0.3	6	6.0	20.0	60
1143650413	**4.0**	0.3	6	6.0	26.0	65
1143650414	**4.0**	0.5	6	6.0	12.0	50
1143650415	**4.0**	0.5	6	6.0	16.0	60
1143650416	**4.0**	0.5	6	6.0	20.0	60
1143650417	**4.0**	0.5	6	6.0	26.0	65
1143650418	**4.0**	1.0	6	6.0	10.0	50
1143650419	**4.0**	1.0	6	6.0	12.0	50
1143650420	**4.0**	1.0	6	6.0	16.0	60
1143650421	**4.0**	1.0	6	6.0	20.0	60
1143650422	**4.0**	1.0	6	6.0	26.0	65
1143650600	**6.0**	0.3	6	9.0	20.0	60
1143650601	**6.0**	0.5	6	9.0	20.0	60
1143650602	**6.0**	1.0	6	9.0	20.0	60
1143650800	**8.0**	0.2	8	12.0	25.0	70
1143650801	**8.0**	0.5	8	12.0	25.0	70
1143650803	**8.0**	1.0	8	12.0	25.0	70
1143651000	**10.0**	0.5	10	15.0	30.0	75
1143651001	**10.0**	1.0	10	15.0	30.0	75
1143651200	**12.0**	0.5	12	18.0	32.0	80
1143651201	**12.0**	1.0	12	18.0	32.0	80

MILL DIA TOLERANCE(mm)	RADIUS TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.02	h6

●: Excellent **O**: Good

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

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

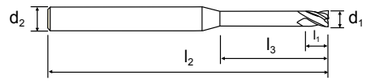
4 FLUTE EXTENDED NECK

MG HM | 30° | FLUTE 4 | PLAIN

Series No. 126365

▶ cutting conditions : p.167

New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.



EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2
1263650100	**1.0**	4	1.5	4.0	50
1263650101	**1.0**	4	1.5	5.0	50
1263650102	**1.0**	4	1.5	6.0	50
1263650103	**1.0**	4	1.5	8.0	50
1263650150	**1.5**	4	2.3	6.0	50
1263650151	**1.5**	4	2.3	8.0	50
1263650152	**1.5**	4	2.3	10.0	50
1263650153	**1.5**	4	2.3	12.0	50
1263650200	**2.0**	6	3.0	8.0	50
1263650201	**2.0**	6	3.0	10.0	50
1263650202	**2.0**	6	3.0	12.0	50
1263650300	**3.0**	6	4.5	10.0	50
1263650301	**3.0**	6	4.5	12.0	50
1263650302	**3.0**	6	4.5	16.0	60
1263650303	**3.0**	6	4.5	20.0	60
1263650400	**4.0**	6	6.0	12.0	50
1263650401	**4.0**	6	6.0	16.0	60
1263650402	**4.0**	6	6.0	20.0	60
1263650500	**5.0**	6	8.0	20.0	60
1263650600	**6.0**	6	9.0	15.0	60
1263650800	**8.0**	8	12.0	25.0	70
1263651000	**10.0**	10	15.0	30.0	75

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

●: Excellent **O**: Good

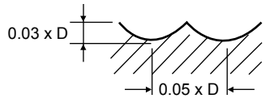
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●	●	O	O	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●	O			O	O									

PULSAR DMX
CUTTING DATA

PULSAR DMX CUTTING CONDITION

100365 (2 Flute Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)									
				0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.5	2.0
P	13	< 35	v_c (m/min)	13	19	28	38	47	57	75	94	141	187
			n	40000	30000	30000	30000	30000	30000	30000	30000	30000	29820
	14		f_z	0.007	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.054	0.057
			f (mm/min)	550	720	900	1140	1440	1740	2340	2880	3240	3420
H	15	35-45	v_c (m/min)	13	19	28	38	47	57	75	94	136	180
			n	40000	30000	30000	30000	30000	30000	30000	30000	28800	28680
	16		f_z	0.006	0.011	0.014	0.017	0.021	0.025	0.033	0.042	0.047	0.05
			f (mm/min)	500	630	810	1020	1260	1500	1980	2520	2700	2880
	15	45-55	v_c (m/min)	10	17	25	34	42	51	68	85	122	151
			n	33000	27000	27000	27000	27000	27000	27000	27000	25800	24000
	16		f_z	0.006	0.011	0.013	0.017	0.021	0.024	0.033	0.042	0.047	0.05
			f (mm/min)	400	575	720	900	1140	1320	1800	2280	2400	2400
K	31		v_c (m/min)	13	19	28	38	47	57	75	94	141	187
	32		n	40000	30000	30000	30000	30000	30000	30000	30000	30000	29820
	33		f_z	0.007	0.012	0.015	0.019	0.024	0.029	0.039	0.048	0.054	0.057
	34		f (mm/min)	550	720	900	1140	1440	1740	2340	2880	3240	3420



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

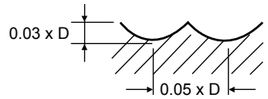
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR DMX CUTTING CONDITION

100365 (2 Flute Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)									
				2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 35	v_c (m/min)	187	187	187	175	157	167	175	157	168	168
			n	23800	19860	14900	11160	8340	6660	5580	4170	3340	2670
	14		f_z	0.074	0.091	0.121	0.156	0.174	0.189	0.199	0.212	0.238	0.264
			f (mm/min)	3510	3600	3600	3480	2910	2520	2220	1770	1590	1410
H	15	35-45	v_c (m/min)	180	180	180	168	152	161	168	151	161	162
			n	22900	19080	14340	10680	8040	6420	5340	4000	3210	2580
	16		f_z	0.066	0.083	0.111	0.138	0.153	0.164	0.174	0.188	0.206	0.227
			f (mm/min)	180	180	180	168	152	161	168	151	161	162
	15	45-55	v_c (m/min)	151	151	151	141	135	136	141	127	136	136
			n	19200	16000	12000	9000	6600	5400	4500	3360	2700	2160
	16		f_z	0.063	0.075	0.1	0.125	0.141	0.15	0.16	0.17	0.189	0.208
			f (mm/min)	2400	2400	2400	2250	1860	1620	1440	1140	1020	900
K	31		v_c (m/min)	187	187	187	175	157	167	175	157	168	168
	32		n	23800	19860	14900	11160	8340	6660	5580	4170	3340	2670
	33		f_z	0.074	0.091	0.121	0.156	0.174	0.189	0.199	0.212	0.238	0.264
	34		f (mm/min)	3510	3600	3600	3480	2910	2520	2220	1770	1590	1410



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

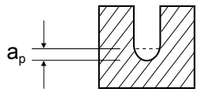
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

102365 (2 Flute Extended Neck, Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5
P	13	< 35	a_p (mm)	0.007	0.007	0.014	0.011	0.014	0.018	0.023	0.043	0.034
			v_c (m/min)	31	42	46	48	58	77	77	89	101
			n	45000	45000	36900	30780	30780	30780	24640	23670	21510
	14		f_z	0.003	0.004	0.005	0.009	0.013	0.016	0.02	0.024	0.03
			f (mm/min)	270	385	395	555	830	995	985	1115	1280
H	15	35-45	a_p (mm)	0.006	0.005	0.011	0.009	0.011	0.014	0.018	0.034	0.026
			v_c (m/min)	28	42	44	46	55	73	73	84	96
			n	45000	45000	34920	29070	29070	29070	23280	22320	20340
	16		f_z	0.003	0.004	0.005	0.008	0.012	0.014	0.018	0.021	0.027
			f (mm/min)	250	350	345	470	680	840	840	930	1100
	16	45-55	a_p (mm)	0.004	0.004	0.008	0.006	0.008	0.01	0.013	0.024	0.019
			v_c (m/min)	24	36	39	40	48	64	65	74	85
			n	38880	38520	30780	25650	25650	25650	20560	19710	18000
	16		f_z	0.003	0.004	0.004	0.008	0.011	0.014	0.017	0.02	0.024
			f (mm/min)	210	295	275	415	555	695	690	770	870
K	31		a_p (mm)	0.007	0.007	0.014	0.011	0.014	0.018	0.023	0.043	0.034
			v_c (m/min)	31	42	46	48	58	77	77	89	101
	32		n	45000	45000	36900	30780	30780	30780	24640	23670	21510
	33		f_z	0.003	0.004	0.005	0.009	0.013	0.016	0.02	0.024	0.03
	34		f (mm/min)	270	385	395	555	830	995	985	1115	1280



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

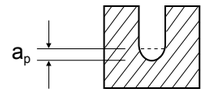
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR DMX CUTTING CONDITION

102365 (2 Flute Extended Neck, Ball Nose)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	13	< 35	a_p (mm)	0.045	0.108	0.144	0.18	0.378	0.504	0.9	0.756
			v_c (m/min)	102	116	111	109	123	122	121	121
			n	16200	12330	8820	6930	6500	4850	3850	3200
	14		f_z	0.045	0.067	0.09	0.108	0.146	0.186	0.214	0.238
			f (mm/min)	1455	1660	1590	1495	1900	1800	1650	1520
H	15	35-45	a_p (mm)	0.035	0.084	0.112	0.14	0.294	0.392	0.7	0.588
			v_c (m/min)	96	109	105	103	117	116	116	115
			n	15300	11610	8370	6570	6200	4600	3680	3050
	16		f_z	0.04	0.06	0.081	0.09	0.129	0.163	0.19	0.213
			f (mm/min)	1235	1400	1355	1180	1600	1500	1400	1300
	16	45-55	a_p (mm)	0036	0.06	0.08	0.1	0.21	0.28	0.5	0.42
			v_c (m/min)	85	97	93	90	104	101	101	100
			n	13500	10260	7380	5760	5500	4000	3200	2650
	16		f_z	0.039	0.057	0.077	0.09	0.121	0.16	0.188	0.208
			f (mm/min)	1040	1160	1130	1040	1330	1280	1200	1100
K	31		a_p (mm)	0.045	0.108	0.144	0.18	0.378	0.504	0.9	0.756
			v_c (m/min)	102	116	111	109	123	122	121	121
	32		n	16200	12330	8820	6930	6500	4850	3850	3200
	33		f_z	0.045	0.067	0.09	0.108	0.146	0.186	0.214	0.238
	34		f (mm/min)	1455	1660	1590	1495	1900	1800	1650	1520



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

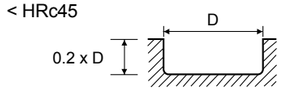
PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

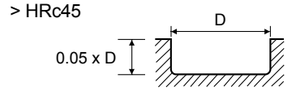
108365 (2 Flute Corner Radius)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				2.0	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**
P	13	**< 35**	v_c (m/min)	113	125	135	144	149	151	158	155	156
	14		n	18000	13240	10720	9160	7900	6000	5040	4120	3100
			f_z	0.007	0.011	0.016	0.023	0.032	0045	0.054	0.051	0.058
			f (mm/min)	260	280	340	420	500	540	540	420	360
H	15	**35-45**	v_c (m/min)	73	81	86	91	95	96	103	205	106
			n	11560	8560	6820	5800	5040	3800	3280	2780	2100
	16		f_z	0.005	0.008	0.012	0.017	0.025	0.033	0.038	0.041	0.04
			f (mm/min)	120	140	170	200	250	250	250	230	170
	15	**45-55**	v_c (m/min)	45	50	54	60	62	63	63	62	65
			n	7200	5280	4300	3800	3280	2520	2020	1680	1280
	16		f_z	0.005	0.007	0.009	0.013	0.018	0.024	0.03	0.03	0.031
			f (mm/min)	70	70	80	100	120	120	120	100	80
K	31		v_c (m/min)	113	125	135	144	149	151	158	155	156
	32		n	18000	13240	10720	9160	7900	6000	5040	4120	3100
	33		f_z	0.007	0.011	0.016	0.023	0.032	0045	0.054	0.051	0.058
	34		f (mm/min)	260	280	340	420	500	540	540	420	360

< HRc45



> HRc45



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

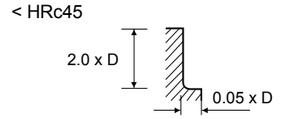
PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

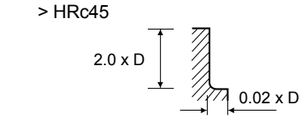
112365 (4 Flute Corner Radius)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				3.0	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**
P	13	**< 35**	v_c (m/min)	125	135	144	149	151	158	155	156
	14		n	13240	10720	9160	7900	6000	5040	4120	3100
			f_z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023
			f (mm/min)	340	420	430	430	460	460	360	280
H	15	**35-45**	v_c (m/min)	81	86	91	95	96	103	105	106
			n	8560	6820	5800	5040	3800	3280	2780	2100
	16		f_z	0.008	0.011	0.016	0.018	0.024	0.027	0.029	0.027
			f (mm/min)	260	300	360	360	360	360	320	230
	15	**45-55**	v_c (m/min)	50	54	60	62	63	63	63	64
			n	5280	4300	3800	3280	2520	2020	1680	1280
	16		f_z	0.006	0.008	0.011	0.013	0.017	0.021	0.021	0.022
			f (mm/min)	130	140	170	3280	170	170	140	115
K	31		v_c (m/min)	125	135	144	149	151	158	155	156
	32		n	13240	10720	9160	7900	6000	5040	4120	3100
	33		f_z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023
	34		f (mm/min)	340	420	430	430	460	460	360	280

< HRc45



> HRc45



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: $n = \frac{v_c * 1000}{\pi * ø}$

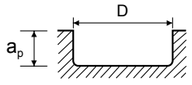
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR DMX CUTTING CONDITION

110365 (2 Flute Extended Neck, Corner Radius)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2
P	13	< 35	a_p (mm)	0.016	0.024	0.032	0.07	0.03	0.064	0.05	0.06
			v_c (m/min)	28	42	57	68	62	82	94	101
			n	45000	45000	45000	43000	32760	32760	29790	26780
	14		f_z	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.004
			f (mm/min)	140	160	160	220	205	205	225	235
H	15	35-45	a_p (mm)	0.012	0.018	0.024	0.053	0.023	0.048	0.038	0.045
			v_c (m/min)	20	27	36	44	41	54	61	64
			n	31050	28800	28800	28000	21600	21600	19440	17010
	16		f_z	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.003
			f (mm/min)	60	70	70	95	90	90	95	100
	16	45-55	a_p (mm)	0.01	0.014	0.019	0.042	0.018	0.038	0.03	0.036
			v_c (m/min)	12	17	23	27	25	33	37	40
			n	19040	18000	18000	17100	13050	13050	11880	10530
	16		f_z	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.003
			f (mm/min)	35	40	40	60	55	55	55	55
K	31		a_p (mm)	0.016	0.024	0.032	0.07	0.03	0.064	0.05	0.06
	32		v_c (m/min)	28	42	57	68	62	82	94	101
			n	45000	45000	45000	43000	32760	32760	29790	26780
	33		f_z	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.004
	34		f (mm/min)	140	160	160	220	205	205	225	235



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

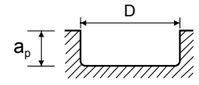
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR DMX CUTTING CONDITION

110365 (2 Flute Extended Neck, Corner Radius)

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				1.5	2.0	3.0	4.0	6.0	8.0	10.0
P	13	< 35	a_p (mm)	0.075	0.16	0.24	0.32	0.84	1.12	1.4
			v_c (m/min)	112	122	135	145	179	181	188
			n	23760	19440	14310	11520	9500	7200	6000
	14		f_z	0.005	0.006	0.009	0.014	0.032	0.044	0.053
			f (mm/min)	245	250	265	325	600	640	640
H	15	35-45	a_p (mm)	0.056	0.12	0.18	0.24	0.63	0.84	1.05
			v_c (m/min)	69	78	87	93	113	114	126
			n	14580	12450	9270	7380	6000	4550	4000
	16		f_z	0.004	0.005	0.007	0.011	0.025	0.033	0.038
			f (mm/min)	105	115	130	160	300	300	300
	16	45-55	a_p (mm)	0.045	0.096	0.144	0.192	0.504	0.672	0.84
			v_c (m/min)	43	49	53	58	75	76	76
			n	9180	7780	5670	4640	3930	3020	2420
	16		f_z	0.003	0.004	0.006	0.008	0.018	0.023	0.029
			f (mm/min)	55	65	65	75	140	140	140
K	31		a_p (mm)	0.075	0.16	0.24	0.32	0.84	1.12	1.4
	32		v_c (m/min)	112	122	135	145	179	181	188
			n	23760	19440	14310	11520	9500	7200	6000
	33		f_z	0.005	0.006	0.009	0.014	0.032	0.044	0.053
	34		f (mm/min)	245	250	265	325	600	640	640



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

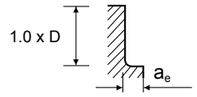
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

114365 (4 Flute Extended Neck, Corner Radius)

MATERIAL GROUP		HARDNESS HRc		Size (mm)									
				1.0	1.2	1.5	2.0	3.0	4.0	6.0	8.0	10.0	12.0
P	13	< 35	a_e (mm)	0.008	0.009	0.011	0.024	0.036	0.048	0.123	0.168	0.21	0.252
			v_c (m/min)	83	101	112	122	135	145	179	181	188	188
			n	26480	23780	23760	18440	14310	11520	9500	7300	6000	5000
	14		f_z	0.002	0.003	0.003	0.004	0.006	.0009	0.013	0.019	0.023	0.022
			f (mm/min)	230	295	300	310	325	405	510	550	550	430
H	15	35-45	a_e (mm)	0.006	0.007	0.008	0.018	0.027	0.036	0.095	0.126	0.158	0.189
			v_c (m/min)	54	64	39	78	87	93	113	114	126	126
			n	17280	17010	14580	12420	9270	7380	6000	4550	4000	3340
	16		f_z	0.002	0.003	0.004	0.005	0.007	0.01	0.018	0.024	0.027	0.028
			f (mm/min)	165	215	220	225	250	290	430	430	430	380
	16	45-55	a_e (mm)	0.005	0.005	0.007	0.014	0.022	0.029	0.076	0.101	0.126	0.151
			v_c (m/min)	33	40	43	49	53	58	74	76	76	75
			n	10560	10530	9180	7780	5670	4640	3930	3020	2420	2000
	16		f_z	0.002	0.003	0.003	0.004	0.005	0.007	0.013	0.017	0.021	0.02
			f (mm/min)	90	115	115	120	120	130	200	200	200	160
K	31		a_e (mm)	0.008	0.009	0.011	0.024	0.036	0.048	0.123	0.168	0.21	0.252
			v_c (m/min)	83	101	112	122	135	145	179	181	188	188
	32		n	26480	23780	23760	18440	14310	11520	9500	7300	6000	5000
	33		f_z	0.002	0.003	0.003	0.004	0.006	.0009	0.013	0.019	0.023	0.022
	34		f (mm/min)	230	295	300	310	325	405	510	550	550	430



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

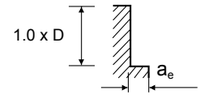
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

126365 (4 Flute Extended Neck)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	13	< 35	a_e (mm)	0.005	0.008	0.011	0.025	0.034	0.042	0.088	0.118	0.147
			v_c (m/min)	55	72	70	91	103	107	126	127	123
			n	17600	15300	11120	9630	9160	6800	6670	5040	3910
	14		f_z	0.003	0.004	0.005	0.008	0.017	0.022	0.03	0.042	0.047
			f (mm/min)	200	260	210	310	550	585	790	850	730
H	15	35-45	a_e (mm)	0.004	0.006	0.008	0.019	0.025	0.032	0.066	0.088	0.11
			v_c (m/min)	34	45	46	57	63	64	76	76	75
			n	10800	9630	7260	6000	4990	4080	4030	3020	2400
	16		f_z	0.003	0.004	0.004	0.008	0.017	0.021	0.03	0.037	0.038
			f (mm/min)	115	155	130	195	340	350	490	450	360
	16	45-55	a_e (mm)	0.003	0.005	0.006	0.015	0.02	0.025	0.053	0.071	0.088
			v_c (m/min)	21	28	30	34	40	39	45	51	51
			n	6800	5850	4800	3630	3180	2500	2400	2010	1630
	16		f_z	0.001	0.002	0.002	0.004	0.004	0.007	0.01	0.016	0.016
			f (mm/min)	30	40	40	55	55	70	95	130	105
K	31		a_e (mm)	0.005	0.008	0.011	0.025	0.034	0.042	0.088	0.118	0.147
			v_c (m/min)	55	72	70	91	103	107	126	127	123
	32		n	17600	15300	11120	9630	9160	6800	6670	5040	3910
	33		f_z	0.003	0.004	0.005	0.008	0.017	0.022	0.03	0.042	0.047
	34		f (mm/min)	200	260	210	310	550	585	790	850	730



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

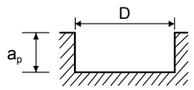
PULSAR DMX CUTTING CONDITION

116365 (2 Flute)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
P	13	< 35	v_c (m/min)	26	37	49	57	60	62	63	66	68
	14		n	42000	39000	39000	36000	32000	28000	25000	23500	21500
			f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
			f (mm/min)	80	85	90	105	120	135	150	155	160
H	16	35-45	v_c (m/min)	16	22	29	34	36	37	38	40	41
	16		n	25200	23400	23400	21600	19200	16800	15000	14100	12900
			f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
			f (mm/min)	48	51	54	63	72	81	90	90	96
	16	45-55	v_c (m/min)	11	15	20	23	24	25	25	27	27
	16		n	16800	15600	15600	14400	12800	11200	10000	9400	8600
			f_z	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002
			f (mm/min)	16	17	18	21	24	27	30	31	32
M	21		v_c (m/min)	13	18	25	28	30	31	31	33	34
	22		n	21000	19500	19500	18000	16000	14000	12500	11750	10750
	23		f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
			f (mm/min)	37	43	45	52	60	67	75	77	80
K	31		v_c (m/min)	26	37	49	57	60	62	63	66	68
	32		n	42000	39000	39000	36000	32000	28000	25000	23500	21500
	33		f_z	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004
	34		f (mm/min)	80	85	90	105	120	135	150	155	160

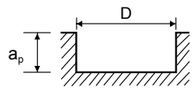
< HRc45

a_p : ø0.2mm - ø1.0mm = 0.15 x D
a_p : ø1.5mm - ø3.0mm = 0.2 x D
a_p : ø3.5mm - ø20.0mm = 0.5 x D



> HRc45

a_p : ø0.2mm - ø1.0mm = 0.02 x D
a_p : ø1.5mm - ø20.0mm = 0.05 x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

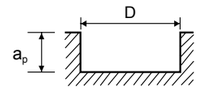
PULSAR DMX CUTTING CONDITION

116365 (2 Flute)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	
P	13	< 35	v_c (m/min)	71	73	80	84	91	95	98	99	
	14		n	15000	11560	10240	8920	8240	7560	6930	6300	
			f_z	0.006	0.008	0.01	0.012	0.015	0.02	0.022	0.025	
			f (mm/min)	170	190	200	210	255	300	310	320	
H	16	35-45	v_c (m/min)	42	48	52	52	56	58	59	59	
	16		n	9000	7560	6560	5560	5090	4620	4200	3780	
			f_z	0.006	0.008	0.01	0.013	0.016	0.019	0.022	0.025	
			f (mm/min)	102	120	130	140	56	180	185	190	
	16	45-55	v_c (m/min)	28	32	33	32	35	37	37	36	
	16		n	6000	5040	4200	3360	3150	2940	2630	2320	
			f_z	0.003	0.003	0.004	0.006	0.006	0.007	0.009	0.011	
			f (mm/min)	34	35	37	40	40	40	45	50	
M	21		v_c (m/min)	35	40	43	44	47	49	50	50	
	22		n	7500	6300	5460	4620	4250	3990	3520	3160	
	23		f_z	0.006	0.007	0.01	0.013	0.016	0.019	0.022	0.025	
			f (mm/min)	85	90	105	44	135	150	155	160	
K	31		v_c (m/min)	71	73	80	84	91	95	98	99	
	32		n	15000	11560	10240	8920	8240	7560	6930	6300	
	33		f_z	0.006	0.008	0.01	0.012	0.015	0.02	0.022	0.025	
	34		f (mm/min)	170	190	200	210	255	300	310	320	

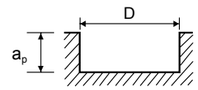
< HRc45

a_p : ø0.2mm - ø1.0mm = 0.15 x D
a_p : ø1.5mm - ø3.0mm = 0.2 x D
a_p : ø3.5mm - ø20.0mm = 0.5 x D



> HRc45

a_p : ø0.2mm - ø1.0mm = 0.02 x D
a_p : ø1.5mm - ø20.0mm = 0.05 x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

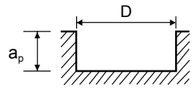
PULSAR DMX CUTTING CONDITION

116365 (2 Flute)

MATERIAL GROUP		HARDNESS HRc		Size (mm) 6.0	6.5	7.0	8.0	8.5	9.0	9.5	10.0
P	13	< 35	v_c (m/min)	105	107	107	106	106	105	104	102
			n	5560	5220	4880	4200	3965	3730	3495	3260
	14		f_z	0.031	0.034	0.037	0.045	0.046	0.048	0.049	0.051
			f (mm/min)	350	355	365	380	365	355	340	330
H	16	35-45	v_c (m/min)	63	64	65	63	64	64	64	63
			n	3360	3150	2940	2520	2390	2260	2130	2000
	16		f_z	0.033	0.034	0.036	0.04	0.04	0.04	0.04	0.04
			f (mm/min)	220	215	210	200	190	180	170	160
	16	45-55	v_c (m/min)	38	39	40	42	43	43	43	43
			n	2000	1920	1840	1680	1600	1520	1440	1360
	16		f_z	0.014	0.016	0.018	0.022	0.022	0.021	0.021	0.022
			f (mm/min)	55	60	65	75	70	65	60	60
M	21		v_c (m/min)	54	54	54	53	53	53	53	53
			n	2840	2655	2470	2100	1995	1890	1785	1680
	22		f_z	0.032	0.034	0.036	0.043	0.044	0.045	0.046	0.048
			f (mm/min)	180	180	180	180	175	170	165	160
	23		v_c (m/min)	105	107	107	106	106	105	104	102
K	31		n	5560	5220	4880	4200	3965	3730	3495	3260
	32		f_z	0.031	0.034	0.037	0.045	0.046	0.048	0.049	0.051
	33		f (mm/min)	350	355	365	380	365	355	340	330
	34										

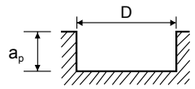
< HRc45

a_p : ø0.2mm - ø1.0mm = 0.15 x D
a_p : ø1.5mm - ø3.0mm = 0.2 x D
a_p : ø3.5mm - ø20.0mm = 0.5 x D



> HRc45

a_p : ø0.2mm - ø1.0mm = 0.02 x D
a_p : ø1.5mm - ø20.0mm = 0.05 x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

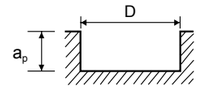
PULSAR DMX CUTTING CONDITION

116365 (2 Flute)

MATERIAL GROUP		HARDNESS HRc		Size (mm) 10.5	11.0	12.0	13.0	14.0	15.0	16.0	20.0
P	13	< 35	v_c (m/min)	103	104	103	106	109	110	111	106
			n	3130	3000	2740	2605	2470	2335	2200	1680
	14		f_z	0.05	0.051	0.051	0.051	0.051	0.05	0.05	0.051
			f (mm/min)	315	305	280	265	250	235	220	170
H	16	35-45	v_c (m/min)	63	64	63	65	67	68	68	67
			n	1920	1840	1680	1600	1520	1440	1360	1060
	16		f_z	0.039	0.039	0.039	0.039	0.039	0.04	0.04	0.038
			f (mm/min)	150	145	130	125	120	115	110	80
	16	45-55	v_c (m/min)	43	44	44	45	45	45	45	43
			n	1310	1260	1160	1095	1030	965	0.022	680
	16		f_z	0.022	0.022	0.024	0.014	0.023	0.022	900	0.022
			f (mm/min)	58	55	55	52	47	43	40	30
M	21		v_c (m/min)	53	53	51	52	53	53	23	53
			n	1600	1520	1360	1285	1210	1135	1060	840
	22		f_z	0.047	0.018	0.048	0.049	0.05	0.051	0.052	0.048
			f (mm/min)	150	145	130	125	120	115	110	80
	23		v_c (m/min)	103	104	103	106	109	110	111	106
K	31		n	3130	3000	2740	2605	2470	2335	2200	1680
	32		f_z	0.05	0.051	0.051	0.051	0.051	0.05	0.05	0.051
	33		f (mm/min)	315	305	280	265	250	235	220	170
	34										

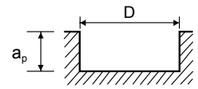
< HRc45

a_p : ø0.2mm - ø1.0mm = 0.15 x D
a_p : ø1.5mm - ø3.0mm = 0.2 x D
a_p : ø3.5mm - ø20.0mm = 0.5 x D



> HRc45

a_p : ø0.2mm - ø1.0mm = 0.02 x D
a_p : ø1.5mm - ø20.0mm = 0.05 x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

PULSAR DMX CUTTING CONDITION

118365 (2 Flute, Long Length)

MATERIAL GROUP		HARDNESS HRc		Size (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	13	< 35	v_c (m/min)	45	48	51	54	54	65	62	72	72	77	75	85
	14		n	14400	10080	8160	6930	5720	5150	3960	3800	2880	2450	2000	1700
			f_z	0.002	0.003	0.004	0.005	0.008	0.012	0.015	0.02	0.033	0.033	0.033	0.031
			f (mm/min)	55	60	70	75	90	120	120	155	190	160	130	105
H	16	35-45	v_c (m/min)	36	38	41	44	44	52	49	57	57	63	63	64
			n	11520	8060	6530	5580	4640	4100	3130	3050	2280	2000	1670	1280
	16		f_z	0.002	0.003	0.005	0.006	0.008	0.012	0.016	0.021	0.033	0.031	0.034	0.031
			f (mm/min)	50	50	60	65	75	100	100	130	150	125	115	1280
	16	45-55	v_c (m/min)	23	24	26	27	27	32	32	37	38	38	38	40
			n	7200	5040	4090	3470	2850	2580	2050	1970	1510	1210	1010	800
	16		f_z	0.002	0.002	0.004	0.004	0.007	0.01	0.011	0.015	0.023	0.025	0.022	0.022
			f (mm/min)	25	25	30	30	40	50	45	60	70	60	45	35
K	31		v_c (m/min)	45	48	51	54	54	65	62	72	72	77	75	85
	32		n	14400	10080	8160	6930	5720	5150	3960	3800	2880	2450	2000	1700
	33		f_z	0.002	0.003	0.004	0.005	0.008	0.012	0.015	0.02	0.033	0.033	0.033	0.031
	34		f (mm/min)	55	60	70	75	90	120	120	155	190	160	130	105

< HRc45

a_p : ø1.0mm - ø3.0mm = 0.4mm
a_p : ø4.0mm - ø12.0mm = 0.3 x D

> HRc45

▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

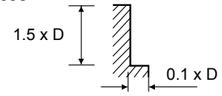
PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

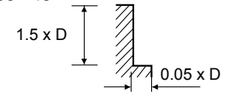
106365 (6 Flute, 45º Helix)

MATERIAL GROUP		HARDNESS HRc		Size (mm)					
				6.0	8.0	10.0	12.0	16.0	20.0
P	13	< 35	v_c (m/min)	105	106	106	107	106	106
	14		n	5560	4200	3360	2840	2100	1680
			f_z	0.06	0.079	0.099	0.099	0.1	0.1
			f (mm/min)	2000	2000	2000	1680	1260	1010
H	16	35-45	v_c (m/min)	73	74	73	75	74	73
			n	1370	2940	2320	2000	1480	1160
	16		f_z	0.059	0.078	0.098	0.097	0.099	0.099
			f (mm/min)	3880	1370	1370	1160	880	690
	16	45-55	v_c (m/min)	30	29	31	32	32	31
			n	1580	1160	1000	840	640	500
	16		f_z	0.022	0.03	0.035	0.036	0.034	0.037
			f (mm/min)	210	210	210	180	130	110
K	31		v_c (m/min)	105	106	106	107	106	106
	32		n	5560	4200	3360	2840	2100	1680
	33		f_z	0.06	0.079	0.099	0.099	0.1	0.1
	34		f (mm/min)	2000	2000	2000	1680	1260	1010

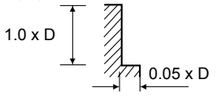
< HRc35



HRc35 - 45



> HRc45



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: $n = \frac{v_c * 1000}{\pi * ø}$

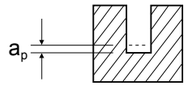
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

PULSAR DMX CUTTING CONDITION

120365 (2 Flute Extended Neck)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.5
P	13	< 35	a_p (mm)	0.009	0.011	0.008	0.018	0.023	0.027	0.032	0.054
			v_c (m/min)	31	39	41	62	62	66	76	81
			n	24660	24660	21920	24660	19680	17520	17280	17280
	14		f_z	0.009	0.009	0.011	0.013	0.017	0.017	0.019	0.021
			f (mm/min)	435	435	495	630	670	595	660	735
H	15	35-45	a_p (mm)	0.007	0.009	0.006	0.014	0.018	0.021	0.025	0.042
			v_c (m/min)	29	36	39	58	59	62	72	77
			n	23220	23220	20640	23220	18640	16560	16290	16290
	16		f_z	0.007	0.007	0.008	0.011	0.015	0.014	0.014	0.016
			f (mm/min)	310	345	350	490	570	460	460	515
	16	45-55	a_p (mm)	0.005	0.006	0.005	0.01	0.013	0.015	0.018	0.03
			v_c (m/min)	26	32	34	52	52	55	63	68
			n	20520	20520	18240	20520	16400	14560	14400	14400
	16		f_z	0.005	0.006	0.007	0.009	0.013	0.011	0.012	0.013
			f (mm/min)	225	230	260	365	425	310	345	385
K	31		a_p (mm)	0.009	0.011	0.008	0.018	0.023	0.027	0.032	0.054
			v_c (m/min)	31	39	41	62	62	66	76	81
	32		n	24660	24660	21920	24660	19680	17520	17280	17280
	33		f_z	0.009	0.009	0.011	0.013	0.017	0.017	0.019	0.021
	34		f (mm/min)	435	435	495	630	670	595	660	735



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

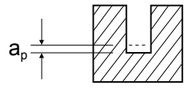
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR DMX CUTTING CONDITION

120365 (2 Flute Extended Neck)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				1.8	2.0	2.5	3.0	4.0	5.0	6.0	
P	13	< 35	a_p (mm)	0.065	0.045	0.056	0.108	0.144	0.18	0.378	
			v_c (m/min)	91	72	87	92	90	90	100	
			n	16020	11520	11070	9810	7200	5760	5300	
	14		f_z	0.021	0.023	0.035	0.035	0.073	0.081	0.1	
			f (mm/min)	680	525	785	695	1055	935	1055	
H	15	35-45	a_p (mm)	0.05	0.035	0.044	0.084	0.112	0.14	0.284	
			v_c (m/min)	86	68	82	87	86	86	94	
			n	15120	10880	10440	9270	6840	5490	5000	
	16		f_z	0.018	0.018	0.026	0.026	0.069	0.066	0.082	
			f (mm/min)	530	395	550	490	940	730	820	
	16	45-55	a_p (mm)	0.036	0.025	0.031	0.06	0.08	0.1	0.21	
			v_c (m/min)	75	60	73	56	76	76	83	
			n	13320	9600	9240	5940	6030	4860	4400	
	16		f_z	0.015	0.016	0.022	0.031	0.052	0.05	0.063	
			f (mm/min)	395	305	415	365	625	490	550	
K	31		a_p (mm)	0.065	0.045	0.056	0.108	0.144	0.18	0.378	
			v_c (m/min)	91	72	87	92	90	90	100	
	32		n	16020	11520	11070	9810	7200	5760	5300	
	33		f_z	0.021	0.023	0.035	0.035	0.073	0.081	0.1	
	34		f (mm/min)	680	525	785	695	1055	935	1055	



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

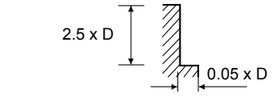
PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

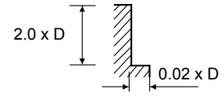
124365 (4 Flute Long Length)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0
P	13	< 35	v_c (m/min)	54	59	60	64	63	75	72	83
			n	17280	12420	9530	8090	6660	6000	4610	4420
	14		f_z	0.002	0.003	0.005	0.006	0.009	00014	0.019	0.025
			f (mm/min)	145	155	195	210	250	335	350	440
H	15	35-45	v_c (m/min)	31	33	34	37	36	43	41	48
			n	9850	7080	5440	4650	3860	3410	2610	2520
	16		f_z	0.002	0.002	0.004	0.005	0.007	0.01	0.013	0.018
			f (mm/min)	60	60	80	85	110	140	135	185
	15	45-55	v_c (m/min)	19	20	21	23	22	27	27	31
			n	6050	4350	3400	2890	2380	2150	1710	1640
	16		f_z	0.001	0.002	0.003	0.004	0.006	0.008	0.01	0.014
			f (mm/min)	30	60	45	50	60	70	70	90
K	31		v_c (m/min)	54	59	60	64	63	75	72	83
	32		n	17280	12420	9530	8090	6660	6000	4610	4420
	33		f_z	0.002	0.003	0.005	0.006	0.009	00014	0.019	0.025
	34		f (mm/min)	145	155	195	210	250	335	350	440

< HRc45



> HRc45



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

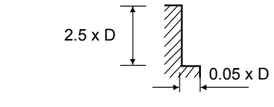
PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

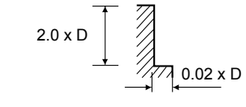
124365 (4 Flute Long Length)

MATERIAL GROUP		HARDNESS HRc		Size (mm)						
				8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	13	< 35	v_c (m/min)	84	89	87	93	98	89	86
			n	3360	2820	2300	2120	1940	1420	1100
	14		f_z	0.035	0.042	0.04	0.041	0.037	0.041	0.042
			f (mm/min)	470	470	365	345	290	235	185
H	15	35-45	v_c (m/min)	48	52	52	54	54	52	64
			n	1900	1640	1390	1230	1070	820	820
	16		f_z	0.024	0.028	0.03	0.029	0.027	0.027	0.027
			f (mm/min)	185	185	165	145	115	90	90
	15	45-55	v_c (m/min)	32	32	32	33	34	31	39
			n	1260	1010	840	760	640	500	500
	16		f_z	0.018	0.022	0.021	0.021	0.021	0.023	0.023
			f (mm/min)	90	90	70	65	55	45	45
K	31		v_c (m/min)	84	89	87	93	98	89	86
	32		n	3360	2820	2300	2120	1940	1420	1100
	33		f_z	0.035	0.042	0.04	0.041	0.037	0.041	0.042
	34		f (mm/min)	470	470	365	345	290	235	185

< HRc45



> HRc45



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

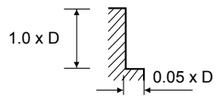
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR DMX CUTTING CONDITION

104365, 122365 (4 Flute, Standard & Heavy Cut)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				1.0	1.2	1.5	2.0	2.5	3.0	3.5	4.0	4.5
P	13	< 35	v_c (m/min)	84	85	88	91	101	105	113	119	122
			n	26800	22500	18750	14450	12800	11150	10300	9450	8660
	14		f_z	0.002	0.003	0.003	0.005	0.0006	0.007	0.011	0.015	0.017
			f (mm/min)	240	250	255	280	300	320	445	570	585
H	16	35-45	v_c (m/min)	51	51	53	59	64	66	70	73	74
			n	16080	13500	11250	9450	8200	6950	6360	5780	5250
	16		f_z	0.002	0.003	0.003	0.004	0.006	0.007	0.011	0.015	0.017
			f (mm/min)	145	150	115	170	185	200	275	350	355
	16	45-55	v_c (m/min)	34	34	35	40	41	40	43	46	47
			n	10720	9000	7500	6300	5250	4200	3940	3680	3290
	16		f_z	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.004	0.005
			f (mm/min)	45	45	45	50	55	60	60	60	65
M	21		v_c (m/min)	42	42	44	50	54	54	58	61	62
			n	13400	11250	9380	7880	6830	5780	5310	4850	4400
	22		f_z	0.002	0.003	0.003	0.004	0.006	0.007	0.011	0.014	0.016
	23		f (mm/min)	120	125	130	140	155	170	225	280	290
K	31		v_c (m/min)	84	85	88	91	101	105	113	119	122
	32		n	26800	22500	18750	14450	12800	11150	10300	9450	8660
	33		f_z	0.002	0.003	0.003	0.005	0.0006	0.007	0.011	0.015	0.017
	34		f (mm/min)	240	250	255	280	300	320	445	570	585



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

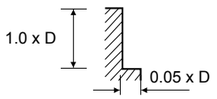
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

PULSAR DMX CUTTING CONDITION

104365, 122365 (4 Flute, Standard & Heavy Cut)

MATERIAL GROUP		HARDNESS HRc		Size (mm)								
				5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
P	13	< 35	v_c (m/min)	124	128	131	133	134	134	132	132	132
			n	7880	7410	6950	6530	6100	5680	5250	4960	4660
	14		f_z	0.019	0.021	0.024	0.026	0.028	0.031	0.034	0.035	0.035
			f (mm/min)	600	630	660	675	685	700	710	685	660
H	16	35-45	v_c (m/min)	74	77	79	80	81	80	79	80	80
			n	4730	4460	4200	3940	3680	3410	3150	2990	2830
	16		f_z	0.019	0.022	0.024	0.026	0.027	0.029	0.03	0.03	0.03
			f (mm/min)	360	385	410	405	395	390	380	360	340
	16	45-55	v_c (m/min)	46	47	47	49	51	52	53	53	57
			n	2900	2700	2500	2400	2300	2200	2100	2000	1900
	16		f_z	0.006	0.007	0.008	0.009	0.01	0.012	0.013	0.013	0.013
			f (mm/min)	70	75	80	90	95	105	110	105	100
M	21		v_c (m/min)	62	65	67	68	68	68	66	66	67
			n	3950	37550	3550	3320	3090	2860	2630	2490	2360
	22		f_z	0.019	0.021	0.023	0.025	0.028	0.03	0.033	0.034	0.034
	23		f (mm/min)	300	315	330	335	340	345	350	340	325
K	31		v_c (m/min)	124	128	131	133	134	134	132	132	132
	32		n	7880	7410	6950	6530	6100	5680	5250	4960	4660
	33		f_z	0.019	0.021	0.024	0.026	0.028	0.031	0.034	0.035	0.035
	34		f (mm/min)	600	630	660	675	685	700	710	685	660



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

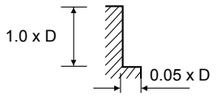
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

PULSAR DMX DESIGNED SPECIFICALLY FOR HIGH SPPED CUTTING

PULSAR DMX CUTTING CONDITION

104365, 122365 (4 Flute, Standard & Heavy Cut)

MATERIAL GROUP		HARDNESS HRc		Size (mm)							
				9.5	**10.0**	**11.0**	**12.0**	**14.0**	**16.0**	**18.0**	**20.0**
P	13	**< 35**	v_c (m/min)	130	128	130	129	136	138	137	132
			n	4370	4080	3750	3430	3090	2750	2430	2100
	14		f_z	0.036	0.037	0.038	0.038	0.038	0.038	0.038	0.038
			f (mm/min)	635	640	565	520	465	420	365	320
H	16	**35-45**	v_c (m/min)	79	79	79	79	84	85	85	84
			n	2660	2500	2300	2100	1900	1700	1510	1330
	16		f_z	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
			f (mm/min)	320	300	275	250	225	205	180	160
	16	**45-55**	v_c (m/min)	54	53	55	55	57	57	56	53
			n	1800	1700	1580	1450	1290	1130	990	850
	16		f_z	0.013	0.013	0.013	0.014	0.014	0.013	0.013	0.012
			f (mm/min)	95	90	85	80	70	60	50	40
M	21		v_c (m/min)	67	66	66	64	68	69	68	66
			n	2230	2100	1900	1700	1540	1380	1210	1050
	22		f_z	0.035	0.036	0.036	0.035	0.036	0.036	0.036	0.036
			f (mm/min)	315	300	270	240	220	200	175	150
	23										
K	31		v_c (m/min)	130	128	130	129	136	138	137	132
	32		n	4370	4080	3750	3430	3090	2750	2430	2100
	33		f_z	0.036	0.037	0.038	0.038	0.038	0.038	0.038	0.038
	34		f (mm/min)	635	640	565	520	465	420	365	320



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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

HX2
MULTI HELIX

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

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

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

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

IDEAL FOR MATERIAL GROUPS

P M K S

HX2 & ET1
END MILLS

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

www.europatool.co.uk

●: Excellent O: Good

HX2 END MILLS

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.
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												136123 136323		Short Length 4 Flute ø3.0mm - 20.0mm	P.187
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												137123 137323		Short Length 4 Flute Corner Radius ø3.0mm - 20.0mm	P.188
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												138123 138323		Long Length 4 Flute ø3.0mm - 25.0mm	P.189
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												139123 139323		Long Length 4 Flute Corner Radius ø3.0mm - 20.0mm	P.190
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												146123 146323		Extended Neck 4 Flute ø3.0mm - 20.0mm	P.191
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												134123 134323		Long Length 4 Flute Ball Nose ø3.0mm - 25.0mm	P.192
o	o	o	o			●	●	●	o	o	o	o	●	●	●	●	●	●												135123 135323		Long Length 5 Flute ø6.0mm - 25.0mm	P.193
																															ET1 END MILLS		
o	o	o	o			●	●	●					●	●	●	●	●	●												132123 132323		Long Length 3&4 Flute 50º Helix ø6.0mm - 25.0mm	P.194
o	o	o	o			●	●	●					●	●	●	●	●	●												320123 320323		Short Length Roughing ø6.0mm - 25.0mm	P.195
o	o	o	o			●	●	●					●	●	●	●	●	●												118123 118323		Long Length Roughing ø6.0mm - 25.0mm	P.196
o	o	o	o			●	●	●					●	●	●	●	●	●												117323		Long Length 6&8 Flute 45º Helix ø6.0mm - 25.0mm	P.197
o	o	o	o			●	●	●					●	●	●	●	●	●												107122		Short Length 4&6 Flute ASP60 ø3.0mm - 25.0mm	P.198
																																Cutting Data	P.199

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

HX2 MULTIPLE HELIX MILLING CUTTERS

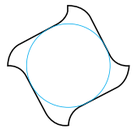
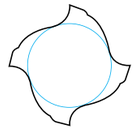
COMPLETELY NEW MILLING GENERATION
WORLD'S FIRST. VERY SMOOTH CHIP REMOVAL AND SILENT MACHINING
AVOIDS RESONANCE VIBRATION DUE TO THE UNIQUE SINUSOIDAL FLUTE FORM DESIGN
IMPROVES SURFACE FINISH DUE TO THE CHATTER FREE DESIGN
INCREASED CUTTING DEPTH AND FEED RATES

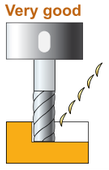
APPLICATION
HX2 : STAINLESS STEELS, TITANIUM ALLOYS, INCONEL

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

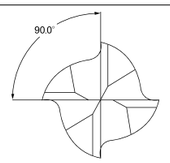
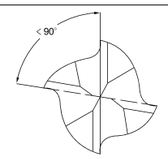
HX2 & ET1 VS COMPETITORS

HX2 CHARACTERISTICS

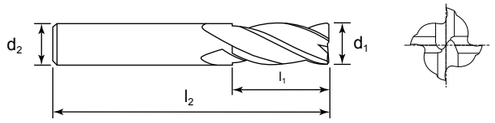
HX2	CONVENTIONAL
	
CROSS SECTION OF CORE	

HX2	CONVENTIONAL
Very good 	
 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



MG HM | FLUTE 4 | PLAIN | FLAT

Series No. 136123, 136323

▶ cutting conditions : p.200

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 **O**: Good

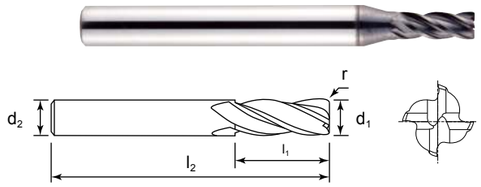
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●	O	O	●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●		O	O	●	●	●						

4 FLUTE SHORT LENGTH CORNER RADIUS HX2

MG HM | FLUTE 4 | PLAIN | FLAT

Series No. 137123, 137323

▶ cutting conditions : p.200



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 **O**: Good

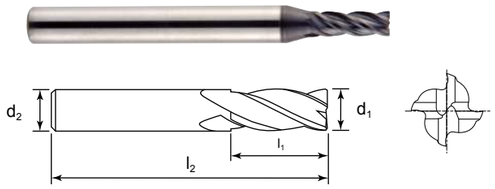
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●	O	O	●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●		O	O	●	●	●						

4 FLUTE LONG LENGTH HX2

MG HM | FLUTE 4 | PLAIN | FLAT

Series No. 138123, 138323

▶ cutting conditions : p.200



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 **O**: Good

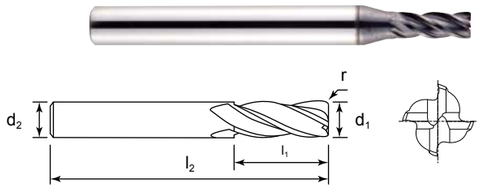
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●	O	O	●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●		O	O	●	●	●						

4 FLUTE LONG LENGTH CORNER RADIUS HX2

MG HM | FLUTE 4 | PLAIN | FLAT

Series No. 139123, 139323

▶ cutting conditions : p.200



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 **O**: Good

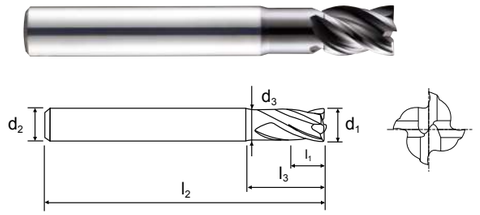
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●	O	O	●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●		O	O	●	●	●						

4 FLUTE EXTENDED NECK HX2

MG HM | FLUTE 4 | PLAIN | FLAT

Series No. 146123, 146323

▶ cutting conditions : p.200



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
1461239013	**1463239013**	**3.0**	6	7.0	17.0	57	2.7
1461230400	**1463230400**	**4.0**	6	8.0	15.0	57	3.7
1461239014	**1463239014**	**4.0**	6	8.0	22.0	63	3.7
1461230500	**1463230500**	**5.0**	6	10.0	17.0	57	4.7
1461239015	**1463239015**	**5.0**	6	10.0	27.0	67	4.7
1461230600	**1463230600**	**6.0**	6	10.0	15.0	57	5.5
1461239001	**1463239001**	**6.0**	6	10.0	20.0	62	5.5
1461239002	**1463239002**	**6.0**	6	10.0	32.0	74	5.5
1461230800	**1463230800**	**8.0**	8	12.0	20.0	63	7.5
1461239003	**1463239003**	**8.0**	8	12.0	30.0	73	7.5
1461239004	**1463239004**	**8.0**	8	12.0	46.0	90	7.5
1461231000	**1463231000**	**10.0**	10	14.0	25.0	72	9.2
1461239005	**1463239005**	**10.0**	10	14.0	35.0	82	9.2
1461239006	**1463239006**	**10.0**	10	14.0	55.0	102	9.2
1461231200	**1463231200**	**12.0**	12	16.0	30.0	83	11
1461239007	**1463239007**	**12.0**	12	16.0	40.0	93	11
1461239008	**1463239008**	**12.0**	12	16.0	64.0	117	11
1461231600	**1463231600**	**16.0**	16	22.0	38.0	92	15
1461239009	**1463239009**	**16.0**	16	22.0	55.0	109	15
1461239010	**1463239010**	**16.0**	16	22.0	87.0	141	15
1461232000	**1463232000**	**20.0**	20	26.0	50.0	104	19
1461239011	**1463239011**	**20.0**	20	26.0	70.0	124	19
1461239012	**1463239012**	**20.0**	20	26.0	110.0	164	19

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

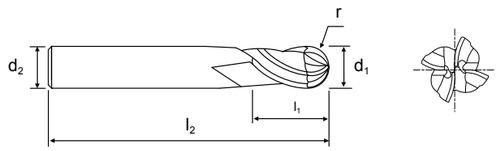
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●	O	O	●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●		O	O	●	●	●						

4 FLUTE LONG LENGTH BALL NOSE HX2

MG HM | FLUTE 4 | PLAIN | FLAT

Series No. 134123, 134323

▶ cutting conditions : p.201



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

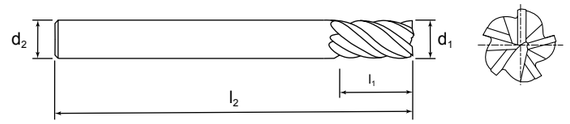
MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

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

5 FLUTE LONG LENGTH HX2

MG HM | FLUTE 5 | PLAIN | FLAT



Series No. 135123, 135323

▶ cutting conditions : p.202

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 **O**: Good

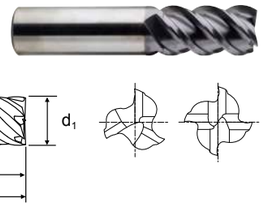
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●	O	O	●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●		O	O	●	●	●						

3&4 FLUTE LONG LENGTH 50º HELIX ET1

MG HM | 50° | FLUTE 3&4 | PLAIN | FLAT

Series No. 132123, 132323

▶ cutting conditions : p.206-207



EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
1321230600	**1323230600**	**6.0**	6	13.0	50	3
1321230800	**1323230800**	**8.0**	8	19.0	60	
1321231000	**1323231000**	**10.0**	10	22.0	70	
1321231200	**1323231200**	**12.0**	12	25.0	75	
1321231600	**1323231600**	**16.0**	16	32.0	90	
1321231800	**1323231800**	**18.0**	18	32.0	90	
1321232000	**1323232000**	**20.0**	20	38.0	100	4
1321232500	**1323232500**	**25.0**	25	45.0	120	

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

●: Excellent **O**: Good

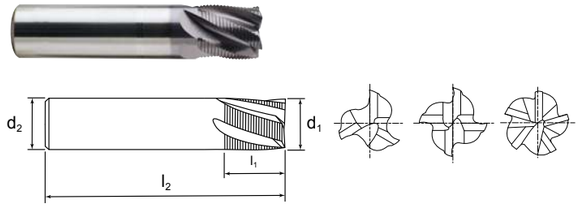
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●			●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●				●	●	●						

MULTIFLUTE SHORT LENGTH ROUGHING ET1

MG HM | 30° | FLUTE 3-5 | FINE | PLAIN | FLAT

Series No. 320123, 320323

▶ cutting conditions : p.204-205



EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
3201230600	**3203230600**	**6.0**	6	7.0	54	3
3201230700	**3203230700**	**7.0**	8	8.0	58	
3201230800	**3203230800**	**8.0**		9.0		
3201230900	**3203230900**	**9.0**	10	13.0	66	4
3201231000	**3203231000**	**10.0**		14.0		
3201231200	**3203231200**	**12.0**	12	16.0	73	
3201231400	**3203231400**	**14.0**	14	18.0	75	
3201231600	**3203231600**	**16.0**	16	22.0	82	
3201231800	**3203231800**	**18.0**	18	24.0	84	
3201232000	**3203232000**	**20.0**	20	26.0	92	
3201232500	**3203232500**	**25.0**	25	25.0	110	5

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 − 48	0 − 58	0 − 70	0 − 84
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

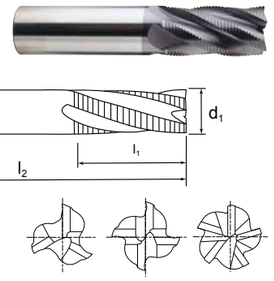
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●			●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●				●	●	●						

MULTIFLUTE LONG LENGTH ROUGHING ET1

MG HM | 30° | FLUTE 3-5 | FINE | PLAIN | FLAT

Series No. 118123, 118323

▶ cutting conditions : p.204-205



EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
1181230600	**1183230600**	**6.0**	6	16.0	57	3
1181230700	**1183230700**	**7.0**	8	16.0	63	
1181230800	**1183230800**	**8.0**		16.0		
1181230900	**1183230900**	**9.0**	10	19.0	72	4
1181231000	**1183231000**	**10.0**		22.0		
1181231200	**1183231200**	**12.0**	12	26.0	83	
1181231400	**1183231400**	**14.0**	14	26.0		
1181231600	**1183231600**	**16.0**	16	32.0	92	
1181231800	**1183231800**	**18.0**	18	32.0		
1181232000	**1183232000**	**20.0**	20	38.0	104	
1181232500	**1183232500**	**25.0**	25	45.0	121	5

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 / − 48	0 / − 58	0 / − 70	0 / − 84
SHANK DIA h6	0 / − 8	0 / − 9	0 / − 11	0 / − 13

●: Excellent **O**: Good

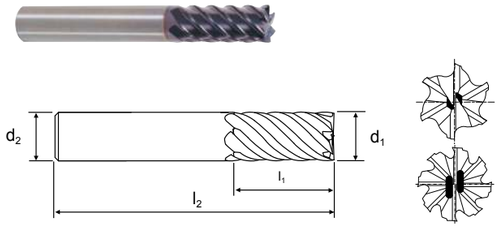
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●			●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●				●	●	●						

6&8 FLUTE LONG LENGTH 45º HELIX ET1

MG HM | 45° | FLUTE 6&8 | PLAIN

Series No. 117323

▶ cutting conditions : p.208-209



EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
1173230600	**6.0**	6	13.0	57	6
1173230700	**7.0**	8	16.0	63	
1173230800	**8.0**		19.0		
1173230900	**9.0**	10	19.0	72	
1173231000	**10.0**		22.0		
1173231200	**12.0**	12	26.0	83	
1173231400	**14.0**	14			
1173231600	**16.0**	16	32.0	92	
1173231800	**18.0**	18			8
1173232000	**20.0**	20	38.0	104	
1173232500	**25.0**	25	44.0		

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

●: Excellent **O**: Good

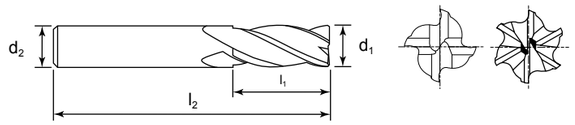
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
O	O		●	●			●	●	●						
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
O	O		●				●	●	●						

4&6 FLUTE SHORT LENGTH
ASP60 ET1

PM ASP60 | 30° | FLUTE 4&6 | FLAT

Series No. 107122

▶ cutting conditions : p.203



EUROPA CODE FLAT	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
1071220300	**3.0**	6	8.0	52	4
1071220400	**4.0**		11.0	55	
1071220500	**5.0**		13.0	57	
1071220600	**6.0**		13.0		
1071220800	**8.0**	10	19.0	69	
1071221000	**10.0**		22.0	72	
1071221200	**12.0**	12	26.0	83	
1071221400	**14.0**		26.0		6
1071221600	**16.0**	16	32.0	92	
1071221800	**18.0**		32.0		
1071222800	**20.0**	20	38.0	104	
1071222500	**25.0**	25	45.0	121	

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
0 ~ +0.03	h6

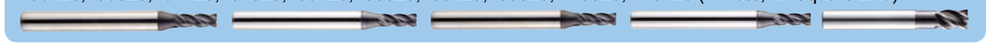
●: Excellent **O**: Good

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

HX2 & ET1
CUTTING DATA

HX2 CUTTING CONDITION

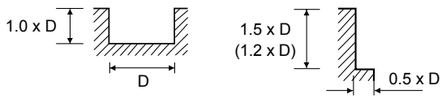
136123,136323,137123,137323,138123,138323,139123,139323, 146323, 146123 (4Flute, All Square End)



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	< 30	v_c (m/min)	125	125	125	125	125	140	140	140	140	140	140	140
	12		n	13475	10105	8085	6735	5050	4455	3710	3180	2785	2475	2225	1780
	13		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
	14		f (mm/min)	275	330	370	435	555	690	695	620	590	585	580	450
M	21	30-45	v_c (m/min)	95	95	95	95	95	95	95	95	95	95	95	95
	22		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
	23		v_c (m/min)	135	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
K	31		v_c (m/min)	125	125	125	125	125	140	140	140	140	140	140	140
	32		n	13475	10105	8085	6735	5050	4455	3710	3180	2785	2475	2225	1780
	33		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
	34		f (mm/min)	275	330	370	435	555	690	695	620	590	585	580	450
S	41		v_c (m/min)	95	95	95	95	95	95	95	95	95	95	95	95
	42		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
	43		f (mm/min)	195	250	310	360	435	590	565	520	480	475	470	380
	51		v_c (m/min)	25	25	25	25	25	25	25	25	25	25	25	25
	52		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
	53		f (mm/min)	55	55	80	95	125	155	150	140	130	125	125	110

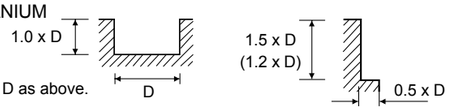
STEEL, STAINLESS STEEL, CAST IRON

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

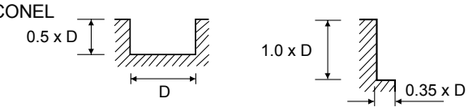


TITANIUM

1.2 x D as above.



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

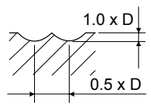
HX2 & ET1

HX2 CUTTING CONDITION

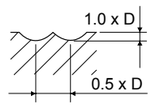
134123, 134323 (4 Flute Ball Nose)

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	< 30	v_c (m/min)	135	135	135	135	135	135	135	135	135	135	135	135
	12		n	14324	10740	8590	7460	5370	4290	3580	3070	2680	2380	2140	1710
	13		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
	14		f (mm/min)	1430	1070	1030	1140	1280	1030	1000	920	800	760	770	680
M	21	30-45	v_c (m/min)	75	75	75	75	75	75	75	75	75	75	75	75
	22		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
	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
K	31		v_c (m/min)	135	135	135	135	135	135	135	135	135	135	135	135
	32		n	14324	10740	8590	7460	5370	4290	3580	3070	2680	2380	2140	1710
	33		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
	34		f (mm/min)	1430	1070	1030	1140	1280	1030	1000	920	800	760	770	680
S	41		v_c (m/min)	55	55	55	55	55	55	55	55	55	55	55	55
	42		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
	43		f (mm/min)	280	210	210	230	260	210	230	210	190	190	210	190
	51		v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30	30
	52		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
	53		f (mm/min)	140	100	80	100	120	100	120	115	110	110	100	80

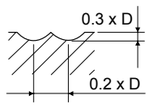
STEEL, STAINLESS STEEL, CAST IRON



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

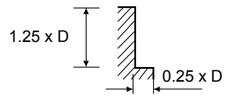
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HX2 CUTTING CONDITION

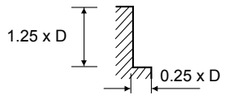
135123, 135323 (5 Flute)

MATERIAL GROUP		HRc		Size (mm)								
				6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	11	< 30	v_c (m/min)	135	135	135	135	135	135	135	135	135
	12		n	7270	5450	4360	3630	3110	2720	2390	2180	1720
	13		f_z	0.034	0.038	0.05	0.063	0.069	0.076	0.082	0.089	0.09
	14		f (mm/min)	1240	1040	1100	1150	1080	1040	980	970	770
M	21		v_c (m/min)	115	115	115	115	115	115	115	115	115
			n	6060	4540	3630	3030	2600	2270	2030	1810	1460
	22		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
	23		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	31		v_c (m/min)	135	135	135	135	135	135	135	135	135
	32		n	7270	5450	4360	3630	3110	2720	2390	2180	1720
	33		f_z	0.034	0.038	0.05	0.063	0.069	0.076	0.082	0.089	0.09
	34		f (mm/min)	1240	1040	1100	1150	1080	1040	980	970	770
S	41		v_c (m/min)	85	85	85	85	85	85	85	85	85
	42		n	4440	3330	2660	220	1900	1660	1500	1330	1080
	43		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
	51		v_c (m/min)	25	25	25	25	25	25	25	25	25
	52		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
	53		f (mm/min)	120	110	110	130	140	130	120	130	100

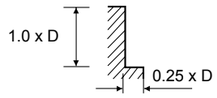
STEEL, STAINLESS STEEL, CAST IRON



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

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

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

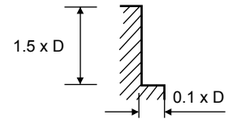
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ET1 CUTTING CONDITION

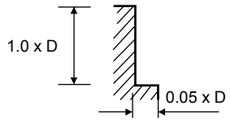
107122 (4&6 Flute ASP60)

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	< 30	v_c (m/min)	40	45	45	50	50	50	50	50	50	50	50	50
	12		n	4400	3600	3000	2600	2000	1600	1320	1160	1000	900	800	640
			f_z	0.011	0.015	0.019	0.023	0.031	0.045	0.047	0.051	0.038	0.039	0.042	0.043
			f (mm/min)	185	210	225	235	250	285	250	235	225	210	200	165
	13	30-45	v_c (m/min)	10	10	10	10	15	15	15	15	15	15	15	15
			n	1100	900	750	600	500	410	340	290	250	225	200	165
	14		f_z	0.005	0.009	0.01	0.012	0.014	0.018	0.021	0.023	0.017	0.017	0.014	0.015
			f (mm/min)	23	31	30	29	28	30	29	27	26	23	17	15
M	21		v_c (m/min)	20	25	25	25	25	25	25	25	25	25	25	25
			n	2200	800	1500	1300	1000	800	660	580	500	450	400	320
	22		f_z	0.013	0.017	0.023	0.027	0.038	0.053	0.058	0.06	0.045	0.046	0.05	0.052
	23		f (mm/min)	110	125	135	140	150	170	150	140	135	125	120	100
S	41		v_c (m/min)	20	25	25	25	25	25	25	25	25	25	25	25
			n	2200	800	1500	1300	1000	800	660	580	500	450	400	320
	42		f_z	0.013	0.017	0.023	0.027	0.038	0.053	0.058	0.06	0.045	0.046	0.05	0.052
	43		f (mm/min)	110	125	135	140	150	170	150	140	135	125	120	100
	51		v_c (m/min)	10	10	10	10	10	10	10	10	10	10	10	10
			n	880	720	600	480	400	330	270	230	200	180	160	130
	52		f_z	0.008	0.013	0.015	0.018	0.021	0.027	0.032	0.035	0.026	0.026	0.022	0.023
	53		f (mm/min)	28	37	36	35	34	36	35	32	31	28	21	18

STEEL, STAINLESS STEEL, 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

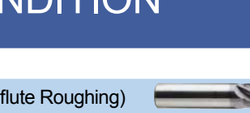
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ET1 CUTTING CONDITION

320123, 320323, 118123, 118323 (Multiflute Roughing)  **SLOTTING**

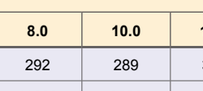
MATERIAL GROUP		HRc		Size (mm)								
				6.0	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**18.0**	**20.0**	**25.0**
P	11	< 30	v_c (m/min)	294	292	289	302	299	302	294	302	338
			n	15600	11600	9200	8000	6800	6000	5200	4800	4300
	12		f_z	0.03	0.04	0.038	0.045	0.053	0.06	0.067	0.068	0.06
			f (mm/min)	1390	1390	1390	1440	1440	1440	1390	1300	1290
	13	30-45	v_c (m/min)	234	231	239	226	229	241	249	226	251
			n	12400	9200	7600	6000	5200	4800	4400	3600	3200
	14		f_z	0.013	0.018	0.016	0.02	0.024	0.024	0.024	0.024	0.023
			f (mm/min)	500	500	500	480	500	460	430	340	370
M	21		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
	22		f_z	0.013	0.018	0.017	0.02	0.024	0.023	0.023	0.023	0.023
	23		f (mm/min)	340	340	340	340	340	310	250	220	250
S	41		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
	42		f_z	0.013	0.018	0.017	0.02	0.024	0.023	0.023	0.023	0.023
	43		f (mm/min)	340	340	340	340	340	310	250	220	250
	51		v_c (m/min)	45	45	41	45	40	40	40	41	47
			n	2400	1800	1300	1200	900	800	700	660	600
	52		f_z	0.016	0.02	0.022	0.024	0.022	0.02	0.021	0.023	0.022
	53		f (mm/min)	115	110	115	115	80	65	60	60	65

STEEL

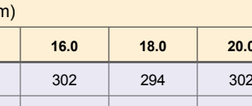


STAINLESS STEEL, TITANIUM

a_p : ø6.0mm - ø10.0mm = 0.25 x D
a_p : ø12.0mm - ø16.0mm = 0.15 x D
a_p : ø18.0mm - ø25.0mm = 0.10 x D



INCONEL



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

ET1 CUTTING CONDITION

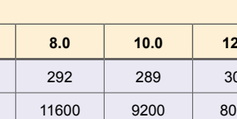
320123, 320323, 118123, 118323 (Multiflute Roughing)  **PROFILING**

MATERIAL GROUP		HRc		Size (mm)								
				6.0	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**18.0**	**20.0**	**25.0**
P	11	< 30	v_c (m/min)	294	292	289	302	299	302	294	302	338
			n	15600	11600	9200	8000	6800	6000	5200	4800	4300
	12		f_z	0.05	0.067	0.063	0.075	0.088	0.1	0.112	0.113	0.1
			f (mm/min)	2320	2320	2320	2400	2400	2400	2320	2160	2150
	13	30-45	v_c (m/min)	234	231	239	226	229	241	249	226	251
			n	12400	9200	7600	6000	5200	4800	4400	3600	3200
	14		f_z	0.023	0.03	0.028	0.033	0.04	0.04	0.041	0.039	0.039
			f (mm/min)	840	840	840	800	840	760	720	560	620
M	21		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
	22		f_z	0.023	0.03	0.028	0.034	0.04	0.039	0.039	0.038	0.038
	23		f (mm/min)	570	570	570	570	570	510	420	360	410
S	41		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
	42		f_z	0.023	0.03	0.028	0.034	0.04	0.039	0.039	0.038	0.038
	43		f (mm/min)	570	570	570	570	570	510	420	360	410
	51		v_c (m/min)	45	45	41	45	40	40	40	41	47
			n	2400	1800	1300	1200	900	800	700	660	600
	52		f_z	0.026	0.033	0.037	0.04	0.036	0.034	0.036	0.038	0.037
	53		f (mm/min)	190	180	190	190	130	110	100	100	110

STEEL

STAINLESS STEEL, TITANIUM

a_e : ø6.0mm - ø10.0mm = 0.15 x D
a_e : ø12.0mm - ø16.0mm = 0.10 x D
a_e : ø18.0mm - ø25.0mm = 0.05 x D



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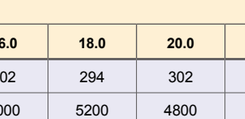


▶ The feed rate for long and long reach tools should be reduced by 50%

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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

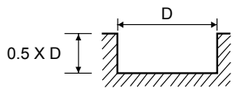
HX2 & ET1

ET1 CUTTING CONDITION

132123, 132323 (3&4 Flute 50º Helix)  **SLOTTING**

MATERIAL GROUP		HRc		Size (mm)							
				6.0	**8.0**	**10.0**	**12.0**	**16.0**	**18.0**	**20.0**	**25.0**
P	11	**< 30**	v_c (m/min)	105	105	100	105	110	110	105	105
			n	5560	4200	3260	2740	2200	1940	1680	1360
	12		f_z	0.019	0.027	0.031	0.03	0.03	0.03	0.022	0.021
			f (mm/min)	310	340	300	250	200	175	150	115
	13	**30-45**	v_c (m/min)	65	65	65	65	70	70	65	65
			n	3360	2520	2000	1680	1360	1210	1060	840
	14		f_z	0.02	0.024	0.023	0.024	0.025	0.023	0.017	0.018
			f (mm/min)	200	180	140	120	100	85	70	60
M	21		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
	22		f_z	0.019	0.025	0.028	0.029	0.032	0.03	0.021	0.022
	23		f (mm/min)	160	160	140	120	100	85	70	60
S	41		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
	42		f_z	0.019	0.025	0.028	0.029	0.032	0.03	0.021	0.022
	43		f (mm/min)	160	160	140	120	100	85	70	60
	51		v_c (m/min)	20	20	20	20	20	20	20	20
			n	1160	840	370	560	420	370	320	270
	52		f_z	0.011	0.016	0.02	0.018	0.02	0.018	0.016	0.014
	53		f (mm/min)	40	40	40	30	25	20	20	15

STEEL, STAINLESS STEEL, TITANIUM



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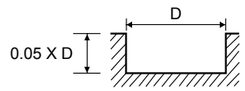


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

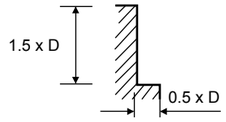
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ET1 CUTTING CONDITION

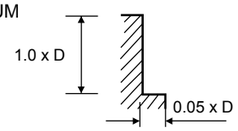
132123, 132323 (3&4 Flute 50º Helix)  **PROFILING**

MATERIAL GROUP		HRc		Size (mm)							
				6.0	**8.0**	**10.0**	**12.0**	**16.0**	**18.0**	**20.0**	**25.0**
P	11	**< 30**	v_c (m/min)	105	105	100	105	110	110	105	105
			n	5560	4200	3260	2740	2200	1940	1680	1360
	12		f_z	0.024	0.033	0.038	0.038	0.038	0.038	0.028	0.028
			f (mm/min)	400	420	370	310	250	220	190	150
	13	**30-45**	v_c (m/min)	65	65	65	65	70	70	65	65
			n	3360	2520	2000	1680	1360	1210	1060	840
	14		f_z	0.025	0.03	0.03	0.03	0.029	0.03	0.022	0.022
			f (mm/min)	250	230	180	150	120	110	95	75
M	21		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
	22		f_z	0.029	0.042	0.046	0.044	0.048	0.046	0.034	0.034
	23		f (mm/min)	250	265	230	180	150	130	115	90
S	41		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
	42		f_z	0.029	0.042	0.046	0.044	0.048	0.046	0.034	0.034
	43		f (mm/min)	250	265	230	180	150	130	115	90
	51		v_c (m/min)	20	20	20	20	20	20	20	20
			n	1160	840	370	560	420	370	320	270
	52		f_z	0.017	0.02	0.025	0.027	0.028	0.027	0.022	0.023
	53		f (mm/min)	55	50	50	45	35	30	30	25

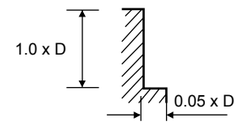
STEEL



STAINLESS STEEL, 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

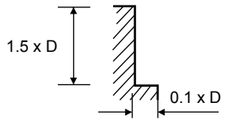
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ET1 CUTTING CONDITION

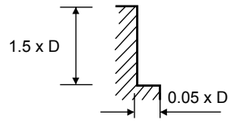
117323 (6&8 Flute 45º Helix)

MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	11	< 30	v_c (m/min)	105	105	105	105	105	105	120
			n	5560	4200	3360	2840	2100	1680	1500
	12		f_z	0.06	0.079	0.099	0.099	0.1	0.075	0.075
			f (mm/min)	2000	2000	2000	1680	1260	1010	900
	13	30-45	v_c (m/min)	75	75	75	75	75	75	85
			n	3880	2940	2320	2000	1480	1160	1100
	14		f_z	0.059	0.078	0.098	0.097	0.099	0.074	0.069
			f (mm/min)	1370	1370	1370	1160	880	690	600
M	21		v_c (m/min)	65	65	60	60	60	55	65
			n	3370	2490	1920	1610	1160	900	850
	22		f_z	0.054	0.074	0.095	0.104	0.111	0.086	0.079
	23		f (mm/min)	1100	1100	1100	1000	770	620	540
S	41		v_c (m/min)	65	65	60	60	60	55	65
			n	3370	2490	1920	1610	1160	900	850
	42		f_z	0.054	0.074	0.095	0.104	0.111	0.086	0.079
	43		f (mm/min)	1100	1100	1100	1000	770	620	540
	51		v_c (m/min)	25	25	15	15	15	15	15
			n	1350	1000	440	400	310	250	220
	52		f_z	0.035	0.047	0.106	0.104	0.102	0.078	0.077
	53		f (mm/min)	280	280	280	250	190	155	135

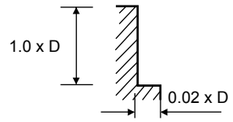
STEEL < HRc30



STEEL > HRc30, STAINLESS STEEL, 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

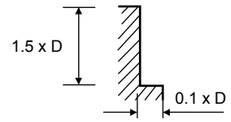
HX2 & ET1

ET1 CUTTING CONDITION

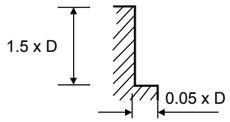
117323 (6&8 Flute 45º Helix)

MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	11	< 30	v_c (m/min)	420	420	420	430	420	420	470
			n	22200	16800	13400	11350	8400	6700	6000
	12		f_z	0.06	0.079	0.1	0.099	0.1	0.075	0.075
			f (mm/min)	8000	8000	8000	6720	5040	4040	3600
	13	30-45	v_c (m/min)	315	315	315	315	315	315	355
			n	16800	12600	9980	8400	6300	5040	4500
	14		f_z	0.06	0.081	0.1	0.1	0.1	0.076	0.075
			f (mm/min)	6090	6090	5990	5040	3780	6050	2700

STEEL < HRc30



STEEL > HRc30



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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

3-FL NECKED
POLISHED FLUTE

Reduced diameter neck to allow multiple passes with no workpiece marking.

Mirror polished flutes for smooth chip evacuation.

Premium grade carbide substrate for increased tool life.

Corner protected to prevent chipping at high speeds.

IDEAL FOR MATERIAL GROUPS

N O

ALU-XP
END MILLS

Super mirror polished for Aluminium and other non-ferrous materials

www.europatool.co.uk

APPLICATION GUIDE

●: Excellent **O**: 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
																							●	●	●	●	●	●	
																							●	●	●	●			
																							●	●	●	●			
																							●	●	●	●			
																			o	o	o	o	●	●	●	●			
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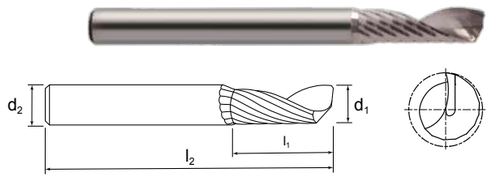
INDEX

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

1 FLUTE LONG LENGTH ROUTER

MG HM | 30° | FLUTE 1 | PLAIN



Series No. 135303

▶ cutting conditions : p.230

Designed for aluminium and non-ferrous materials such as acrylic.
1 flute allows for excellent chip evacuation.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1353030200	**2.0**	3	8.0	50
1353030300	**3.0**	3	12.0	50
1353030400	**4.0**	4	15.0	60
1353030500	**5.0**	5	17.0	60
1353030600	**6.0**	6	20.0	65
1353030800	**8.0**	8	22.0	65
1353031000	**10.0**	10	25.0	75
1353031200	**12.0**	12	30.0	80

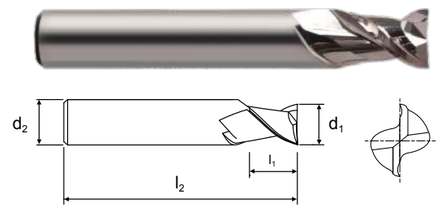
MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: 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	
										●	●	●	●		

2 FLUTE SHORT LENGTH 45º HELIX

MG HM | 45° | FLUTE 2 | PLAIN



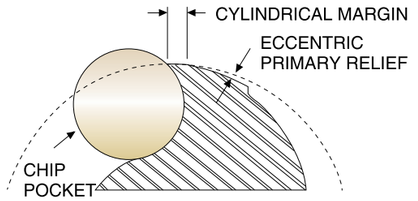
Series No. 152303

▶ cutting conditions : p.232

Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1523030300	**3.0**	6	5.0	50
1523030400	**4.0**	6	8.0	54
1523030500	**5.0**	6	9.0	54
1523030600	**6.0**	6	10.0	54
1523030800	**8.0**	8	12.0	58
1523031000	**10.0**	10	14.0	66
1523031200	**12.0**	12	16.0	73
1523031400	**14.0**	14	18.0	75
1523031600	**16.0**	16	22.0	82
1523031800	**18.0**	18	24.0	84
1523032000	**20.0**	20	26.0	92

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	h6



●: Excellent **O**: Good

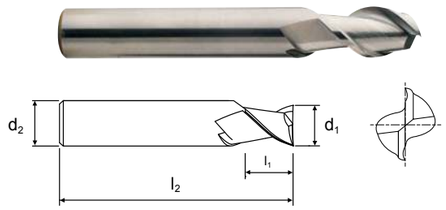
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

2 FLUTE SHORT LENGTH 45º HELIX 90º CORNER

MG HM | 45º | FLUTE 2 | PLAIN

Series No. 331303

▶ cutting conditions : p.232



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
90º sharp corner.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
3313030300	**3.0**	3	7.0	38
3313030350	**3.5**	6	7.0	57
3313030400	**4.0**	6	8.0	57
3313030450	**4.5**	6	8.0	57
3313030500	**5.0**	6	10.0	57
3313030600	**6.0**	6	10.0	57
3313030800	**8.0**	8	16.0	63
3313031000	**10.0**	10	19.0	72
3313031200	**12.0**	12	22.0	83
3313031400	**14.0**	14	22.0	83
3313031600	**16.0**	16	26.0	92
3313032000	**20.0**	20	32.0	104

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

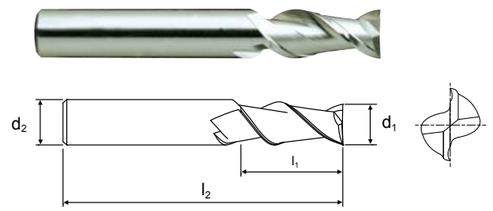
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

2 FLUTE LONG LENGTH 45º HELIX

MG HM | 45º | FLUTE 2 | PLAIN

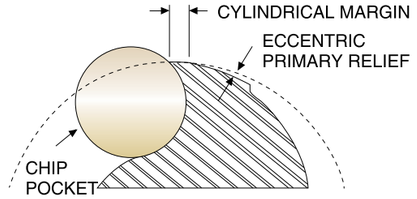
Series No. 151303

▶ cutting conditions : p.232



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1513030300	**3.0**	6	8.0	57
1513030400	**4.0**	6	11.0	57
1513030500	**5.0**	6	13.0	57
1513030600	**6.0**	6	13.0	57
1513030800	**8.0**	8	19.0	63
1513031000	**10.0**	10	22.0	72
1513031200	**12.0**	12	26.0	83
1513031400	**14.0**	14	26.0	83
1513031600	**16.0**	16	32.0	92
1513031800	**18.0**	18	32.0	92
1513032000	**20.0**	20	38.0	104



MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	h6

●: Excellent **O**: Good

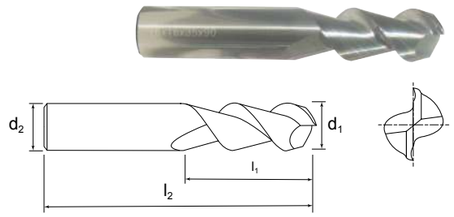
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

2 FLUTE LONG LENGTH 55º HELIX

MG HM | 55º | FLUTE 2 | PLAIN

Series No. 157303

▶ cutting conditions : p.233



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
90º sharp corner.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1513030300	**3.0**	6	8.0	57
1513030400	**4.0**	6	11.0	57
1513030500	**5.0**	6	13.0	57
1513030600	**6.0**	6	13.0	57
1513030800	**8.0**	8	19.0	63
1513031000	**10.0**	10	22.0	72
1513031200	**12.0**	12	26.0	83
1513031400	**14.0**	14	26.0	83
1513031600	**16.0**	16	32.0	92
1513031800	**18.0**	18	32.0	92
1513032000	**20.0**	20	38.0	104

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

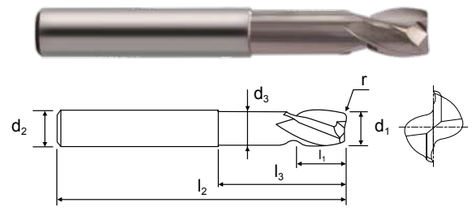
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

2 FLUTE EXTENDED NECK 30º HELIX CORNER RADIUS

MG HM | 30º | FLUTE 2 | PLAIN

Series No. 155303

▶ cutting conditions : p.232



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner radius.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1553030400	**4.0**	0.3	6	5.0	10.0	50	3.6
1553030600	**6.0**	0.5	6	8.0	20.0	64	5.4
1553030800	**8.0**	0.6	8	10.0	30.0	64	7.2
1553031000	**10.0**	0.8	10	12.0	36.0	70	9.0
1553031200	**12.0**	1.0	12	14.0	40.0	76	11.0
1553031600	**16.0**	1.3	16	18.0	45.0	90	14.5
1553032000	**20.0**	1.6	20	24.0	45.0	100	18.0

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

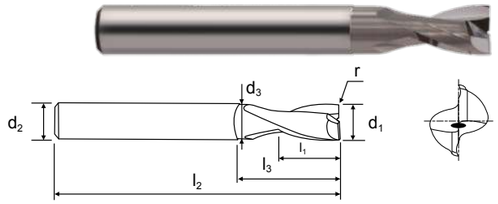
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
										O	**O**	**O**	**O**		
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

2 FLUTE EXTENDED NECK 25º HELIX CORNER RADIUS

MG HM | 25º | FLUTE 2 | PLAIN

Series No. 122303

▶ cutting conditions : p.231



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner radius.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1223030200	**2.0**	0.2	3	3.0	6.0	40	1.9
1223030300	**3.0**	0.2	3	4.0	8.0	40	2.9
1223030400	**4.0**	0.2	4	5.0	12.0	50	3.8
1223030500	**5.0**	0.2	5	8.0	14.0	50	4.8
1223030600	**6.0**	0.2	6	8.0	18.0	65	5.7
1223030800	**8.0**	0.2	8	10.0	22.0	70	7.7
1223031000	**10.0**	0.2	10	14.0	28.0	80	9.7
1223031200	**12.0**	0.2	12	16.0	35.0	90	11.5
1223031600	**16.0**	0.2	16	20.0	40.0	90	15.5
1223032000	**20.0**	0.2	20	25.0	50.0	100	19.5

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

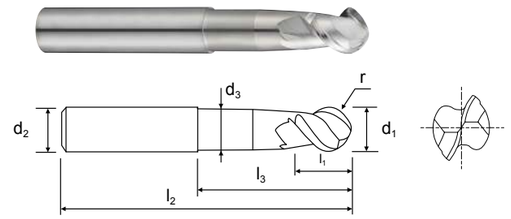
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

2 FLUTE EXTENDED NECK 50º HELIX BALL NOSE

MG HM | 50º | FLUTE 2 | PLAIN

Series No. 112303

▶ cutting conditions : p.230



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1123030600	**6.0**	3.0	6	5.5	25.0	55	5.4
1123030800	**8.0**	4.0	8	7.0	30.0	65	7.2
1123031000	**10.0**	5.0	10	8.5	35.0	75	9.0
1123031200	**12.0**	6.0	12	10.5	40.0	75	11.0
1123031600	**16.0**	8.0	16	14.0	50.0	90	14.5
1123032000	**20.0**	10.0	20	17.0	50.0	100	18.0

MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.02	±0.010	h6

●: Excellent **O**: Good

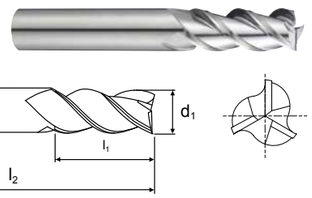
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
										O	O	O	O		
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

3 FLUTE LONG LENGTH 45º HELIX

MG HM | 45º | FLUTE 3 | PLAIN

Series No. 143303

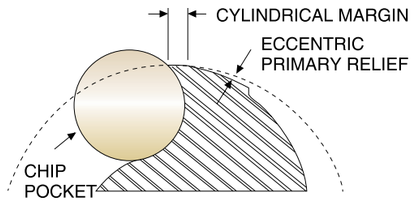
▶ cutting conditions : p.235



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1433030300	**3.0**	6	12.0	57
1433030400	**4.0**	6	15.0	57
1433030500	**5.0**	6	20.0	57
1433030600	**6.0**	6	20.0	65
1433030800	**8.0**	8	22.0	65
1433031000	**10.0**	10	25.0	70
1433031200	**12.0**	12	25.0	75
1433031600	**16.0**	16	35.0	90
1433032000	**20.0**	20	40.0	100

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	h6



●: Excellent **O**: Good

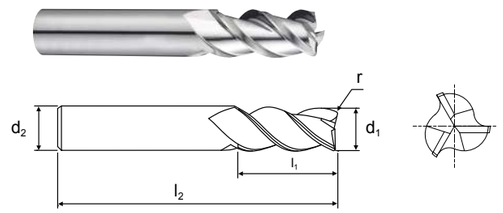
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

3 FLUTE LONG LENGTH 45º HELIX CORNER RADIUS

MG HM | 45º | FLUTE 3 | PLAIN

Series No. 142303

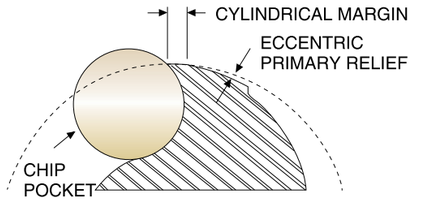
▶ cutting conditions : p.236



Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner radius.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1423030300	**3.0**	0.5	6	12.0	57
1423030901	**3.0**	1.0	6	12.0	57
1423030400	**4.0**	0.5	6	15.0	57
1423030902	**4.0**	1.0	6	15.0	57
1423030500	**5.0**	0.5	6	20.0	57
1423030903	**5.0**	1.0	6	20.0	57
1423030600	**6.0**	0.5	6	20.0	65
1423030904	**6.0**	1.0	6	20.0	65
1423030800	**8.0**	0.5	8	22.0	65
1423030905	**8.0**	1.0	8	22.0	65
1423031000	**10.0**	0.5	10	25.0	70
1423030906	**10.0**	1.0	10	25.0	70
1423030907	**10.0**	2.0	10	25.0	70
1423031200	**12.0**	0.5	12	25.0	75
1423030908	**12.0**	1.0	12	25.0	75
1423030909	**12.0**	2.0	12	25.0	75
1423031600	**16.0**	0.5	16	35.0	90
1423030910	**16.0**	1.0	16	35.0	90
1423030911	**16.0**	2.0	16	35.0	90
1423032000	**20.0**	0.5	20	40.0	100
1423039012	**20.0**	1.0	20	40.0	100
1423039013	**20.0**	2.0	20	40.0	100

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	h6



●: Excellent **O**: 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	
										●	●	●	●		

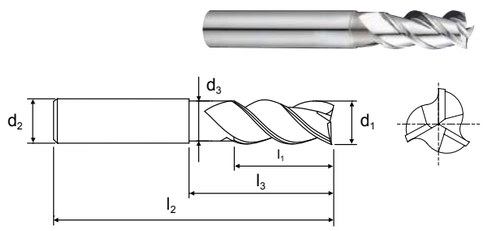
3 FLUTE EXTENDED NECK 45º HELIX

MG HM | 45º | FLUTE 3 | PLAIN

Series No. 153303

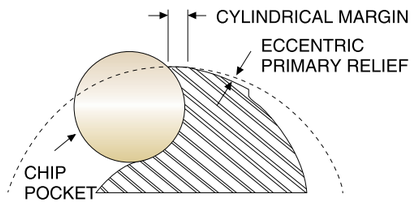
▶ cutting conditions : p.235

Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.



EUROPA CODE	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
1533030300	**3.0**	6	8.0	12.0	57	2.7
1533030400	**4.0**	6	11.0	18.0	57	3.7
1533030500	**5.0**	6	13.0	18.0	57	4.7
1533030600	**6.0**	6	13.0	18.0	57	5.7
1533030800	**8.0**	8	21.0	25.0	63	7.4
1533031000	**10.0**	10	22.0	30.0	72	9.2
1533031200	**12.0**	12	26.0	36.0	83	11.0
1533031600	**16.0**	16	36.0	42.0	92	15.0
1533032000	**20.0**	20	41.0	52.0	104	19.0

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	h6



●: Excellent **O**: 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	
										●	●	●	●		

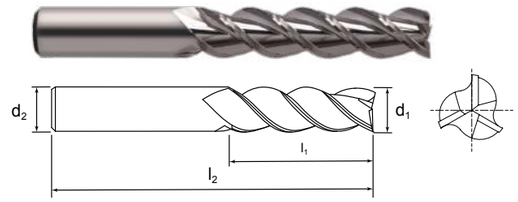
3 FLUTE LONG SERIES 45º HELIX

MG HM | 45º | FLUTE 3 | PLAIN

Series No. 144303

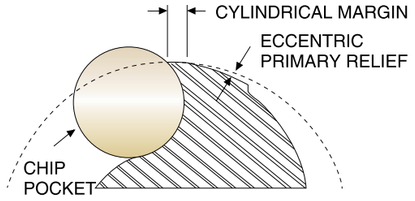
▶ cutting conditions : p.235

Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.



EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1443030300	**3.0**	6	15.0	75
1443030400	**4.0**	6	20.0	75
1443030500	**5.0**	6	25.0	75
1443030600	**6.0**	6	25.0	75
1443030800	**8.0**	8	30.0	80
1443031000	**10.0**	10	40.0	100
1443031200	**12.0**	12	50.0	100
1443031600	**16.0**	16	70.0	125
1443032000	**20.0**	20	75.0	150

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.015	h6

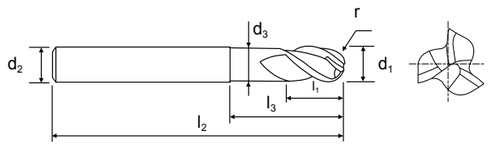


●: Excellent **O**: Good

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	
										●	●	●	●		

3 FLUTE EXTENDED NECK 40º HELIX BALL NOSE

MG HM | 40º | FLUTE 3 | PLAIN



Series No. 116303

▶ cutting conditions : p.238

Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1163030200	**2.0**	1.0	6	3.0	5.0	60	1.9
1163030250	**2.5**	1.25	6	4.0	6.0	60	2.4
1163030300	**3.0**	1.5	6	4.5	6.5	60	2.8
1163030350	**3.5**	1.75	6	5.0	7.0	65	3.2
1163030400	**4.0**	2.0	6	6.0	8.0	65	3.7
1163030500	**5.0**	2.5	6	7.5	10.0	65	4.6
1163030600	**6.0**	3.0	6	9.0	12.0	75	5.6
1163030800	**8.0**	4.0	8	12.0	25.0	75	7.4
1163031000	**10.0**	5.0	10	15.0	30.0	80	9.4
1163031200	**12.0**	6.0	12	18.0	36.0	90	11.4
1163031600	**16.0**	8.0	16	24.0	40.0	100	15.4

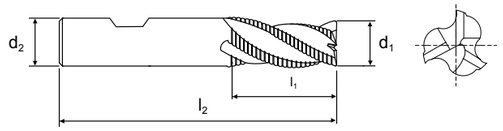
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: Good

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

3 FLUTE LONG LENGTH 30º HELIX ROUGHING

MG HM | WR | ALU | FLUTE 3 | 30° | DIN 6535HA | DIN 6535HB



Series No. 125103, 125303

▶ cutting conditions : p.237

Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.

EUROPA CODE FLAT	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1251030600	**1253030600**	**6.0**	6	16.0	57
1251030800	**1253030800**	**8.0**	8	16.0	63
1251031000	**1253031000**	**10.0**	10	22.0	72
1251031200	**1253031200**	**12.0**	12	26.0	83
1251031400	**1253031400**	**14.0**	14	26.0	83
1251031600	**1253031600**	**16.0**	16	32.0	92
1251032000	**1253032000**	**20.0**	20	38.0	104

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 − 48	0 − 58	0 − 70	0 − 84
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: 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	
										●	●	●	●		

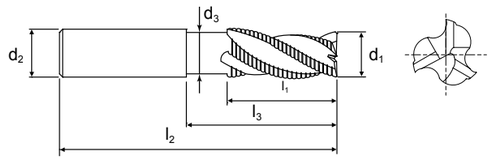
3 FLUTE EXTENDED NECK 30º HELIX ROUGHING

MG HM | WR | ALU | FLUTE 3 | 30° | DIN 6535HA | DIN 6535HB

Series No. 126103, 126303

▶ cutting conditions : p.237

Suitable for high speed machining of aluminium and other non-ferrous materials.
Exellent surface finishes, superior chip removal.
Corner protected.



EUROPA CODE FLAT	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
1261030600	**1263030600**	**6.0**	6	16.0	20.0	57	5.0
1261030800	**1263030800**	**8.0**	8	16.0	25.0	63	7.0
1261031000	**1263031000**	**10.0**	10	22.0	30.0	72	9.0
1261031200	**1263031200**	**12.0**	12	26.0	36.0	83	10.5
1261031600	**1263031600**	**16.0**	16	32.0	42.0	92	14.5
1261032000	**1263032000**	**20.0**	20	38.0	52.0	104	18.5

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA h10	0 − 48	0 − 58	0 − 70	0 − 84
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

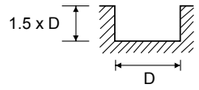
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
										●	●	●	●		

ALU-XP
CUTTING DATA

ALU-XP CUTTING CONDITIONS

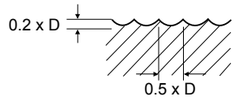
135303 (1 Flute Router)

MATERIAL GROUP			Size (mm)							
			2.0	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**
N	71	v_c (m/min)	145	170	190	190	190	195	190	190
	72	n	23000	18000	15000	12000	10000	78000	6000	5000
	73	f_z	0.065	0.094	0.12	0.15	0.18	0.244	0.333	0.44
	74	f (mm/min)	1500	1700	1800	1800	1800	1900	2000	2200
O		v_c (m/min)	200	235	250	235	255	250	250	255
	81	n	32000	25000	20000	15000	13500	10000	8000	6700
	82	f_z	0.069	0.096	0.12	0.147	0.17	0.24	0.3	0.343
		f (mm/min)	2200	2400	2400	2200	2300	2400	2400	2300



112303 (2 Flute 50º Helix, Ball Nose)

MATERIAL GROUP			Size (mm)					
			6.0	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	61	v_c (m/min)	85	85	105	125	135	105
	62	n	4400	3360	3360	3360	2640	1680
	63	f_z	0.04	0.06	0.069	0.089	0.101	0.131
	64	f (mm/min)	350	400	465	600	535	440
	71	v_c (m/min)	270	280	350	420	440	350
	72	n	14400	11200	11200	11200	8800	5600
	73	f_z	0.049	0.071	0..084	0.07	0.123	0.157
	74	f (mm/min)	1400	1600	1880	2400	2160	1760



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

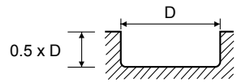
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ALU-XP SUPER MIRROR POLISHED FLUTE

ALU-XP CUTTING CONDITIONS

122303 (2 Flute 25º Helix) SLOTTING

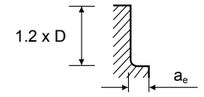
MATERIAL GROUP			Size (mm)								
			2.0	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	71	v_c (m/min)	65	100	130	165	195	200	250	300	320	250
	72	n	10400	10400	10400	10400	10400	8000	8000	8000	6400	4000
	73	f_z	0.022	0.035	0.046	0.05	0.058	0.09	0.011	0.135	0.156	0.2
	74	f (mm/min)	460	720	960	1040	1200	1440	1760	2160	2000	1600



122303 (2 Flute 25º Helix) PROFILIING

MATERIAL GROUP			Size (mm)								
			2.0	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	71	v_c (m/min)	65	100	130	165	195	200	250	300	320	250
	72	n	10400	10400	10400	10400	10400	8000	8000	8000	6400	4000
	73	f_z	0.039	0.046	0.054	0.065	0.077	0.115	0.135	0.17	0.194	0.25
	74	f (mm/min)	810	960	1120	1360	1600	1840	2160	2720	2480	2000

a_e : ø2.0mm - ø10.0mm = 0.25 x D
a_e : ø12.0mm - ø20.0mm = 0.5x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

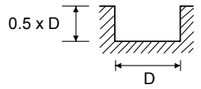
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

ALU-XP CUTTING CONDITIONS

331303, 151303, 152303 (2 Flute 45º Helix, Short & Long) — SLOTTING

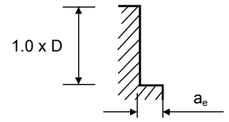
MATERIAL GROUP			Size (mm)										
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	71	v_c (m/min)	95	125	155	190	200	250	300	265	300	225	250
	72	n	10000	10000	10000	10000	8000	8000	8000	6000	6000	4000	4000
	73	f_z	0.035	0.045	0.05	0.06	0.088	0.106	0.131	0.15	0.158	0.175	0.2
	74	f (mm/min)	700	900	1000	1200	1400	1700	2100	1800	1900	1400	1600



331303, 151303, 152303 (2 Flute 45º Helix, Short & Long) — PROFILING

MATERIAL GROUP			Size (mm)										
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
N	71	v_c (m/min)	95	125	155	190	200	250	300	265	300	225	250
	72	n	10000	10000	10000	10000	8000	8000	8000	6000	6000	4000	4000
	73	f_z	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.183	0.2	0.225	0.238
	74	f (mm/min)	900	1100	1300	1500	1800	2100	1600	2200	2400	1800	1900

a_e : ø3.0mm - ø10.0mm = 0.25 x D
a_e : ø12.0mm - ø20.0mm = 0.15x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

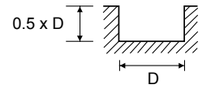
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ALU-XP SUPER MIRROR POLISHED FLUTE

ALU-XP CUTTING CONDITIONS

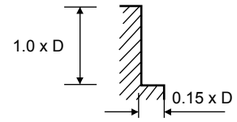
157303 (2 Flute 55º Helix) — SLOTTING

MATERIAL GROUP			Size (mm)								
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	71	v_c (m/min)	339	407	424	458	452	452	441	452	452
	72	n	36000	32400	27000	24300	18000	14400	11700	9000	7200
	73	f_z	0.019	0.025	0.047	0.052	0.07	0.1	0.123	0.16	0.188
	74	f (mm/min)	1350	1620	2520	2520	2520	2880	2880	2880	2700



157303 (2 Flute 55º Helix) — PROFILIING

MATERIAL GROUP			Size (mm)								
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	71	v_c (m/min)	339	407	424	458	452	452	441	452	452
	72	n	36000	32400	27000	24300	18000	14400	11700	9000	7200
	73	f_z	0.03	0.036	0.067	0.074	0.1	0.141	0.173	0.225	0.269
	74	f (mm/min)	2160	2340	3600	3600	3600	4050	4050	4050	3870



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: $n = \frac{v_c * 1000}{\pi * ø}$

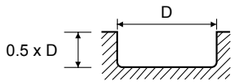
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

ALU-XP CUTTING CONDITIONS

155303 (2 Flute Corner Radius) SLOTTING

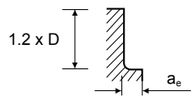
MATERIAL GROUP			Size (mm)						
			4.0	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	61	v_c (m/min)	40	60	60	75	90	95	75
	62	n	3120	3120	2400	2400	2400	1920	1200
	63	f_z	0.038	0.049	0.075	0.092	0.114	0.132	0.167
	64	f (mm/min)	240	305	360	440	545	505	400
	71	v_c (m/min)	130	195	200	250	300	320	250
	72	n	10400	10400	8000	8000	8000	6400	4000
	73	f_z	0.046	0.058	0.09	0.110	0.135	0.156	0.2
	74	f (mm/min)	960	1200	1440	1760	2160	2000	1600



155303 (2 Flute Corner Radius) PROFILING

MATERIAL GROUP			Size (mm)						
			4.0	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	61	v_c (m/min)	40	60	60	75	90	95	75
	62	n	3120	3120	2400	2400	2400	1920	1200
	63	f_z	0.045	0.064	0.097	0.114	0.142	0.163	0.21
	64	f (mm/min)	280	400	465	545	680	625	505
	71	v_c (m/min)	130	195	200	250	300	320	250
	72	n	10400	10400	8000	8000	8000	6400	4000
	73	f_z	0.054	0.077	0.115	0.135	0.17	0.194	0.25
	74	f (mm/min)	1120	1600	1840	2160	2720	2480	2000

a_e : ø4.0mm - ø10.0mm = 0.25 x D
a_e : ø12.0mm - ø20.0mm = 0.5x D



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: $n = \frac{v_c * 1000}{\pi * ø}$

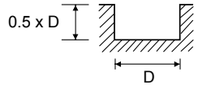
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

ALU-XP CUTTING CONDITIONS

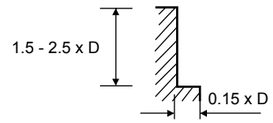
143303, 144303, 153303 (3 Flute 45º Helix, Long & Long Series) SLOTTING

MATERIAL GROUP			Size (mm)								
			3.0	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	71	v_c (m/min)	65	90	110	130	140	175	210	210	175
	72	n	7000	7000	7000	7000	5600	5600	5600	4200	2800
	73	f_z	0.035	0.045	0.05	0.06	0.088	0.106	0.131	0.158	0.2
	74	f (mm/min)	730	940	1050	1250	1470	1780	2200	1990	1680



143303, 144303, 153303 (3 Flute 45º Helix, Long & Long Series) PROFILING

MATERIAL GROUP			Size (mm)								
			3.0	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
N	71	v_c (m/min)	65	90	110	130	140	175	210	210	175
	72	n	7000	7000	7000	7000	5600	5600	5600	4200	2800
	73	f_z	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.2	0.238
	74	f (mm/min)	940	1150	1360	1580	1900	2200	2740	2520	2000



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

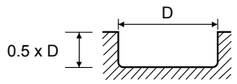
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

ALU-XP CUTTING CONDITIONS

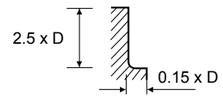
142303 (3 Flute 45º Helix, Corner Radius) — SLOTTING

MATERIAL GROUP			Size (mm)								
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	71	v_c (m/min)	95	125	155	190	200	250	300	300	250
	72	n	10000	10000	10000	10000	8000	8000	8000	6000	4000
	73	f_z	0.039	0.05	0.055	0.066	0.096	0.117	0.145	0.174	0.22
	74	f (mm/min)	1160	1490	1650	1980	2310	2810	3470	3140	2640



142303 (3 Flute 45º Helix, Corner Radius) — PROFILING

MATERIAL GROUP			Size (mm)								
			3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	71	v_c (m/min)	95	125	155	190	200	250	300	300	250
	72	n	10000	10000	10000	10000	8000	8000	8000	6000	4000
	73	f_z	0.05	0.061	0.072	0.083	0.125	0.145	0.179	0.22	0.262
	74	f (mm/min)	1490	1820	2150	2480	3000	3470	4290	3960	3140



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: $n = \frac{v_c * 1000}{\pi * ø}$

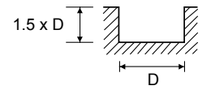
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

ALU-XP CUTTING CONDITIONS

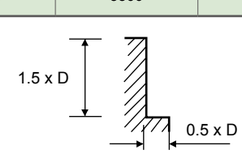
125103, 125303, 126103, 126303 (3 Flute Roughing) — SLOTTING

MATERIAL GROUP			Size (mm)					
			6.0	8.0	10.0	12.0	16.0	20.0
N	71	v_c (m/min)	200	200	205	320	322	320
	72	n	13500	10500	8500	8500	6400	5100
	73	f_z	0.168	0.168	0.169	0.165	00.167	0.163
	74	f (mm/min)	6800	5300	4300	4200	3200	2500



125103, 125303, 126103, 126303 (3 Flute Roughing) — PROFILING

MATERIAL GROUP			Size (mm)					
			6.0	8.0	10.0	12.0	16.0	20.0
N	71	v_c (m/min)	200	200	205	320	322	320
	72	n	13500	10500	8500	8500	6400	5100
	73	f_z	0.168	0.167	0.169	0.167	0.167	0.165
	74	f (mm/min)	5300	4000	3500	3200	2400	1900



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

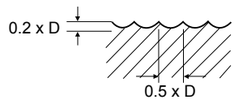
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

ALU-XP SUPER MIRROR POLISHED FLUTE

ALU-XP CUTTING CONDITIONS

116303 (3 Flute 40º Helix, Ball Nose) 

MATERIAL GROUP			Size (mm)										
			2.0	**2.5**	**3.0**	**3.5**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**
N	61	v_c (m/min)	40	40	40	50	55	70	85	85	105	125	135
	62	n	6400	5200	4400	4400	4400	4400	4400	3360	3360	3360	2640
	63	f_z	0.015	0.018	0.022	0.022	0.028	0.031	0.04	0.06	0.069	0.089	0.101
	64	f (mm/min)	190	190	190	190	250	270	350	400	465	600	535
	71	v_c (m/min)	135	140	135	160	180	225	270	280	350	420	440
	72	n	21600	17600	14400	14400	14400	14400	14400	11200	11200	11200	8800
	73	f_z	0.018	0.022	0.026	0.028	0.035	0.038	0.049	0.071	0.084	0.107	0.123
	74	f (mm/min)	760	760	760	800	1000	1080	1400	1600	1880	2400	2160



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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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

DUAL HELIX
DIAMOND COATED

IDEAL FOR MATERIAL GROUPS

0

CFRP & GRAPHITE
END MILLS

Diamond coated end mills for composite materials and graphite.

www.europatool.co.uk

APPLICATION GUIDE

●: Excellent **O**: 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
																													●
																													●
																													●

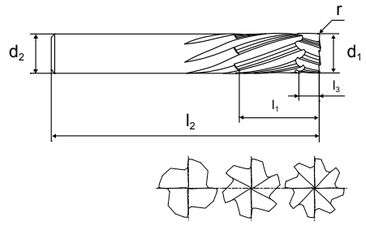
For material group examples, refer to page 2

For full material group tables, refer to pages 444-449

INDEX

MULTIFLUTE STANDARD LENGTH
DUAL HELIX CORNER RADIUS

MG HM | 20°/20° | FLUTE 4-8 | PLAIN



Series No. 172390

▶ cutting conditions : p.252

For composite materials.
Reduces delamination and burrs.
Diamond coated with excellent abrasion resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	LENGTH OF CUT l_3	OVERALL LENGTH l_2	NO. OF FLUTE z
1723900600	**6.0**	0.5	6	12.0	3.0	65	4
1723900800	**8.0**	0.5	8	16.0	4.0	70	6
1723901000	**10.0**	0.5	10	20.0	5.0	80	6
1723901200	**12.0**	0.5	12	24.0	6.0	90	8

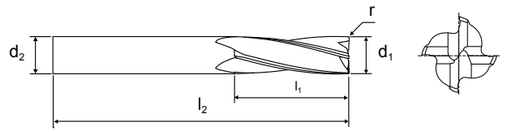
MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: 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	
														●	

4 FLUTE STANDARD LENGTH
15° HELIX CORNER RADIUS

MG HM | 15° | FLUTE 4 | PLAIN



Series No. 172490

▶ cutting conditions : p.253

For composite materials.
Reduces delamination and burrs.
Diamond coated with excellent abrasion resistance.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1724900600	**6.0**	0.2	6	18.0	65
1724900800	**8.0**	0.2	8	24.0	70
1724901000	**10.0**	0.3	10	30.0	80
1724901200	**12.0**	0.3	12	36.0	100

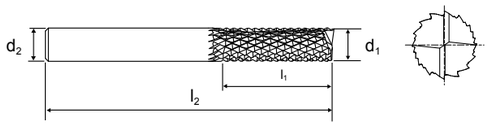
MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: 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	
														●	

STANDARD LENGTH END MILL TYPE ROUTER

MG HM | PLAIN



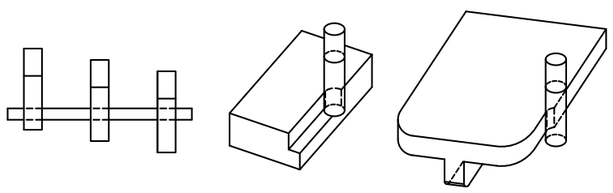
Series No. 172590

▶ cutting conditions : p.254

For composite materials.
Reduces delamination and burrs.
Diamond coated with excellent abrasion resistance.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1725900300	**3.0**	3	9.0	50
1725900400	**4.0**	4	12.0	50
1725900500	**5.0**	5	15.0	50
1725900600	**6.0**	6	18.0	65
1725900800	**8.0**	8	24.0	75
1725901000	**10.0**	10	30.0	85
1725901200	**12.0**	12	36.0	100

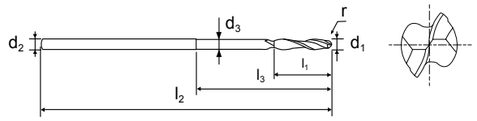
MILL DIA TOLERANCE	SHANK DIA TOLERANCE
-0.02~-0.08	h6



●: Excellent **O**: 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	
														●	

2 FLUTE LONG LENGTH BALL NOSE EXTENDED NECK



MG HM | 30° | DIAMOND COATED | FLUTE 2 | PLAIN

Series No. 113325

▶ cutting conditions : p.254

For machining graphite
Diamond coated with excellent abrasion resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1133250200	**2.0**	1.0	4	10.0	20.0	80	1.95
1133250300	**3.0**	1.5		15.0	25.0		2.9
1133250400	**4.0**	2.0		20.0	30.0		3.9
1133250500	**5.0**	2.5	6	30.0	50.0	100	4.9
1133250600	**6.0**	3.0		30.0	50.0		5.5
1133250800	**8.0**	4.0	8	40.0	60.0	110	7.5
1133251000	**10.0**	5.0	10	50.0	70.0	120	9.5
1133251200	**12.0**	6.0	12	55.0	75.0	130	11.5

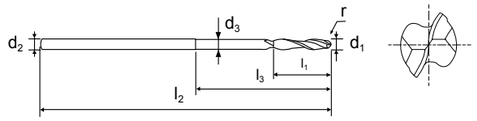
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: 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	

2 FLUTE LONG REACH
BALL NOSE EXTENDED NECK

MG HM | 30° | DIAMOND COATED | FLUTE 2 | PLAIN



Series No. 114325

▶ cutting conditions : p.254

For machining graphite
Diamond coated with excellent abrasion resistance.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1143250200	**2.0**	1.0	4	10.0	20.0	100	1.95
1143250300	**3.0**	1.5		15.0	25.0		2.9
1143250400	**4.0**	2.0		20.0	30.0		3.9
1143250500	**5.0**	2.5	6	30.0	50.0	120	4.9
1143250600	**6.0**	3.0		30.0	50.0	150	5.5
1143250800	**8.0**	4.0	8	40.0	60.0		7.5

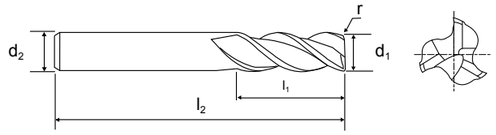
MILL DIA TOLERANCE(mm)	RADIUS r TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	±0.010	h6

●: Excellent **O**: 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	

3 FLUTE SHORT LENGTH
40º HELIX CORNER RADIUS

MG HM | 40º | FLUTE 3 | PLAIN



Series No. 118325

▶ cutting conditions : p.255

For machining graphite
Diamond coated with excellent abrasion resistance.
Available from European stock.

EUROPA CODE	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2
1183250200	**2.0**	0.15	3	6.0	40
1183250300	**3.0**	0.15	3	12.0	40
1183250400	**4.0**	0.2	4	14.0	50
1183250500	**5.0**	0.3	5	16.0	50
1183250600	**6.0**	0.3	6	20.0	65
1183250800	**8.0**	0.5	8	20.0	65
1183251000	**10.0**	0.5	10	25.0	75
1183251200	**12.0**	0.5	12	25.0	75

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

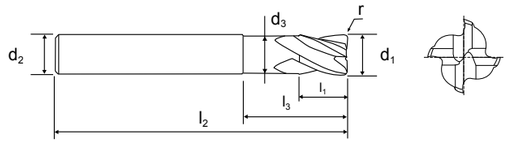
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	

4 FLUTE EXTENDED NECK CORNER RADIUS

MG HM | 30° | FLUTE 4 | PLAIN

Series No. 141325

▶ cutting conditions : p.255



For machining graphite
Diamond coated with excellent abrasion resistance.
Available from European stock.

EUROPA CODE	CUTTING DIAMETER d_1	RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NECK DIAMETER d_3
1413250600	**6.0**	0.5	6	10.0	40.0	80	5.9
1413250800	**8.0**	0.5	8	10.0	40.0	80	7.8
1413250901	**8.0**	1.0	8	10.0	60.0	100	7.8
1413251000	**10.0**	0.5	10	25.0	-	75	-
1413250902	**10.0**	0.5	10	12.0	40.0	80	9.8
1413250903	**10.0**	1.0	10	12.0	40.0	80	9.8
1413250904	**10.0**	0.5	10	12.0	80.0	125	9.8
1413251200	**12.0**	0.5	12	25.0	-	80	-
1413250905	**12.0**	0.5	12	15.0	40.0	80	11.8
1413250906	**12.0**	1.0	12	15.0	40.0	80	11.8
1413250907	**12.0**	1.0	12	15.0	80.0	125	11.8

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.03	h6

●: Excellent **O**: Good

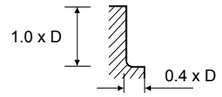
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
13	14	16	23		33	34	51	52	53	71	72	73	74	83	

CFRP & GRAPHITE
CUTTING DATA

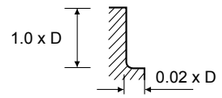
CFRP & GRAPHITE CUTTING CONDITIONS

172390 (Multiflute Dual Helix, Corner Radius)

MATERIAL GROUP		MATERIAL TYPE		Size (mm)			
				6.0	8.0	10.0	12.0
O	83	CFRP	v_c (m/min)	150	150	150	150
			n	7950	5960	4770	6970
			f_z	0.035	0.045	0.055	0.065
			f (mm/min)	1115	1610	1575	2065
	83	GFRP	v_c (m/min)	80	80	80	80
			n	4240	3180	2540	2120
			f_z	0.025	0.031	0.037	0.043
			f (mm/min)	425	590	565	730



MATERIAL GROUP		MATERIAL TYPE		Size (mm)			
				6.0	8.0	10.0	12.0
O	83	CFRP	v_c (m/min)	200	200	200	200
			n	10610	7950	6360	5300
			f_z	0.047	0.062	0.077	0.092
			f (mm/min)	1995	2955	2940	3900
	83	GFRP	v_c (m/min)	100	100	100	100
			n	5300	3970	3180	2650
			f_z	0.035	0.04	0.045	0.05
			f (mm/min)	740	955	860	1060



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: $n = \frac{v_c * 1000}{\pi * ø}$

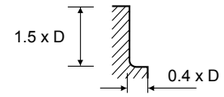
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

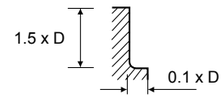
CFRP & GRAPHITE CUTTING CONDITIONS

172490 (4 Flute 15º Helix, Corner Radius)

MATERIAL GROUP		MATERIAL TYPE		Size (mm)			
				6.0	8.0	10.0	12.0
O	83	CFRP	v_c (m/min)	200	200	200	200
			n	10610	7950	6360	5300
			f_z	0.035	0.045	0.055	0.065
			f (mm/min)	1485	1430	1400	1380
	83	GFRP	v_c (m/min)	100	100	100	100
			n	5300	3970	3180	2650
			f_z	0.025	0.031	0.037	0.043
			f (mm/min)	530	490	470	455



MATERIAL GROUP		MATERIAL TYPE		Size (mm)			
				6.0	8.0	10.0	12.0
O	83	CFRP	v_c (m/min)	200	200	200	200
			n	10610	7950	6360	5300
			f_z	0.028	0.036	0.044	0.052
			f (mm/min)	1190	1145	1120	1100
	83	GFRP	v_c (m/min)	100	100	100	100
			n	5300	3970	3180	2650
			f_z	0.025	0.028	0.032	0.035
			f (mm/min)	530	445	405	370



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: $n = \frac{v_c * 1000}{\pi * ø}$

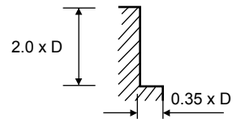
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CFRP & GRAPHITE CUTTING CONDITIONS

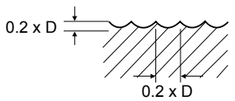
172590 (Router, End Mill Type)

MATERIAL GROUP		MATERIAL TYPE		Size (mm)						
				3.0	4.0	5.0	6.0	8.0	10.0	12.0
O	83	CFRP	v_c (m/min)	200	200	200	200	200	200	200
			n	21220	15910	12730	10610	7950	6360	5300
			f (mm/min)	1270	1430	1910	2225	2620	3080	3390
	83	GFRP	v_c (m/min)	100	100	100	100	100	100	100
			n	10610	7950	6360	5300	3970	3180	2650
			f (mm/min)	635	715	950	1110	1310	1525	1695



113325, 114325 (2 Flute Ball Nose, Extended Neck)

MATERIAL GROUP		MATERIAL TYPE		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
O		GRAPHITE	v_c (m/min)	100	150	200	245	285	325	360	395
			n	16000	16000	16000	15500	15000	13000	11500	10500
			f_z	0.025	0.045	0.066	0.082	0.098	0.115	0.133	0.15
			f (mm/min)	800	1450	2100	2550	2950	3000	3050	3150



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

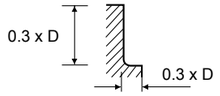
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CFRP & GRAPHITE CUTTING CONDITIONS

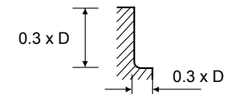
118325 (3 Flute 40º Helix, Corner Radius)

MATERIAL GROUP		MATERIAL TYPE		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
O		GRAPHITE	v_c (m/min)	250	375	505	630	755	805	815	790
			n	40000	40000	40000	40000	40000	32000	26000	21000
			f_z	0.025	0.036	0.05	0.06	0.07	0.088	0.11	0.13
			f (mm/min)	3000	4200	6000	7200	8400	8400	8600	8200



141325 (4 Flute Extended Neck, Corner Radius)

MATERIAL GROUP		MATERIAL TYPE		Size (mm)			
				6.0	8.0	10.0	12.0
O		GRAPHITE	v_c (m/min)	755	805	815	790
			n	40000	32000	26000	21000
			f_z	0.035	0.044	0.055	0.065
			f (mm/min)	5600	5600	5700	5450



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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

HX2S
MULTIPLE HELIX

Optimal roughing tooth profile allows for increased cutting depths and feed rates.

Special tool geometry designed for high feed rate and heavy cutting.

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

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

IDEAL FOR MATERIAL GROUPS

P M K S

HX2S & SABRE
ROUGHING END MILLS

Carbide and powder metallurgy for Steel, Cast iron, Stainless steel and Nickel alloys

www.europatool.co.uk

APPLICATION GUIDE

●: Excellent **O**: 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
●	●	●	●						●	●	●	●																	
●	●	●	●						●	●	●	●																	
●	●	●	●						●	●	●	●																	
●	●	●	●	o		●	●	●	o	o	o	o				o	o	o											
●	●	●	●	o		●	●	●	o	o	o	o				o	o	o											
●	●	●	●	o		●	●	●	o	o	o	o				o	o	o											
●	●	●	●	o		●	●	●	o	o	o	o																	

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

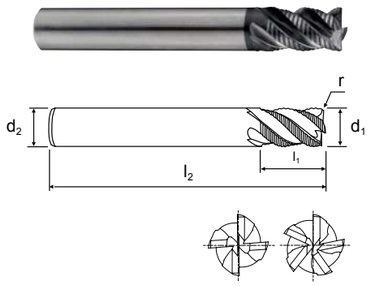
INDEX

4&5 FLUTE HX2S SHORT LENGTH MULTI HELIX CORNER RADIUS

MG HM | M-Helix | FLUTE 4&5 | PLAIN | FLAT

Series No. 167123,167323

▶ cutting conditions : p.268-269



Unique flute design for excellent chip evacuation and vibration reduction.
Optimal roughing tooth profile to reduce cutting forces.
Special tool geometry for high feed rate and heavy cutting.
Strong end tooth design for plunge and pocket milling.
Custom engineered coating to allow long tool life and excellent chip evacuation.

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	NO. OF FLUTE z
1671230600	**1673230600**	**6.0**	0.5	6	9.0	57	4
1671230800	**1673230800**	**8.0**	0.5	8	12.0	63	4
1671231000	**1673231000**	**10.0**	0.5	10	15.0	72	4
1671231200	**1673231200**	**12.0**	0.5	12	18.0	83	4
1671231600	**1673231600**	**16.0**	1.0	16	24.0	92	5
1671232000	**1673232000**	**20.0**	1.0	20	30.0	104	5

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.05	h6

●: Excellent **O**: Good

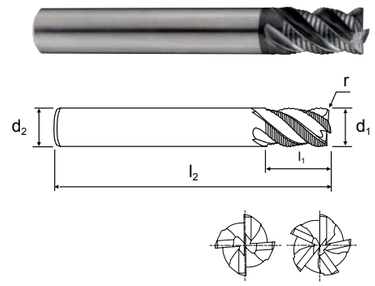
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●				●	●									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●				●	●									

4&5 FLUTE HX2S LONG LENGTH MULTI HELIX CORNER RADIUS

MG HM | M-Helix | FLUTE 4&5 | PLAIN | FLAT

Series No. 168123, 168323

▶ cutting conditions : p.268-269



Unique flute design for excellent chip evacuation and vibration reduction.
Optimal roughing tooth profile to reduce cutting forces.
Special tool geometry for high feed rate and heavy cutting.
Strong end tooth design for plunge and pocket milling.
Custom engineered coating to allow long tool life and excellent chip evacuation.

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	NO. OF FLUTE z
1681230600	**1683230600**	**6.0**	0.5	6	12.0	57	4
1681230800	**1683230800**	**8.0**	0.5	8	16.0	63	4
1681231000	**1683231000**	**10.0**	0.5	10	20.0	72	4
1681231200	**1683231200**	**12.0**	0.5	12	24.0	83	4
1681231600	**1683231600**	**16.0**	1.0	16	32.0	92	5
1681232000	**1683232000**	**20.0**	1.0	20	40.0	104	5

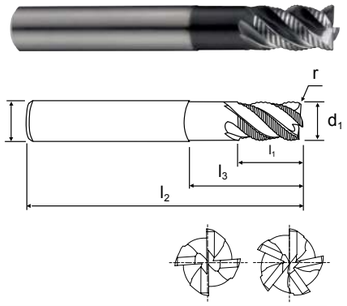
MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.05	h6

●: Excellent **O**: 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	
●	●				●	●									

4&5 FLUTE HX2S EXTENDED NECK MULTI HELIX CORNER RADIUS

MG HM | M-Helix | FLUTE 4&5 | PLAIN | FLAT



Series No. 169123, 169323

▶ cutting conditions : p.268-269

Unique flute design for excellent chip evacuation and vibration reduction.
Optimal roughing tooth profile to reduce cutting forces.
Special tool geometry for high feed rate and heavy cutting.
Strong end tooth design for plunge and pocket milling.
Custom engineered coating to allow long tool life and excellent chip evacuation.

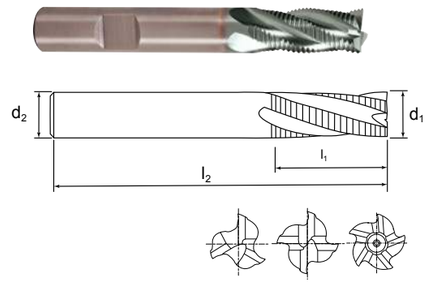
EUROPA CODE FLATTED	EUROPA CODE PLAIN	CUTTING DIAMETER d_1	CORNER RADIUS r	SHANK DIAMETER d_2	LENGTH OF CUT l_1	EFFECTIVE LENGTH l_3	OVERALL LENGTH l_2	NO. OF FLUTE z
1691230600	**1693230600**	**6.0**	0.5	6	9.0	18.0	57	4
1691230800	**1693230800**	**8.0**	0.5	8	12.0	24.0	63	4
1691231000	**1693231000**	**10.0**	0.5	10	15.0	30.0	72	4
1691231200	**1693231200**	**12.0**	0.5	12	18.0	36.0	83	4
1691231600	**1693231600**	**16.0**	1.0	16	24.0	48.0	100	5
1691232000	**1693232000**	**20.0**	1.0	20	30.0	60.0	110	5

MILL DIA TOLERANCE	SHANK DIA TOLERANCE
0~-0.05	h6

●: Excellent **O**: 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	
●	●				●	●									

MULTIFLUTE SABRE SHORT LENGTH FINE PITCH



PREMIUM PM | FLUTE 3-5 | DIN 844 | 30° | FINE | DIN 1835B | <Ø20 | >Ø20

Series No. 190140

▶ cutting conditions : p.270

Suitable for high feed roughing.
Designed for Steel, Stainless steel and Nickel alloys.
Sabre coating suitable for high speed cutting.
Centre cutting up to ø 20.0mm, non-centre cutting from ø 22.0mm.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
1901400600	**6.0**	6	13.0	57	3
1901400700	**7.0**	10	16.0	66	3
1901400800	**8.0**	10	19.0	69	3
1901400900	**9.0**	10	19.0	69	3
1901401000	**10.0**	10	22.0	72	4
1901401200	**12.0**	12	26.0	83	4
1901401400	**14.0**	12	26.0	83	4
1901401600	**16.0**	16	32.0	92	4
1901401800	**18.0**	16	32.0	92	4
1901402000	**20.0**	20	38.0	104	4
1901402200	**22.0**	20	38.0	104	5
1901402500	**25.0**	25	45.0	121	5

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA js12	± 60	± 75	± 90	± 105
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

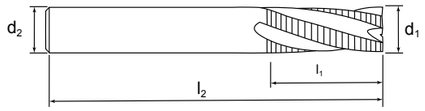
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●		●		O	O	O	O	O						

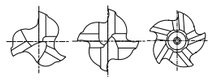
MULTIFLUTE SABRE LONG LENGTH FINE PITCH

PREMIUM PM | FLUTE 3-5 | DIN 844 | 30° | FINE | DIN 1835B | <Ø20 | >Ø20

Series No. 191140

▶ cutting conditions : p.270





Suitable for high feed roughing.
Designed for Steel, Stainless steel and Nickel alloys.
Sabre coating suitable for high speed cutting.
Centre cutting up to ø 20.0mm, non-centre cutting from ø 22.0mm.

EUROPA CODE	CUTTING DIAMETER d_1	SHANK DIAMETER d_2	LENGTH OF CUT l_1	OVERALL LENGTH l_2	NO. OF FLUTE z
1911400600	**6.0**	6	24.0	68	3
1911400700	**7.0**	10	30.0	80	3
1911400800	**8.0**	10	38.0	88	3
1911400900	**9.0**	10	38.0	88	3
1911401000	**10.0**	10	45.0	95	4
1911401200	**12.0**	12	53.0	110	4
1911401400	**14.0**	12	53.0	110	4
1911401600	**16.0**	16	63.0	123	4
1911401800	**18.0**	16	63.0	123	4
1911402000	**20.0**	20	75.0	141	4
1911402200	**22.0**	20	75.0	141	5
1911402500	**25.0**	25	90.0	168	5

Tolerances according to DIN 7160 & 7161

Tolerance range in µm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA js12	± 60	± 75	± 90	± 105
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

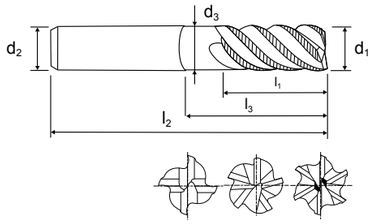
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●		●		O	O	O	O	O						

MULTIFLUTE SABRE EXTENDED NECK 45° HELIX FINE PITCH

PREMIUM PM | FLUTE 4-6 | DIN 844 | 45° | FINE | DIN 1835B | <Ø16 | >Ø16

Series No. 121240

▶ cutting conditions : p.270



Suitable for high feed roughing.
Designed for Steel, Stainless steel and Nickel alloys.
Sabre coating suitable for high speed cutting.
Centre cutting up to ø 16.0mm, non-centre cutting from ø 18.0mm.

EUROPA CODE	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	NO. OF FLUTE z
1212400600	**6.0**	6	13.0	–	57	–	4
1212400800	**8.0**	10	19.0	–	69	–	4
1212401000	**10.0**	10	22.0	31.0	72	9.5	4
1212401200	**12.0**	12	26.0	37.0	83	11.5	4
1212401400	**14.0**	12	26.0	-	83	-	5
1212401600	**16.0**	16	32.0	44.0	92	15.0	5
1212401800	**18.0**	16	32.0	-	83	-	6
1212402000	**20.0**	20	38.0	54.0	104	19.0	6
1212402500	**25.0**	25	45.0	63.0	121	24.0	6

Tolerances according to DIN 7160 & 7161

Tolerance range in µm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA js12	± 60	± 75	± 90	± 105
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

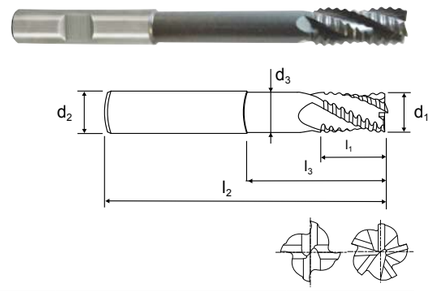
P		H	M		K		S			N				O	
11	12	15	21	22	31	32	41	42	43	61	62	63	64	81	82
●	●		●	●	O	O									
13	14	16	23		33	34	51	52	53	71	72	73	74	83	
●	●		●		O	O	O	O	O						

MULTIFLUTE SABRE EXTENDED NECK COARSE PITCH

PREMIUM PM | FLUTE 4-5 | 30° | COARSE | DIN 1835B

Series No. 192140

▶ cutting conditions : p.271



Suitable for high feed roughing.
Designed for Steel, Stainless steel and Cast iron.
Sabre coating suitable for high speed cutting.
Optimized geometry for high chip removal.

EUROPA CODE	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	NO. OF FLUTE z
1921401000	**10.0**	10	22.0	69.0	110	8.5	4
1921401200	**12.0**	12	26.0	78.0	125	10.5	4
1921401600	**16.0**	16	32.0	87.0	138	14.0	4
1921402000	**20.0**	20	38.0	108.0	160	18.0	4
1921402500	**25.0**	25	45.0	155.0	216	23.0	5

Tolerances according to DIN 7160 & 7161

Tolerance range in μm				
Nominal Diameter in mm				
	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
MILL DIA js12	± 60	± 75	± 90	± 105
SHANK DIA h6	0 − 8	0 − 9	0 − 11	0 − 13

●: Excellent **O**: Good

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

HX2S & SABRE
CUTTING DATA

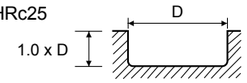
HX2S & SABRE CUTTING CONDITION

167123, 167323, 168123, 168323, 169123, 169323 (4&5 Flute Multi Helix, Corner Radius)

SLOTTING

MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
P	11	< 25	v_c (m/min)	225	225	225	225	225	225
			n	12000	9000	7200	6000	4500	3600
	12		f_z	0.032	0.046	0.057	0.064	0.067	0.074
			f (mm/min)	1550	1650	1650	1540	1500	1330
	13	25-40	v_c (m/min)	200	205	200	205	205	200
			n	10600	8100	6400	5400	4100	3200
	14		f_z	0.026	0.036	0.046	0.053	0.051	0.056
			f (mm/min)	1100	1180	1180	1140	1050	900
K	31		v_c (m/min)	225	225	225	225	225	225
			n	12000	9000	7200	6000	4500	3600
	32		f_z	0.032	0.046	0.057	0.064	0.067	0.074
			f (mm/min)	1550	1650	1650	1540	1500	1330
	33		v_c (m/min)	200	205	200	205	205	200
			n	10600	8100	6400	5400	4100	3200
	34		f_z	0.026	0.036	0.046	0.053	0.051	0.056
			f (mm/min)	1100	1180	1180	1140	1050	900

< HRc25



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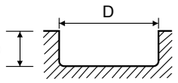


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

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.

HX2S & SABRE ROUGHING

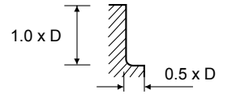
HX2S & SABRE CUTTING CONDITION

167123, 167323, 168123, 168323, 169123, 169323 (4&5 Flute Multi Helix, Corner Radius)

PROFILING

MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
P	11	< 25	v_c (m/min)	300	300	300	300	300	300
			n	15800	11900	9500	8000	6000	4800
	12		f_z	0.041	0.057	0.071	0.08	0.082	0.089
			f (mm/min)	2570	2700	2700	2570	2450	2140
	13	25-40	v_c (m/min)	270	270	270	270	270	270
			n	14300	10700	8500	7100	5400	4300
	14		f_z	0.032	0.046	0.057	0.065	0.065	0.07
			f (mm/min)	1850	1950	1950	1850	1750	1500
K	31		v_c (m/min)	300	300	300	300	300	300
			n	15800	11900	9500	8000	6000	4800
	32		f_z	0.041	0.057	0.071	0.08	0.082	0.089
			f (mm/min)	2570	2700	2700	2570	2450	2140
	33		v_c (m/min)	270	270	270	270	270	270
			n	14300	10700	8500	7100	5400	4300
	34		f_z	0.032	0.046	0.057	0.065	0.065	0.07
			f (mm/min)	1850	1950	1950	1850	1750	1500

< HRc25



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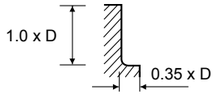


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

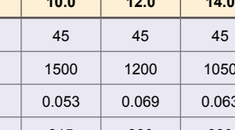
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

HX2S & SABRE CUTTING CONDITION

190140, 191140, 121240 (Multiflute PM Sabre, Fine Pitch)

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
P	11	< 20	v_c (m/min)	40	50	45	45	45	50	50	50	45	45
			n	2200	1900	1500	1200	1050	950	890	760	650	600
	12		f_z	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.085	0.088
			f (mm/min)	180	230	315	330	330	330	330	330	330	315
	13	20-30	v_c (m/min)	30	35	35	35	35	35	35	35	30	35
			n	1600	1400	1050	900	760	660	610	530	470	420
	14		f_z	0.018	0.029	0.46	0.064	0.061	0.07	0.063	0.072	0.082	0.087
			f (mm/min)	115	160	195	230	230	230	230	230	230	220
H	15	30-40	v_c (m/min)	25	25	30	30	30	30	30	30	30	30
			n	1300	1050	890	740	630	550	490	440	400	360
			f_z	0.02	0.03	0.045	0.061	0.057	0.065	0.061	0.068	0.075	0.083
			f (mm/min)	105	125	160	180	180	180	180	180	180	180
M	21		v_c (m/min)	27	30	32	32	32	32	32	32	32	32
			n	1450	1200	950	800	690	600	550	480	430	390
	22		f_z	0.019	0.029	0.045	0.064	0.059	0.068	0.062	0.071	0.079	0.085
	23		f (mm/min)	110	140	170	205	205	205	205	205	205	200
K	31		v_c (m/min)	40	50	45	45	45	50	50	50	45	45
	32		n	2200	1900	1500	1200	1050	950	890	760	650	600
	33		f_z	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.085	0.088
	34		f (mm/min)	180	230	315	330	330	330	330	330	330	315
S	51		v_c (m/min)	12	12	15	15	15	15	15	15	15	15
			n	635	475	475	395	340	300	265	240	215	190
	52		f_z	0.018	0.028	0.042	0.061	0.055	0.066	0.06	0.069	0.077	0.082
	53		f (mm/min)	35	40	80	95	75	80	65	65	80	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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

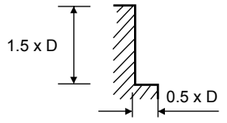
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

HX2S & SABRE CUTTING CONDITION

192140 (Multiflute PM Sabre, Extended Neck, Coarse Pitch)

MATERIAL GROUP		HRc		Size (mm)				
				10.0	12.0	16.0	20.0	25.0
P	11	< 20	v_c (m/min)	47	47	47	47	47
			n	1500	1200	950	760	600
	12		f_z	0.045	0.058	0.074	0.092	0.09
			f (mm/min)	270	280	280	280	270
	13	20-30	v_c (m/min)	33	33	33	33	33
			n	1050	900	660	530	420
	14		f_z	0.039	0.054	0.074	0.092	0.088
			f (mm/min)	165	195	195	195	185
H	15	30-40	v_c (m/min)	28	28	282	28	28
			n	890	740	550	440	360
			f_z	0.038	0.052	0.07	0.088	0.086
			f (mm/min)	135	155	155	155	155
M	21		v_c (m/min)	30	30	30	30	30
			n	950	800	600	480	390
	22		f_z	0.038	0.055	0.073	0.091	0.087
	23		f (mm/min)	145	175	175	175	170
K	31		v_c (m/min)	47	47	47	47	47
	32		n	1500	1200	950	760	600
	33		f_z	0.045	0.058	0.074	0.092	0.09
	34		f (mm/min)	270	280	280	280	270



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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

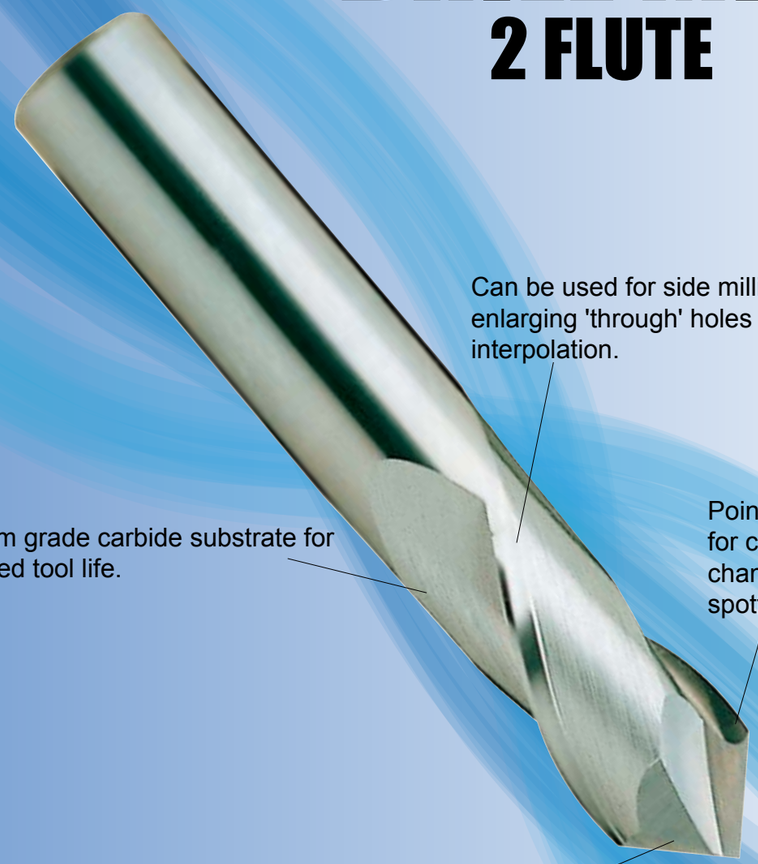
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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.

HX2S & SABRE ROUGHING

SUPERIOR PERFORMANCE

DRILL MILL
2 FLUTE



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

Premium grade carbide substrate for increased tool life.

Point can be used for countersinking, chamfering and spotting.

90º included point angle.

IDEAL FOR MATERIAL GROUPS

P M K S N

STANDARD CARBIDE
END MILLS

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

www.europatool.co.uk

APPLICATION GUIDE

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●: Excellent O: Good

P				H		M			K				S						N								O					**DRILL MILL**		
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	Uncoated	TiAlN Coated	Item	Description	Page No.
●	●	●	●			o	o		●	●	●		o	o									o	o	o					197303	-		Standard Length ø3.0mm - 20.0mm	P.292
																																2-FLUTE END MILLS		
●	●	●	●			o	o		●	●	●		o	o					o	o	o		o	o	o					301303	301323		Standard Length ø1.0mm - 25.0mm	P.278
●	●	●	●			o	o		●	●	●		o	o					o	o	o		o	o	o					302303	302323		Long Series ø3.0mm - 25.0mm	P.279
●	●	●	●			o	o		●	●	●		o	o									o	o	o					-	120323		Standard Length Corner Radius ø2.0mm - 12.0mm	P.290
●	●	●	●			o	o		●	●	●		o	o									o	o	o					-	121323		Long Series Corner Radius ø3.0mm - 12.0mm	P.291
●	●	●	●			o	o		●	●	●		o	o									o	o	o					313303	313323		Standard Length Ball Nose ø1.0mm - 25.0mm	P.284
●	●	●	●			o	o		●	●	●		o	o									o	o	o					314303	314323		Long Series Ball Nose ø3.0mm - 25.0mm	P.285
																																3-FLUTE END MILLS		
●	●	●	●			o	o		●	●	●		o	o									o	o	o					304303	304323		Standard Length ø1.0mm - 25.0mm	P.280
●	●	●	●			o	o		●	●	●		o	o									o	o	o					305303	305323		Long Series ø3.0mm - 25.0mm	P.281
●	●	●	●			o	o		●	●	●		o	o									o	o	o					307303	307323		Standard Length Ball Nose ø1.0mm - 16.0mm	P.286
●	●	●	●			o	o		●	●	●		o	o									o	o	o					308303	308323		Long Series Ball Nose ø3.0mm - 25.0mm	P.287
																																4-FLUTE END MILLS		
●	●	●	●			o	o		●	●	●		o	o									o	o	o					310303	310323		Standard Length ø1.0mm - 25.0mm	P.282
●	●	●	●			o	o		●	●	●		o	o									o	o	o					311303	311323		Long Series ø3.0mm - 25.0mm	P.283
●	●	●	●			o	o		●	●	●		o	o									o	o	o					-	140323		Standard Length Corner Radius ø2.0mm - 12.0mm	P.290
●	●	●	●			o	o		●	●	●		o	o									o	o	o					-	142323		Long Series Corner Radius ø3.0mm - 12.0mm	P.291
●	●	●	●			o	o		●	●	●		o	o									o	o	o					315303	315323		Standard Length Ball Nose ø1.0mm - 25.0mm	P.288
●	●	●	●			o	o		●	●	●		o	o									o	o	o					316303	316323		Long Series Ball Nose ø3.0mm - 25.0mm	P.289
																																	Imperial Size End Mills	P.300

CONTINUED OVERLEAF

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

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●: Excellent **O**: 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
●	●	●	●			o	o		●	●	●		o	o					o	o	o		o	o	o				
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- For material group examples, refer to page 2
- For full material group tables, refer to pages 444-449

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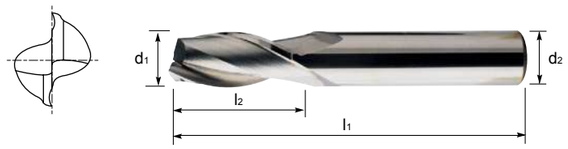
DIN STANDARD END MILLS

2 FLUTE, STANDARD, PLAIN SHANK

MG HM | N | 30° | FLUTE 2 | PLAIN

Series No. 301303,301323

▶ cutting conditions : p.302-303



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	6.0	16.0		**3013030450**	**3013230450**
5.0		16.0		**3013030500**	**3013230500**
6.0		19.0	58.0	**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		**3013031100**	**3013231100**
12.0		25.0		**3013031200**	**3013231200**
14.0	14.0	32.0	89.0	**3013031400**	**3013231400**
16.0	16.0	32.0		**3013031600**	**3013231600**
18.0	18.0	38.0	100.0	**3013031800**	**3013231800**
20.0	20.0	38.0		**3013032000**	**3013232000**
25.0	25.0	38.0		**3013032500**	**3013232500**

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

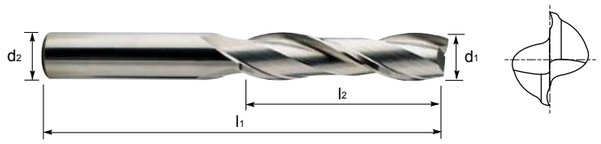
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

2 FLUTE, LONG, PLAIN SHANK

MG HM | N | 30° | FLUTE 2 | PLAIN

Series No. 302303,302323

▶ cutting conditions : p.302-303



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**	**3023230500**
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

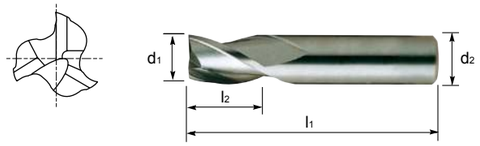
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

3 FLUTE, STANDARD, PLAIN SHANK

MG HM | N | 30° | FLUTE 3 | PLAIN

Series No. 304303,304323

▶ cutting conditions : p.304-307



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	6.0	16.0		**3043030450**	**3043230450**
5.0		16.0		**3043030500**	**3043230500**
6.0		19.0	58.0	**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	12.0	25.0		**3043031100**	**3043231100**
12.0	12.0	25.0		**3043031200**	**3043231200**
14.0	14.0	32.0	89.0	**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

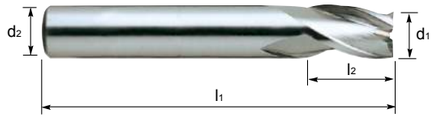
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

3 FLUTE, LONG, PLAIN SHANK

MG HM | N | 30° | FLUTE 3 | PLAIN

Series No. 305303,305323

▶ cutting conditions : p.304-307



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

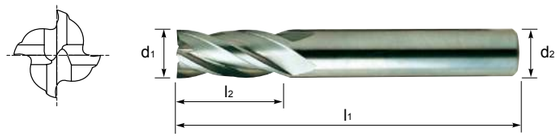
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

4 FLUTE, STANDARD, PLAIN SHANK

MG HM | N | 30° | FLUTE 4 | PLAIN

Series No. 310303,310323

▶ cutting conditions : p.312-313



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	6.0	16.0		**3103030450**	**3103230450**
5.0		16.0		**3103030500**	**3103230500**
6.0		19.0	58.0	**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		**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

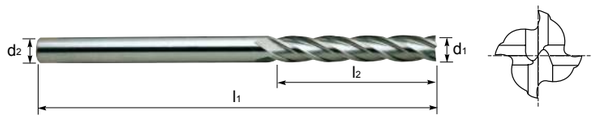
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

4 FLUTE, LONG, PLAIN SHANK

MG HM | N | 30° | FLUTE 4 | PLAIN

Series No. 311303,311323

▶ cutting conditions : p.312-313



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	75.0	**3113030500**	**3113230500**
6.0	6.0	25.0		**3113030600**	**3113230600**
8.0	8.0	25.0		**3113030800**	**3113230800**
10.0	10.0	38.0	100.0	**3113031000**	**3113231000**
12.0	12.0	50.0		**3113031200**	**3113231200**
16.0	16.0	58.0	125.0	**3113039016**	**3113239016**
18.0	18.0	58.0		**3113039018**	**3113239018**
20.0	20.0	58.0		**3113039020**	**3113239020**
25.0	25.0	58.0		**3113039025**	**3113239025**
12.0	12.0	75.0	150.0	**3113039001**	**3113239001**
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

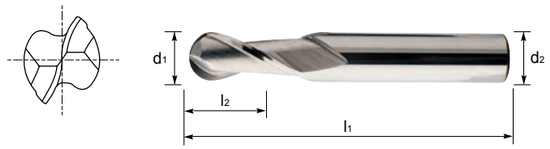
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

2 FLUTE, STANDARD, BALL NOSE

MG HM | N | 30° | FLUTE 2 | PLAIN

Series No. 313303,313323

▶ cutting conditions : p.314-315



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	6.0	16.0		**3133030450**	**3133230450**
5.0		16.0		**3133030500**	**3133230500**
6.0		19.0	58.0	**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		**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

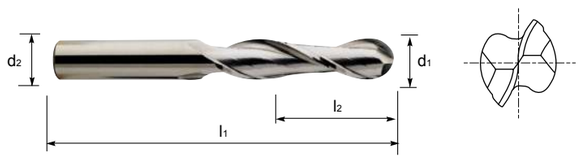
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

2 FLUTE, LONG, BALL NOSE

MG HM | N | 30° | FLUTE 2 | PLAIN

Series No. 314303,314323

▶ cutting conditions : p.314-315



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

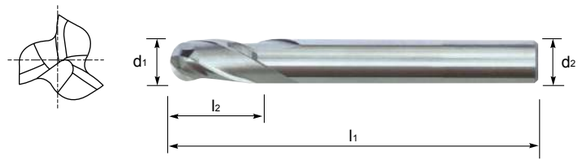
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

3 FLUTE, STANDARD, BALL NOSE

MG HM | N | 30° | FLUTE 3 | PLAIN

Series No. 307303,307323

▶ cutting conditions : p.316-317



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	**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		19.0	58.0	**3073030600**	**3073230600**
8.0	8.0	20.0	63.0	**3073030800**	**3073230800**
10.0	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**

▶ TiAlN Coating to Order

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

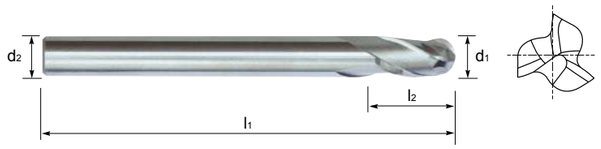
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

3 FLUTE, LONG, BALL NOSE

MG HM | N | 30° | FLUTE 3 | PLAIN

Series No. 308303,308323

▶ cutting conditions : p.316-317



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	**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		**3083030800**	**3083230800**
10.0	10.0	38.0	100.0	**3083031000**	**3083231000**
12.0	12.0	50.0		**3083031200**	**3083231200**
16.0	16.0	75.0	150.0	**3083031600**	**3083231600**
20.0	20.0	75.0		**3083032000**	**3083232000**
25.0	25.0	75.0		**3083032500**	**3083232500**

▶ TiAlN Coating to Order

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

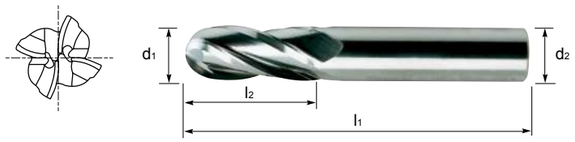
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

4 FLUTE, STANDARD, BALL NOSE

MG HM | N | 30° | FLUTE 4 | PLAIN

Series No. 315303,315323

▶ cutting conditions : p.318-319



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	6.0	16.0		3153030450	3153230450
5.0		16.0		3153030500	3153230500
6.0		19.0	58.0	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		3153031100	3153231100
12.0		25.0		3153031200	3153231200
14.0	14.0	32.0	89.0	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

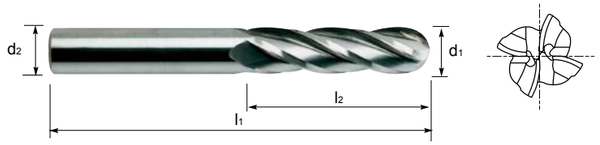
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

4 FLUTE, LONG, BALL NOSE

MG HM | N | 30° | FLUTE 4 | PLAIN

Series No. 316303,316323

▶ cutting conditions : p.318-319



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

MG HM | EUROPA STD | 30° | FLUTE 2&4 | DIN 6535HA

Series No. 120323,140323

▶ cutting conditions : p.320-321

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

MG HM | EUROPA STD | 30° | FLUTE 2&4 | DIN 6535HA

Series No. 121323,142323

▶ cutting conditions : p.320-321

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

MG HM | EUROPA STD | N | FLUTE 2 | 30° | DIN 6535HA

Series No. 197303

▶ cutting conditions : p.322-324

- 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.

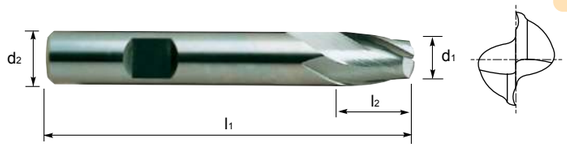
EUROPA CODE PLAIN	Mill Diameter	Shank Diameter h6	Length of Cut	Overall Length
1973030300	**3.0**	4	6	50
1973030400	**4.0**	5	8	50
1973030500	**5.0**	6	10	50
1973030600	**6.0**	8	12	60
1973030800	**8.0**	10	16	70
1973031000	**10.0**	12	18	70
1973031200	**12.0**	12	20	70
1973031400	**14.0**	14	24	80
1973031600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

▶ TiAlN Coating to Order

MILL DIA TOLERANCE(mm)	SHANK DIA TOLERANCE
Ø3 ~ Ø10=h9 Ø12 ~ Ø20=d9	h6

2 FLUTE, SHORT LENGTH

MG HM | DIN 6527 | N | ≈30° | FLUTE 2 | FLAT



Series No. 100103

▶ cutting conditions : p.302

Mill Dia. h10(d_1)	Shank Dia. h6(d_2)	Length of Cut l_2	Overall Length l_1	Carbide	TiAlN Carbide
3.0	6.0	4.0	50.0	**1001030300**	**1001230300**
3.5		4.0		**1001030350**	**1001230350**
4.0		5.0	54.0	**1001030400**	**1001230400**
4.5		5.0		**1001030450**	**1001230450**
5.0		6.0		**1001030500**	**1001230500**
6.0		7.0		**1001030600**	**1001230600**
7.0	8.0	8.0	58.0	**1001030700**	**1001230700**
8.0		9.0		**1001030800**	**1001230800**
9.0	10.0	10.0	66.0	**1001030900**	**1001230900**
10.0		11.0		**1001031000**	**1001231000**
12.0	12.0	12.0	73.0	**1001031200**	**1001231200**
14.0	14.0	14.0	75.0	**1001031400**	**1001231400**
16.0	16.0	16.0	82.0	**1001031600**	**1001231600**
18.0	18.0	18.0	84.0	**1001031800**	**1001231800**
20.0	20.0	20.0	92.0	**1001032000**	**1001232000**

▶ TiAlN Coating to Order

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

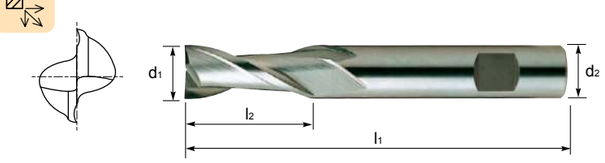
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

2 FLUTE, LONG LENGTH

MG HM | DIN 6527 | N | ≈30° | FLUTE 2 | FLAT

Series No. 102103

▶ cutting conditions : p.302



Mill Dia. h10(d_1)	Shank Dia. h6(d_2)	Length of Cut l_2	Overall Length l_1	Carbide	TiAlN Carbide
3.0	6.0	7.0	57.0	**1021030300**	**1021230300**
3.5		7.0		**1021030350**	**1021230350**
4.0		8.0		**1021030400**	**1021230400**
4.5		8.0		**1021030450**	**1021230450**
5.0		10.0		**1021030500**	**1021230500**
6.0		10.0		**1021030600**	**1021230600**
7.0	8.0	13.0	63.0	**1021030700**	**1021230700**
8.0		16.0		**1021030800**	**1021230800**
9.0	10.0	16.0	72.0	**1021030900**	**1021230900**
10.0		19.0		**1021031000**	**1021231000**
12.0	12.0	22.0	83.0	**1021031200**	**1021231200**
14.0	14.0	22.0		**1021031400**	**1021231400**
16.0	16.0	26.0	92.0	**1021031600**	**1021231600**
18.0	18.0	26.0		**1021031800**	**1021231800**
20.0	20.0	32.0	104.0	**1021032000**	**1021232000**

▶ TiAlN Coating to Order

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

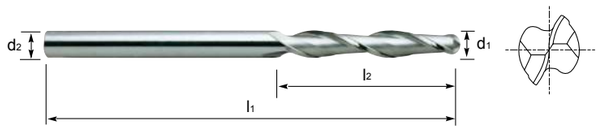
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

2 FLUTE, EXTRA LONG LENGTH, BALL NOSE

MG HM | N | 30° | FLUTE 2 | PLAIN

Series No. 162303

▶ cutting conditions : p.314-315



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	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**

▶ TiAlN Coating to Order

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

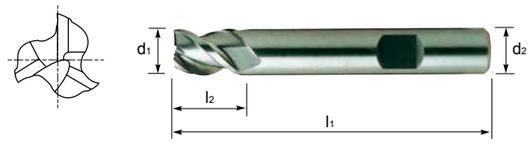
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

3 FLUTE, 45° HELIX, SHORT LENGTH

MG HM | DIN 6527 | N | 45° | FLUTE 3 | FLAT

Series No. 140103

▶ cutting conditions : p.308-311



Mill Dia. h10(d_1)	Shank Dia. h6(d_2)	Length of Cut l_2	Overall Length l_1	Carbide	TiAlN Carbide
3.0	6.0	4.0	50.0	**1401030300**	**1401230300**
3.5		4.0		**1401030350**	**1401230350**
4.0		5.0	54.0	**1401030400**	**1401230400**
4.5		5.0		**1401030450**	**1401230450**
5.0		6.0		**1401030500**	**1401230500**
6.0		7.0		**1401030600**	**1401230600**
7.0	8.0	8.0	58.0	**1401030700**	**1401230700**
8.0		9.0		**1401030800**	**1401230800**
9.0	10.0	10.0	66.0	**1401030900**	**1401230900**
10.0		11.0		**1401031000**	**1401231000**
12.0	12.0	12.0	73.0	**1401031200**	**1401231200**
14.0	14.0	14.0	75.0	**1401031400**	**1401231400**
16.0	16.0	16.0	82.0	**1401031600**	**1401231600**
18.0	18.0	18.0	84.0	**1401031800**	**1401231800**
20.0	20.0	20.0	92.0	**1401032000**	**1401232000**

▶ TiAlN Coating to Order

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

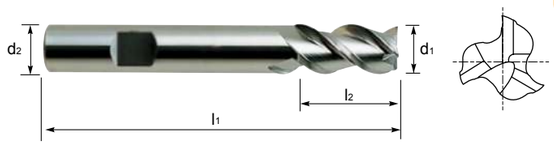
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

3 FLUTE, 45° HELIX, LONG LENGTH

MG HM | DIN 6527 | N | 45° | FLUTE 3 | FLAT

Series No. 141103

▶ cutting conditions : p.308-311



Mill Dia. h10(d_1)	Shank Dia. h6(d_2)	Length of Cut l_2	Overall Length l_1	Carbide	TiAlN Carbide
3.0	6.0	7.0	57.0	**1411030300**	**1411230300**
3.5		7.0		**1411030350**	**1411230350**
4.0		8.0		**1411030400**	**1411230400**
4.5		8.0		**1411030450**	**1411230450**
5.0		10.0		**1411030500**	**1411230500**
6.0		10.0		**1411030600**	**1411230600**
7.0	8.0	13.0	63.0	**1411030700**	**1411230700**
8.0		16.0		**1411030800**	**1411230800**
9.0	10.0	16.0	72.0	**1411030900**	**1411230900**
10.0		19.0		**1411031000**	**1411231000**
12.0	12.0	22.0	83.0	**1411031200**	**1411231200**
14.0	14.0	22.0		**1411031400**	**1411231400**
16.0	16.0	26.0	92.0	**1411031600**	**1411231600**
18.0	18.0	26.0		**1411031800**	**1411231800**
20.0	20.0	32.0	104.0	**1411032000**	**1411232000**

▶ TiAlN Coating to Order

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

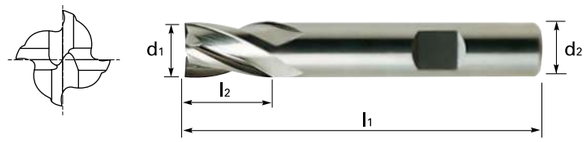
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

4 FLUTE, SHORT LENGTH

MG HM | DIN 6527 | N | ≈30° | FLUTE 4 | FLAT

Series No. 109103

▶ cutting conditions : p.312-313



Mill Dia. h10(d_1)	Shank Dia. h6(d_2)	Length of Cut l_2	Overall Length l_1	Carbide	TiAlN Carbide
3.0	6.0	5.0	50.0	**1091030300**	**1091230300**
3.5		6.0		**1091030350**	**1091230350**
4.0		8.0	54.0	**1091030400**	**1091230400**
4.5		8.0		**1091030450**	**1091230450**
5.0		9.0		**1091030500**	**1091230500**
6.0		10.0		**1091030600**	**1091230600**
7.0	8.0	11.0	58.0	**1091030700**	**1091230700**
8.0		12.0		**1091030800**	**1091230800**
9.0	10.0	13.0	66.0	**1091030900**	**1091230900**
10.0		14.0		**1091031000**	**1091231000**
12.0	12.0	16.0	73.0	**1091031200**	**1091231200**
14.0	14.0	18.0	75.0	**1091031400**	**1091231400**
16.0	16.0	22.0	82.0	**1091031600**	**1091231600**
18.0	18.0	24.0	84.0	**1091031800**	**1091231800**
20.0	20.0	26.0	92.0	**1091032000**	**1091232000**

▶ TiAlN Coating to Order

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

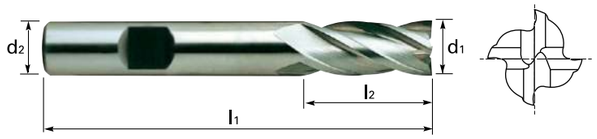
Toleranzwerte in µm / Tolerance range in µm					
Nennmaßbereich in mm / Nominal-Diameter in mm					
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11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

4 FLUTE, LONG LENGTH

MG HM | DIN 6527 | N | ≈30° | FLUTE 4 | FLAT

Series No. 111103

▶ cutting conditions : p.312-313



Mill Dia. h10(d_1)	Shank Dia. h6(d_2)	Length of Cut l_2	Overall Length l_1	Carbide	TiAlN Carbide
3.0	6.0	8.0	57.0	**1111030300**	**1111230300**
3.5		10.0		**1111030350**	**1111230350**
4.0		11.0		**1111030400**	**1111230400**
4.5		11.0		**1111030450**	**1111230450**
5.0		13.0		**1111030500**	**1111230500**
6.0		13.0		**1111030600**	**1111230600**
7.0	8.0	16.0	63.0	**1111030700**	**1111230700**
8.0		19.0		**1111030800**	**1111230800**
9.0	10.0	19.0	72.0	**1111030900**	**1111230900**
10.0		22.0		**1111031000**	**1111231000**
12.0	12.0	26.0	83.0	**1111031200**	**1111231200**
14.0	14.0	26.0		**1111031400**	**1111231400**
16.0	16.0	32.0	92.0	**1111031600**	**1111231600**
18.0	18.0	32.0		**1111031800**	**1111231800**
20.0	20.0	38.0	104.0	**1111032000**	**1111232000**

▶ 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
h10	0 — 40	0 — 48	0 — 58	0 — 70	0 — 84
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13

IMPERIAL SIZE END MILLS

The following ranges are available in imperial sizes, although not listed fully in the catalogue. Please contact the sales office for full dimensions.

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"

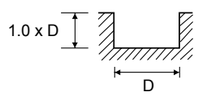
▶ TiAlN Coating to Order

STANDARD CARBIDE
CUTTING DATA

K30 CARBIDE CUTTING CONDITION

301303, 302303, 100103, 102103, 501303, 502303 (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	11	< 30	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	0.007	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
	13	30-40	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	21		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50
	22		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	31		v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40
	32		n	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640
	33		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	61		v_c (m/min)	75	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	0.010	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
	72		n	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600
	73		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	41		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50
	42		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800
	43		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

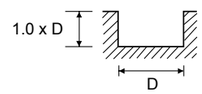
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

STANDARD K30 CARBIDE

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	11	< 30	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
	13	30-40	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	21		v_c (m/min)	70	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	0.004	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	31		v_c (m/min)	55	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	0.012	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	61		v_c (m/min)	105	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	0.01	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
	72		n	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240
	73		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	41		v_c (m/min)	70	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	0.004	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: $n = \frac{v_c * 1000}{\pi * ø}$

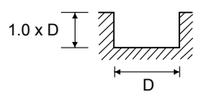
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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, 507303, 508303 (3 Flute)  **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	11	**< 30**	v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30
			n	4800	3200	2400	1900	1600	1200	950	800	700	600	480
	12		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
	13	**30-40**	v_c (m/min)	25	25	25	25	25	25	25	25	25	25	25
			n	4000	2600	2000	1600	1300	1000	800	660	570	500	400
	14		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	21		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
	22		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	31		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
	32		f_z	0.007	0.011	0.014	0.018	0.025	0.035	0.046	0.063	0.074	0.083	0.112
	33		f (mm/min)	140	140	130	135	160	170	180	190	200	200	215
N	61		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
	62		f_z	0.006	0.009	0.012	0.015	0.02	0.026	0.032	0.039	0.045	0.051	0.064
	63		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
	72		f_z	0.006	0.009	0.012	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.063
	73		f (mm/min)	290	300	290	290	305	310	305	300	300	300	300
S	41		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
	42		f_z	0.002	0.003	0.005	0.006	0.008	0.01	0.013	0.015	0.018	0.023	0.029
	43		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

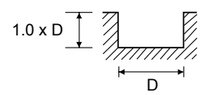
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

STANDARD K30 CARBIDE

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	11	**< 30**	v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40
			n	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670
	12		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
	13	**30-40**	v_c (m/min)	35	35	35	35	35	35	35	35	35	35	35
			n	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
	14		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	70
			n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120
	22		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	55
			n	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900
	32		f_z	0.007	0.011	0.013	0.018	0.026	0.036	0.046	0.063	0.074	0.083	0.111
	33		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	105
			n	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680
	62		f_z	0.006	0.009	0.012	0.015	0.02	0.025	0.032	0.038	0.045	0.051	0.063
	63		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	140	135	140	140	140
			n	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240
	72		f_z	0.006	0.009	0.012	0.015	0.019	0.026	0.032	0.038	0.043	0.05	0.063
	73		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	70
			n	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120
	42		f_z	0.002	0.003	0.004	0.006	0.008	0.01	0.013	0.016	0.018	0.024	0.03
	43		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: $n = \frac{v_c * 1000}{\pi * ø}$

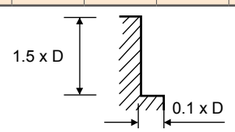
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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, 507303, 508303 (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	11	< 30	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
	13	30-40	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	21		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50
	22		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	31		v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40
	32		n	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640
	33		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	61		v_c (m/min)	75	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	0.022	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
	72		n	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600
	73		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	41		v_c (m/min)	50	50	50	50	50	50	50	50	50	50	50
	42		n	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800
	43		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: $n = \frac{v_c * 1000}{\pi * ø}$

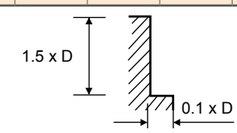
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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	11	< 30	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
	13	30-40	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	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	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	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	008	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	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	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: $n = \frac{v_c * 1000}{\pi * ø}$

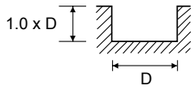
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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

140103, 141103 (3 Flute, 45º Helix)  SLOTTING

MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	11	< 30	v_c (m/min)	30	30	30	30	30	30	30
			n	1600	1200	950	800	700	600	480
	12		f_z	0.02	0.026	0.33	0.04	0.045	0.056	0.069
			f (mm/min)	95	95	95	95	95	100	100
	13	30-40	v_c (m/min)	25	25	25	25	25	25	25
			n	1300	1000	800	660	570	500	400
	14		f_z	0.017	0.022	0.027	0.033	0.038	0.053	0.067
			f (mm/min)	65	65	65	65	65	80	80
K	31		v_c (m/min)	40	40	40	40	40	40	40
			n	2100	1600	1300	1000	900	800	640
	32		f_z	0.035	0.048	0.062	0.083	0.096	0.113	0.151
	33		f (mm/min)	220	230	240	250	260	270	290
N	61		v_c (m/min)	75	75	75	75	75	75	75
			n	4000	3000	2400	2000	1700	1500	1200
	62		f_z	0.026	0.034	0.043	0.052	0.061	0.069	0.086
	63		f (mm/min)	310	310	310	310	310	310	310
	71		v_c (m/min)	100	100	100	100	100	100	100
			n	5300	4000	3200	2600	2300	2000	1600
	72		f_z	0.026	0.034	0.043	0.053	0.059	0.068	0.085
	73		f (mm/min)	410	410	410	410	410	410	410



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

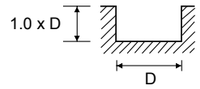
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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

140103, 141103 (3 Flute, 45º Helix TiAlN)  SLOTTING

MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	11	< 30	v_c (m/min)	40	40	40	40	40	40	40
			n	2240	1680	1330	1120	980	840	670
	12		f_z	0.02	0.027	0.034	0.04	0.046	0.056	0.07
			f (mm/min)	135	135	135	135	135	140	140
	13	30-40	v_c (m/min)	35	35	35	35	35	35	35
			n	1820	1400	1120	925	800	700	560
	14		f_z	0.016	0.021	0.027	0.032	0.038	0.052	0.065
			f (mm/min)	90	90	90	90	90	110	110
K	31		v_c (m/min)	55	55	55	55	55	55	55
			n	2940	2240	1820	1400	1260	1120	895
	32		f_z	0.035	0.048	0.061	0.083	0.097	0.113	0.151
	33		f (mm/min)	310	320	335	350	365	380	405
N	61		v_c (m/min)	105	105	105	105	105	105	105
			n	5600	4200	3360	2800	2380	2100	1680
	62		f_z	0.026	0.035	0.043	0.052	0.061	0.069	0.086
	63		f (mm/min)	435	435	435	435	435	435	435
	71		v_c (m/min)	140	140	140	140	140	140	140
			n	7420	5600	4480	3640	3220	2800	2240
	72		f_z	0.026	0.034	0.043	0.053	0.06	0.068	0.086
	73		f (mm/min)	140	140	140	140	140	140	140



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

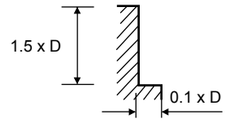
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

STANDARD K30 CARBIDE

K30 CARBIDE CUTTING CONDITION

140103, 141103 (3 Flute, 45º Helix)  PROFILING

MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	11	< 30	v_c (m/min)	30	30	30	30	30	30	30
			n	1600	1200	950	800	700	600	480
	12		f_z	0.04	0.053	0.068	0.079	0.09	0.111	0.139
			f (mm/min)	190	190	190	190	190	200	200
	13	30-40	v_c (m/min)	25	25	25	25	25	25	25
			n	1300	1000	800	660	570	500	400
	14		f_z	0.033	0.043	0.054	0.066	0.076	0.107	0.133
			f (mm/min)	130	130	130	130	130	160	160
K	31		v_c (m/min)	40	40	40	40	40	40	40
			n	2100	1600	1300	1000	900	800	640
	32		f_z	0.07	0.096	0.123	0.167	0.193	0.225	0.302
	33		f (mm/min)	440	460	480	500	520	540	580
N	61		v_c (m/min)	75	75	75	75	75	75	75
			n	4000	3000	2400	2000	1700	1500	1200
	62		f_z	0.052	0.069	0.086	0.103	0.122	0.138	0.172
	63		f (mm/min)	620	620	620	620	620	620	620
	71		v_c (m/min)	100	100	100	100	100	100	100
			n	5300	4000	3200	2600	2300	2000	1600
	72		f_z	0.052	0.068	0.085	0.105	0.119	0.137	0.171
	73		f (mm/min)	820	820	820	820	820	820	820



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

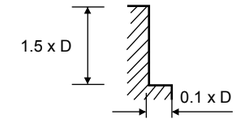
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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

140103, 141103 (3 Flute, 45º Helix TiAlN)  PROFILING

MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	11	< 30	v_c (m/min)	40	40	40	40	40	40	40
			n	2240	1680	1330	1120	980	840	670
	12		f_z	0.039	0.053	0.066	0.079	0.09	0.111	0.139
			f (mm/min)	265	265	265	265	265	280	280
	13	30-40	v_c (m/min)	35	35	35	35	35	35	35
			n	1820	1400	1120	925	800	700	560
	14		f_z	0.033	0.043	0.054	0.065	0.075	0.107	0.134
			f (mm/min)	180	180	180	180	180	225	225
K	31		v_c (m/min)	55	55	55	55	55	55	55
			n	2940	2240	1820	1400	1260	1120	895
	32		f_z	0.07	0.096	0.123	0.167	0.193	0.225	0.302
	33		f (mm/min)	615	645	670	700	730	755	810
N	61		v_c (m/min)	105	105	105	105	105	105	105
			n	5600	4200	3360	2800	2380	2100	1680
	62		f_z	0.052	0.069	0.086	0.104	0.122	0.138	0.173
	63		f (mm/min)	870	870	870	870	870	870	870
	71		v_c (m/min)	140	140	140	140	140	140	140
			n	7420	5600	4480	3640	3220	2800	2240
	72		f_z	0.052	0.068	0.086	0.105	0.119	0.137	0.171
	73		f (mm/min)	1150	1150	1150	1150	1150	1150	1150



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

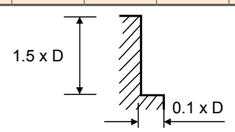
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

STANDARD K30 CARBIDE

K30 CARBIDE CUTTING CONDITION

310303, 311303, 109103, 111103, 510303, 511303 (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	11 12	< 30	v_c (m/min)	30	30	30	30	30	30	30	30	30	30	30
			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
	13 14	30-40	v_c (m/min)	25	25	25	25	25	25	25	25	25	25	25
			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	21 22		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	31 32 33		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 62 63		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	0.023	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 72 73		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	41 42 43		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

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

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

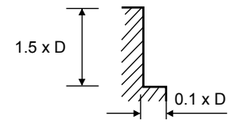
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

STANDARD K30 CARBIDE

K30 CARBIDE CUTTING CONDITION

310323, 311323, 109123, 111123 (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	11 12	< 30	v_c (m/min)	40	40	40	40	40	40	40	40	40	40	40
			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
	13 14	30-40	v_c (m/min)	35	35	35	35	35	35	35	35	35	35	35
			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	21 22		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	31 32 33		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 62 63		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	0.015	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 72 73		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	.0122	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	41 42 43		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

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

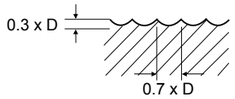
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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,
513303, 514303 (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	11	< 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
	12		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
	13	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
	14		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		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
	32		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
	33														
N	71		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
	72		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
	73														



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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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

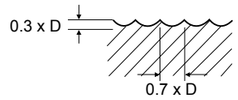
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

STANDARD K30 CARBIDE

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	11	< 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
	12		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
	13	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
	14		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		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
	32		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
	33														
N	71		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
	72		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
	73														



▶ 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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, 519303, 520303 (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	11 12	< 30	v_c (m/min)	83	86	94	105	118	132	144	158	172	171
			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
	13 14	30-40	v_c (m/min)	62	69	75	86	95	105	116	124	135	135
			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 32 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 72 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 : ø3.0mm - ø6.0mm = 0.2 x D
a_p : ø8.0mm - ø25.0mm = 0.3 x 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

STANDARD K30 CARBIDE

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	11 12	< 30	v_c (m/min)	108	112	123	137	153	171	188	206	223	223
			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
	13 14	30-40	v_c (m/min)	81	90	97	111	123	137	151	161	176	176
			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 32 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 72 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 : ø3.0mm - ø6.0mm = 0.2 x D
a_p : ø8.0mm - ø25.0mm = 0.3 x 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: $n = \frac{v_c * 1000}{\pi * ø}$

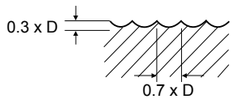
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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, 515303, 517303 (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	11	**< 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
	12		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
			f (mm/min)	140	150	150	160	150	140	140	130	130	130	130	130
	13	**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
	14		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
K	31		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
	32		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
	33														
N	71		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
	72		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
	73														



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

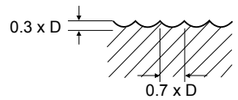
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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	11	**< 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
	12		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
			f (mm/min)	195	210	210	225	210	195	195	180	180	180	180	180
	13	**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
	14		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
K	31		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
	32		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
	33														
N	71		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
	72		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
	73														



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

STANDARD K30 CARBIDE

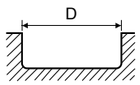
K30 CARBIDE CUTTING CONDITION

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	11	< 30	v_c (m/min)	50	55	65	70	70	70	70	70
			n	7850	6100	5150	4300	3800	2850	2200	1850
	12		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
	13	30-45	v_c (m/min)	30	35	40	40	45	45	40	45
			n	5150	3800	3150	2550	2300	1700	1350	1150
	14		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	35
			n	4300	3150	2650	2150	1950	1450	1150	950
	22		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
			n	9350	6050	4600	3650	2950	2200	1850	1450
	32		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
	33		v_c (m/min)	105	105	110	105	105	110	105	105
			n	16500	1000	8800	6800	5700	4400	3400	2850
N	61		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
	62		v_c (m/min)	140	145	140	145	145	145	145	140
			n	22000	15400	11000	9150	7600	5700	4600	3750
	63		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

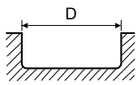
STEEL, STAINLESS STEEL

< ø 3.0mm: 0.2 x D
> ø 3.0mm: 0.5 x D



CAST IRON, COPPER, ALUMINIUM

1.0 x D



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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	11	< 30	v_c (m/min)	60	70	80	85	90	90	85	90
			n	9850	7600	6450	5350	4750	3550	2750	2350
	12		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
	13	30-45	v_c (m/min)	40	45	50	50	55	55	55	55
			n	6450	4750	3950	3200	2850	2150	1700	1450
	14		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
			n	5350	3950	3300	2700	2400	1800	1450	1150
	22		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
			n	9350	6050	4600	3650	2950	2200	1850	1450
	32		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
	33		v_c (m/min)	105	105	110	105	105	110	105	105
			n	16500	11000	8800	6800	5700	4400	3400	2850
N	61		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
	62		v_c (m/min)	140	145	140	145	145	145	145	140
			n	22000	15400	11000	9150	7600	5700	4600	3750
	63		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

1.0 x D

CAST IRON, COPPER, ALUMINIUM

1.5 x D

▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

STANDARD K30 CARBIDE

K30 CARBIDE CUTTING CONDITION

197303 (2 Flute Drill 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	11	**< 30**	v_c (m/min)	35	40	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
	13	**30-40**	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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

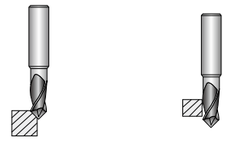
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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

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	11	**< 30**	v_c (m/min)	35	40	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
	13	**30-40**	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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

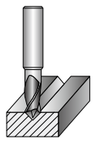
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

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

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	11 12	< 30	v_c (m/min)	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
			f (mm/min)	30	30	30	30	35	35	40	40	40
	13 14	30-40	v_c (m/min)	30	35	35	35	35	40	40	40	40
			n	3300	2800	2200	1800	1300	1200	1000	770	600
			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
M	21 22		v_c (m/min)	25	25	30	25	30	30	20	35	30
			n	2400	2000	1760	1400	1100	1000	840	660	440
			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
N	71 72 73		v_c (m/min)	130	150	150	145	145	155	165	165	165
			n	14000	11800	9500	7700	5800	5000	4400	3300	2600
			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
S	41 42 43		v_c (m/min)	25	25	30	25	30	30	20	35	30
			n	2400	2000	1760	1400	1100	1000	840	660	440
			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 - 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

SUPERIOR PERFORMANCE

Clarkson

COARSE PITCH
ROUGHING/FINISHING

Truncated knuckle form for use in roughing and finishing operations.

Premium grade HSSCo8 substrate for increased tool life. TiAlN coating available to order.

3 to 6 flute depending on diameter.

Centre cutting up to 20.0mm, can be used for plunging.

IDEAL FOR MATERIAL GROUPS

P N

HSSCo FLATTED SHANK
END MILLS

Clarkson

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

www.europatool.co.uk

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1-FLUTE END MILLS

P				H		M			K				S						N								O			Code	Item	Description	Page No.
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.
																							●	●	●					135316		Short Length Router ø3.0mm - 10.0mm	P.348
																							●	●	●					136316		Long Length Router ø5.0mm - 8.0mm	P.349

2-FLUTE END MILLS

P				H		M			K				S						N								O			Code	Item	Description	Page No.
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.
●	●	●	●																				o	o	o					100102		Short Length DIN327 ø1.0mm - 32.0mm	P.332-333
●	●	●	●																				o	o	o					101102		Long Length DIN844 ø2.0mm - 25.0mm	P.334
●	●	●	●																				o	o	o					102102		Extra Long Length DIN844 ø3.0mm - 25.0mm	P.335
●	●	●	●																				o	o	o					112102		Short Length DIN327 Ball Nose ø3.0mm - 25.0mm	P.341
●	●	●	●																				o	o	o					114102		Long Length DIN844 Ball Nose ø3.0mm - 25.0mm	P.342
																							●	●	●					131102		Short Length DIN844 42º Helix ø2.0mm - 25.0mm	P.350

3-FLUTE END MILLS

P				H		M			K				S						N								O			Code	Item	Description	Page No.
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.
●	●	●	●																				o	o	o					103102		Stub Length DIN327 ø2.0mm - 25.0mm	P.336
●	●	●	●																				o	o	o					104102		Short Length DIN844 ø1.5mm - 30.0mm	P.337
●	●	●	●																				o	o	o					105102		Long Length DIN844 ø3.0mm - 25.0mm	P.338
●	●	●	●																				o	o	o					128102		Short Length DIN Throwaway ø1.0mm - 20.0mm	P.346
●	●	●	●																				o	o	o					129102		Long Length DIN Throwaway ø1.5mm - 10.0mm	P.347
●	●	●	●																				o	o	o					328102 (24M)		Short Length BS Throwaway ø1.0mm - 10.0mm	P.365
●	●	●	●																				o	o	o					329102 (24L)		Long Length BS Throwaway ø1.5mm - 10.0mm	P.366
●	●	●	●																				o	o	o					334102 (24N)		Long Length BS Throwaway B/N ø2.0mm - 6.0mm	P.367

MULTI-FLUTE END MILLS

P				H		M			K				S						N								O			Code	Item	Description	Page No.
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.
●	●	●	●																				o	o	o					107102		Short Length DIN844 ø2.0mm - 32.0mm	P.339
●	●	●	●																				o	o	o					108102		Long Length DIN844 ø3.0mm - 25.0mm	P.340
●	●	●	●																				o	o	o					115102		Short Length DIN1889 Ball Nose ø6.0mm - 25.0mm	P.343
●	●	●	●																				o	o	o					116102		Long Length DIN1889 Ball Nose ø10.0mm - 25.0mm	P.344
●	●	●	●																				o	o	o					132102		Short Length DIN844 50º Helix ø2.0mm - 30.0mm	P.345

CONTINUED OVERLEAF

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

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ROUGHING END MILLS

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.
●	●	●	●																				o	o	o					**133102**		Short Length Coarse 3 Flute DIN844 ø10.0mm - 40.0mm	**P.353**
●	●	●	●																				o	o	o					**134102**		Long Length Coarse 3 Flute DIN844 ø10.0mm - 40.0mm	**P.354**
●	●	●	●																				●	●	●					**124102**		Short Length Coarse Alu 3 Flute DIN844 37º ø6.0mm - 30.0mm	**P.355**
●	●	●	●																				●	●	●					**125102**		Long Length Coarse Alu 3 Flute DIN844 37º ø10.0mm - 30.0mm	**P.356**
●	●	●	●																				o	o	o					**118102**		Short Length Coarse Multi Flute DIN844 ø6.0mm - 50.0mm	**P.351**
●	●	●	●																				o	o	o					**119102**		Long Length Coarse Multi Flute DIN844 ø6.0mm - 40.0mm	**P.352**
●	●	●	●																				o	o	o					**127102**		Short Length Coarse Multi Flute DIN844 B/N ø8.0mm - 40.0mm	**P.357**
●	●	●	●																				o	o	o					**121102**		Short Length Fine Multi Flute DIN844 ø6.0mm - 32.0mm	**P.358**
●	●	●	●																				o	o	o					**122102**		Long Length Fine Multi Flute DIN844 ø6.0mm - 40.0mm	**P.359**
●	●	●	●																				o	o	o					**121113**		Short Length Fine Multi Flute DIN844 PM ø6.0mm - 30.0mm	**P.360**

ROUGHING & FINISHING END MILLS

●	●	●	●																				o	o	o					**138102**		Short Length Coarse 3 Flute DIN844 ø6.0mm - 40.0mm	**P.363**
●	●	●	●																				o	o	o					**139102**		Long Length Coarse 3 Flute DIN844 ø6.0mm - 40.0mm	**P.364**
●	●	●	●																				o	o	o					**126102**		Short Length Coarse Multi Flute DIN844 ø6.0mm - 40.0mm	**P.361**
●	●	●	●																				o	o	o					**137102**		Long Length Coarse Multi Flute DIN844 ø6.0mm - 32.0mm	**P.362**
																																Cutting Data	**P.369**

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

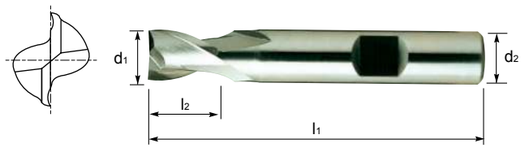
2 FLUTE, SHORT LENGTH

Clarkson

HSS Co8 | DIN 327 | N | ≈30° | FLUTE 2 | DIN 1835B

Series No. 100102

▶ cutting conditions : p.374-375



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	TiAlN 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	49.0	**1001020250**	**1001210250**
2.8		5.0		**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		**1001020450**	**1001210450**
4.8		8.0	52.0	**1001020480**	**1001210480**
5.0		8.0		**1001020500**	**1001210500**
5.5		8.0		**1001020550**	**1001210550**
5.75		8.0		**1001020575**	**1001210575**
6.0		8.0		**1001020600**	**1001210600**
6.5	10.0	10.0	60.0	**1001020650**	**1001210650**
6.75		10.0		**1001020675**	**1001210675**
7.0		10.0		**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		**1001020850**	**1001210850**
8.7		11.0		**1001020870**	**1001210870**
9.0		11.0		**1001020900**	**1001210900**
9.5		11.0		**1001020950**	**1001210950**
10.0		13.0	63.0	**1001021000**	**1001211000**
11.0	12.0	13.0	70.0	**1001021100**	**1001211100**

▶ 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

HSSCo FLATTED SHANK

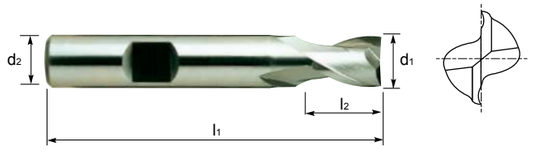
2 FLUTE, SHORT LENGTH

Clarkson

HSS Co8 | DIN 327 | N | ≈30° | FLUTE 2 | DIN 1835B

Series No. 100102

▶ cutting conditions : p.374-375



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	TiAlN 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	**1001023200**	**1001213200**

▶ 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

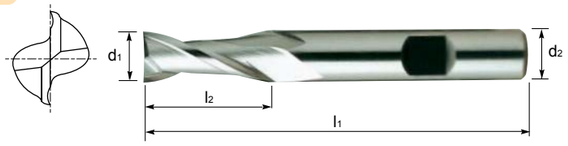
2 FLUTE, LONG LENGTH

Clarkson

HSS Co8 | DIN 844 | N | ≈30° | FLUTE 2 | DIN 1835B

Series No. 101102

▶ cutting conditions : p.374-375



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	TiAlN 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	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	25.0	45.0	121.0	**1011022500**	**1011212500**

▶ 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

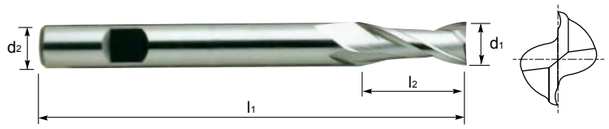
2 FLUTE, EXTRA LONG LENGTH

Clarkson

HSS Co8 | DIN 844 | N | 30° | FLUTE 2 | DIN 1835B

Series No. 102102

▶ cutting conditions : p.374-375



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	TiAlN HSS Co8
3.0	6.0	8.0	56.0	**1021020300**	**1021210300**
3.5		10.0	59.0	**1021020350**	**1021210350**
4.0		11.0	63.0	**1021020400**	**1021210400**
4.5		11.0		**1021020450**	**1021210450**
5.0		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		**1021020900**	**1021210900**
10.0		22.0	95.0	**1021021000**	**1021211000**
12.0	12.0	26.0	110.0	**1021021200**	**1021211200**
14.0		26.0		**1021021400**	**1021211400**
16.0	16.0	32.0	123.0	**1021021600**	**1021211600**
18.0		32.0		**1021021800**	**1021211800**
20.0	20.0	38.0	141.0	**1021022000**	**1021212000**
22.0		38.0		**1021022200**	**1021212200**
25.0	25.0	45.0	166.0	**1021022500**	**1021212500**

▶ TiAlN Coating to Order

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

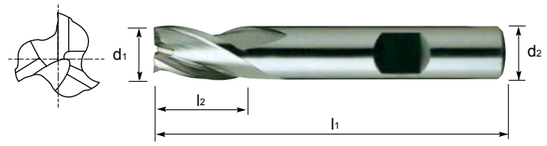
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	— 14 — 28	— 20 — 38	— 25 — 47	—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

3 FLUTE, STUB LENGTH

HSS Co8 | DIN 327 | N | ≈30° | FLUTE 3 | DIN 1835B

Series No. 103102

▶ cutting conditions : p.376-379



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

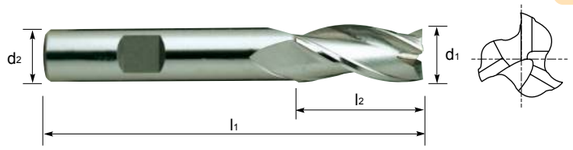
Toleranzwerte in µm / Tolerance range in µm						
Nennmaßbereich in mm / Nominal-Diameter in mm						
	von 1 bis 3 from 1 to 3	über 3 bis 6 over 3 to 6	über 6 bis 10 over 6 to 10	über 10 bis 18 over 10 to 18	über 18 bis 30 over 18 to 30	über 30 bis 50 over 30 to 50
e8	— 14 — 28	— 20 — 38	— 25 — 47	—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

3 FLUTE, SHORT LENGTH

HSS Co8 | DIN 844 | N | ≈30° | FLUTE 3 | DIN 1835B

Series No. 104102

▶ cutting conditions : p.376-379



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		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		**1041020750**	**1041210750**
8.0		19.0	69.0	**1041020800**	**1041210800**
8.5		19.0		**1041020850**	**1041210850**
9.0		19.0		**1041020900**	**1041210900**
10.0		22.0	72.0	**1041021000**	**1041211000**
12.0	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**

▶ 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

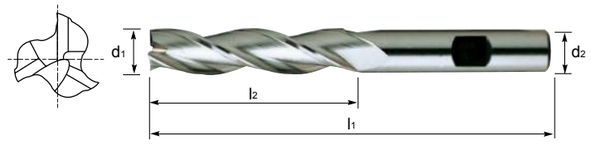
3 FLUTE, LONG LENGTH

Clarkson

HSS Co8 | DIN 844 | N | 30° | FLUTE 3 | DIN 1835B

Series No. 105102

▶ cutting conditions : p.376-379



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	TiAlN 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	25.0	90.0	166.0	**1051022500**	**1051212500**

▶ TiAlN Coating to Order

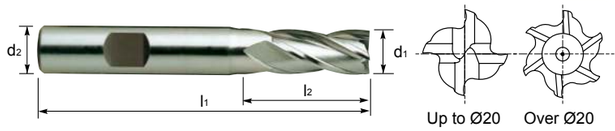
Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

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

4&6 FLUTE, SHORT LENGTH

Clarkson

HSS Co8 | DIN 844 | N | ≈30° | FLUTE 4&6 | DIN 1835B | ~Ø20 | Ø22~



Series No. 107102

▶ cutting conditions : p.380-381

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	TiAlN 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	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		4	**1071021200**	**1071211200**
13.0		26.0	83.0	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	32.0	53.0	133.0	6	**1071023200**	**1071213200**

▶ TiAlN Coating to Order

TOLERANCE	
MILL DIA.	+0.040 -0
SHANK DIA.	h6

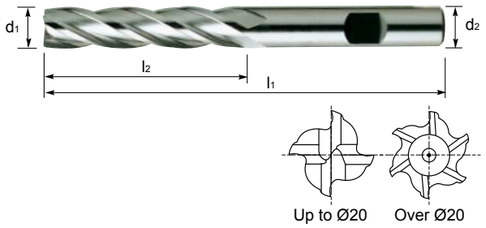
4&6 FLUTE, LONG LENGTH

Clarkson

HSS Co8 | DIN 844 | N | ≈30° | FLUTE 4&6 | DIN 1835B | ~Ø20 | Ø22~

Series No. 108102

▶ cutting conditions : p.380-381



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	TiAlN 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	

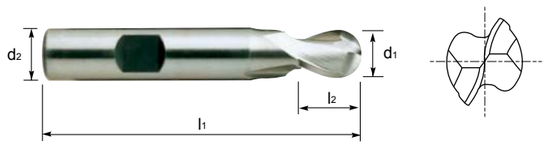
2 FLUTE, SHORT LENGTH, BALL NOSE

Clarkson

HSS Co8 | DIN 327 | N | ≈30° | FLUTE 2 | DIN 1835B

Series No. 112102

▶ cutting conditions : p.370



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	TiAlN 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		8.0		**1121020600**	**1121210600**
7.0	10.0	10.0	60.0	**1121020700**	**1121210700**
8.0		11.0	61.0	**1121020800**	**1121210800**
9.0		11.0		**1121020900**	**1121210900**
10.0		13.0	63.0	**1121021000**	**1121211000**
12.0	12.0	16.0	73.0	**1121021200**	**1121211200**
13.0		16.0		**1121021300**	**1121211300**
14.0		16.0		**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**

▶ TiAlN Coating to Order

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

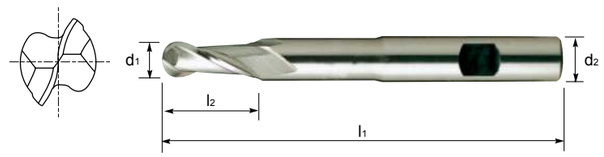
2 FLUTE, LONG LENGTH, BALL NOSE

Clarkson

HSS Co8 | DIN 1889 | N | ≈30° | FLUTE 2 | DIN 1835B

Series No. 114102

▶ cutting conditions : p.370



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	TiAlN 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	**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	25.0	45.0	166.0	**1141022500**	**1141212500**

▶ TiAlN Coating to Order

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

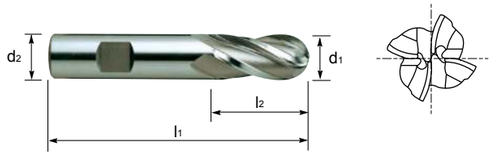
4&6 FLUTE, SHORT LENGTH, BALL NOSE

Clarkson

HSS Co8 | DIN 1889 | N | 30° | FLUTE 4&6 | DIN 1835B

Series No. 115102

▶ cutting conditions : p.371



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	TiAlN 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**

▶ TiAlN Coating to Order

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

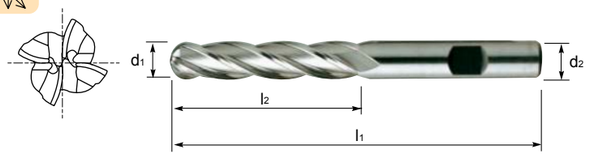
4&6 FLUTE, LONG LENGTH, BALL NOSE

Clarkson

HSS Co8 | DIN 1889 | N | 30° | FLUTE 4&6 | DIN 1835B

Series No. 116102

▶ cutting conditions : p.371



R : ±0.02mm

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

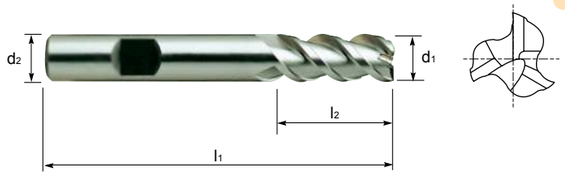
MULTI FLUTE, SHORT LENGTH, 50º HELIX

Clarkson

HSS Co8 | DIN 844 | N | 50° | FLUTE 2-4 | DIN 1835B

Series No. 132102

▶ cutting conditions : p.372



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		16.0	66.0	3	**1321020700**	**1321210700**
8.0	10.0	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	20.0	38.0	104.0	3	**1321022000**	**1321212000**
25.0	25.0	45.0	121.0	4	**1321022500**	**1321212500**
30.0		45.0		4	**1321023000**	**1321213000**

▶ 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	

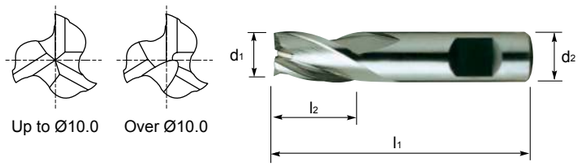
3 FLUTE, SHORT LENGTH, THROW AWAY, DIN STD

Clarkson

HSS Co8 | N | 30° | FLUTE 3 | DIN 1835B

Series No. 128102

▶ cutting conditions : p.376-379



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	TiAlN 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		1281020300	1281210300
3.3		6.0	37.0	1281020330	1281210330
3.5		6.0		1281020350	1281210350
3.8		7.0	38.0	1281020380	1281210380
4.0		7.0		1281020400	1281210400
4.3		7.0		1281020430	1281210430
4.5		7.0		1281020450	1281210450
4.8		8.0	39.0	1281020480	1281210480
5.0		8.0		1281020500	1281210500
5.5		8.0		1281020550	1281210550
5.75		8.0		1281020575	1281210575
6.0		8.0		1281020600	1281210600
6.5	8.0	10.0	42.0	1281020650	1281210650
7.0		10.0		1281020700	1281210700
7.5		10.0		1281020750	1281210750
8.0		11.0	43.0	1281020800	1281210800
8.5		11.0	48.0	1281020850	1281210850
9.0	10.0	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

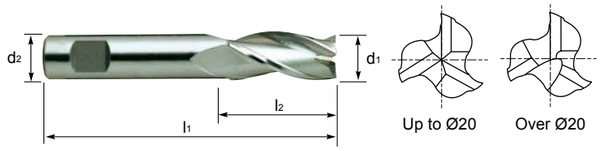
3 FLUTE, LONG LENGTH, THROW AWAY, DIN STD

Clarkson

HSS Co8 | N | 30° | FLUTE 3 | DIN 1835B

Series No. 129102

▶ cutting conditions : p.376-379



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	TiAlN 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		1291020600	1291210600
6.5	8.0	16.0	48.0	1291020650	1291210650
7.0		16.0		1291020700	1291210700
7.5		16.0		1291020750	1291210750
8.0		19.0	51.0	1291020800	1291210800
8.5	10.0	19.0	56.0	1291020850	1291210850
9.0		19.0		1291020900	1291210900
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

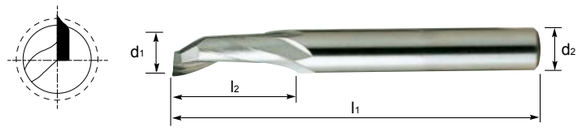
ALUMINIUM ROUTER

Clarkson

HSS Co5 | W | FLUTE 1 | DIN 1835A

Series No. 135316

▶ cutting conditions : p.372



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	TiAlN 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	80.0	**1353160800**	**1353270800**
10.0		14.0		**1353161000**	**1353271000**

▶ 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
js14	± 125	± 150	± 180	± 215	± 260	± 310
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13	0 — 16

HSSCo FLATTED SHANK

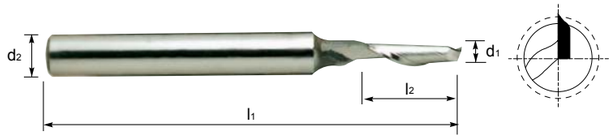
ALUMINIUM ROUTER

Clarkson

HSS Co5 | W | FLUTE 1 | DIN 1835A

Series No. 136316

▶ cutting conditions : p.372



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	TiAlN 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**

▶ 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
js14	± 125	± 150	± 180	± 215	± 260	± 310
h6	0 — 6	0 — 8	0 — 9	0 — 11	0 — 13	0 — 16

HSSCo FLATTED SHANK

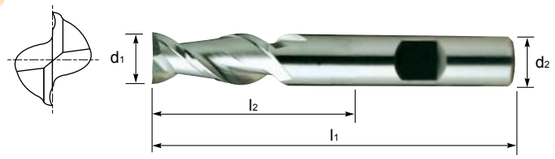
2 FLUTE, SHORT LENGTH, 42º HELIX for ALUMINIUM

Clarkson

HSS Co8 | DIN 844 | W | 42° | FLUTE 2 | DIN 1835B

Series No. 131102

▶ cutting conditions : p.373



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	TiAlN 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**	**1311212000**
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**	**1311212400**
25.0		45.0		**1311022500**	**1311212500**

▶ 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

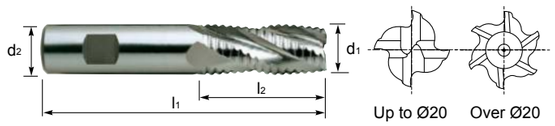
MULTI FLUTE, SHORT LENGTH, COARSE PITCH ROUGHING

Clarkson

HSS Co8 | DIN 844 | NR | 30° | FLUTE 3-6 | COARSE | DIN 1835B | ~Ø20 | Ø22~

Series No. 118102

▶ cutting conditions : p.382-383



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	TiAlN 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		38.0	98.0	4	**1181029001**	**1181219001**
20.0	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**	**1181212400**
25.0		45.0		5	**1181022500**	**1181212500**
26.0		45.0		6	**1181022600**	**1181212600**
28.0		45.0		6	**1181022800**	**1181212800**
30.0		45.0		6	**1181023000**	**1181213000**
32.0	32.0	53.0	133.0	6	**1181023200**	**1181213200**
35.0		53.0		6	**1181023500**	**1181213500**
36.0		53.0		6	**1181023600**	**1181213600**
38.0		63.0	155.0	6	**1181023800**	**1181213800**
38.0	40.0	63.0		6	**1181029003**	**1181219003**
40.0	32.0	63.0		6	**1181024000**	**1181214000**
40.0	40.0	63.0		6	**1181029004**	**1181219004**
50.0	50.0	75.0	177.0	6	**1181025000**	**1181215000**

▶ 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

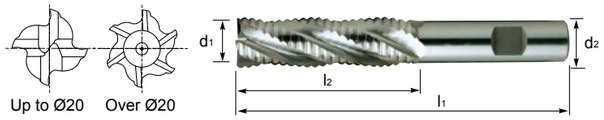
MULTI FLUTE, LONG LENGTH, COARSE PITCH ROUGHING

Clarkson

HSS Co8 | DIN 844 | NR | 30° | FLUTE 3-6 | COARSE | DIN 1835B | ~Ø20 | Ø22~

Series No. 119102

▶ cutting conditions : p.382-383



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		45.0	95.0	4	**1191021000**	**1191211000**
11.0	12.0	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		53.0		4	**1191021500**	**1191211500**
16.0	16.0	63.0	123.0	4	**1191021600**	**1191211600**
17.0		63.0		4	**1191021700**	**1191211700**
18.0		63.0		4	**1191021800**	**1191211800**
19.0		63.0		4	**1191021900**	**1191211900**
20.0		75.0	135.0	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**	**1191213200**
35.0		106.0		6	**1191023500**	**1191213500**
36.0		106.0		6	**1191023600**	**1191213600**
38.0		125.0	217.0	6	**1191023800**	**1191213800**
38.0	40.0	125.0		6	**1191029003**	**1191219003**
40.0	32.0	125.0		6	**1191024000**	**1191214000**
40.0	40.0	125.0		6	**1191029004**	**1191219004**

▶ 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

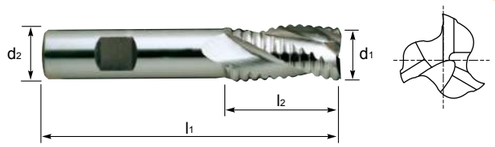
3 FLUTE, SHORT LENGTH, COARSE PITCH ROUGHING

Clarkson

HSS Co8 | DIN 844 | NR | 30° | FLUTE 3 | COARSE | DIN 1835B

Series No. 133102

▶ cutting conditions : p.382-383



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**	**1331214000**

▶ 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

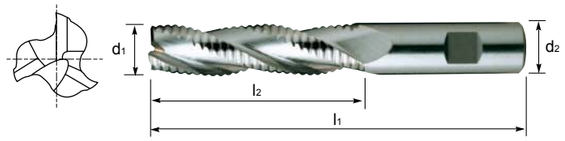
3 FLUTE, LONG LENGTH, COARSE PITCH ROUGHING

Clarkson

HSS Co8 | DIN 844 | NR | 30° | FLUTE 3 | COARSE | DIN 1835B

Series No. 134102

▶ cutting conditions : p.382-383



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	TiAlN HSS Co8
10.0	10.0	45.0	95.0	**1341021000**	**1341021000**
12.0	12.0	53.0	110.0	**1341021200**	**1341021200**
14.0		53.0		**1341021400**	**1341021400**
16.0	16.0	63.0	123.0	**1341021600**	**1341021600**
18.0		63.0		**1341021800**	**1341021800**
20.0	20.0	75.0	141.0	**1341022000**	**1341022000**
22.0		75.0		**1341022200**	**1341022200**
25.0	25.0	90.0	166.0	**1341022500**	**1341022500**
28.0		90.0		**1341022800**	**1341022800**
30.0		90.0		**1341023000**	**1341023000**
36.0	32.0	106.0	186.0	**1341023600**	**1341023600**
40.0		125.0	217.0	**1341024000**	**1341024000**

▶ TiAlN Coating to Order

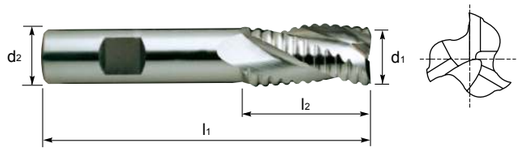
Tolerances according to DIN 7160 & 7161
Toleranzen nach DIN 7160 & 7161

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, 37º HELIX, COARSE PITCH

Clarkson

HSS Co8 | DIN 844 | WR | 37° | FLUTE 3 | ALUMINIUM | DIN 1835B



Series No. 124102

▶ cutting conditions : p.382-383

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	TiAlN 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	72.0	**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**

▶ 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

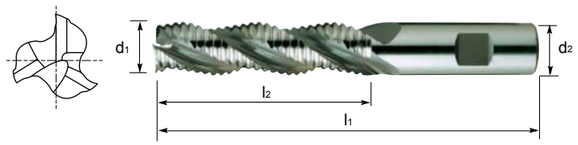
3 FLUTE, LONG LENGTH, 37º HELIX, COARSE PITCH

Clarkson

HSS Co8 | DIN 844 | WR | 37° | FLUTE 3 | ALUMINIUM | DIN 1835B

Series No. 125102

▶ cutting conditions : p.382-383



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	TiAlN 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**

▶ 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

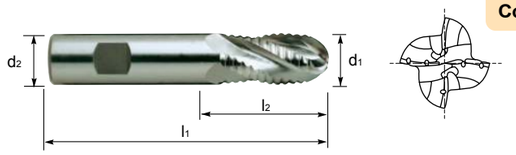
3&4 FLUTE, SHORT LENGTH, BALL NOSE, COARSE PITCH

Clarkson

HSS Co8 | DIN 1889 | NR | 30° | FLUTE 3&4 | COARSE | DIN 1835B

Series No. 127102

▶ cutting conditions : p.385



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	TiAlN 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**

▶ 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

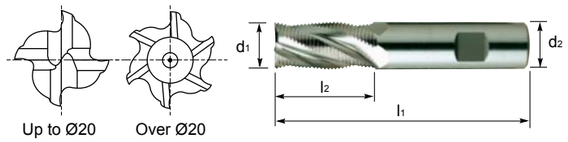
MULTI FLUTE, SHORT LENGTH, FINE PITCH ROUGHING

Clarkson

HSS Co8 | DIN 844 | HR | 30° | FLUTE 3-6 | FINE | DIN 1835B | ~Ø20 | Ø22~

Series No. 121102

▶ cutting conditions : p.382-383



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**

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

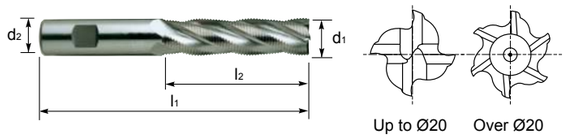
MULTI FLUTE, LONG LENGTH, FINE PITCH ROUGHING

Clarkson

HSS Co8 | DIN 844 | HR | 30° | FLUTE 3-6 | FINE | DIN 1835B | ~Ø20 | Ø22~

Series No. 122102

▶ cutting conditions : p.382-383



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		45.0	95.0	4	**1221021000**	**1221211000**
11.0	12.0	45.0	102.0	4	**1221021100**	**1221211100**
12.0		53.0	110.0	4	**1221021200**	**1221211200**
13.0		53.0		4	**1221021300**	**1221211300**
14.0		53.0		4	**1221021400**	**1221211400**
15.0		53.0		4	**1221021500**	**1221211500**
16.0	16.0	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	20.0	75.0	141.0	4	**1221022000**	**1221212000**
22.0		75.0		5	**1221022200**	**1221212200**
24.0	25.0	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		90.0		6	**1221023000**	**1221213000**
32.0	32.0	106.0	186.0	6	**1221023200**	**1221213200**
35.0		106.0		6	**1221023500**	**1221213500**
36.0		106.0		6	**1221023600**	**1221213600**
38.0		125.0	217.0	6	**1221023800**	**1221213800**
38.0	40.0	125.0		6	**1221029001**	**1221219001**
40.0	32.0	125.0		6	**1221024000**	**1221214000**
40.0	40.0	125.0		6	**1221029002**	**1221219002**

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

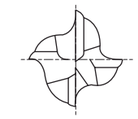
MULTI FLUTE, SHORT LENGTH, FINE PITCH ROUGHING

Clarkson

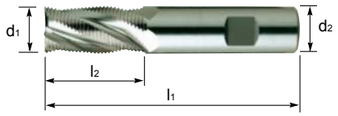
PREMIUM PM | DIN 844 | HR | 30° | FLUTE 4-6 | FINE | DIN 1835B | ~Ø20 | Ø22~

Series No. 121113

▶ cutting conditions : p.384



~Ø20 : Center Cut
Ø20~ : Center Hole



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	10.0	16.0	66.0	4	**1211130700**	**1211220700**
8.0		19.0	69.0	4	**1211130800**	**1211220800**
9.0		19.0		5	**1211130900**	**1211220900**
10.0		22.0	72.0	5	**1211131000**	**1211221000**
11.0	12.0	22.0	79.0	5	**1211131100**	**1211221100**
12.0		26.0	83.0	5	**1211131200**	**1211221200**
13.0		26.0		5	**1211131300**	**1211221300**
14.0		26.0		5	**1211131400**	**1211221400**
15.0		26.0		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**

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

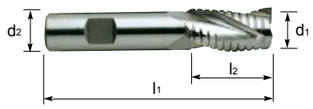
MULTI FLUTE, SHORT LENGTH, ROUGHING & FINISHING

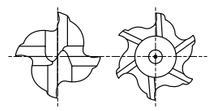
Clarkson

HSS Co8 | DIN 844 | NF | 30° | FLUTE 3-6 | ROUGHING FINISHING | DIN 1835B | ~Ø20 | Ø22~

Series No. 126102

▶ cutting conditions : p.386-387





Up to Ø20 Over Ø20

ROUGHING-FINISHING END MILLS
Short 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	13.0	57.0	3	**1261020600**	**1261210600**
7.0	10.0	16.0	66.0	3	**1261020700**	**1261210700**
8.0		19.0	69.0	4	**1261020800**	**1261210800**
9.0		19.0		4	**1261020900**	**1261210900**
10.0		22.0	72.0	4	**1261021000**	**1261211000**
11.0	12.0	22.0	79.0	4	**1261021100**	**1261211100**
12.0		26.0	83.0	4	**1261021200**	**1261211200**
13.0		26.0		4	**1261021300**	**1261211300**
14.0		26.0		4	**1261021400**	**1261211400**
16.0	16.0	32.0	92.0	4	**1261021600**	**1261211600**
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**	**1261213200**
36.0		53.0		6	**1261023600**	**1261213600**
40.0		63.0	155.0	6	**1261024000**	**1261214000**

▶ 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

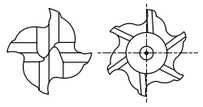
MULTI FLUTE, LONG LENGTH, ROUGHING & FINISHING

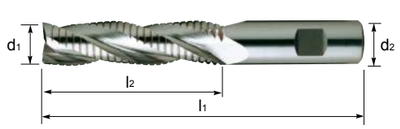
Clarkson

HSS Co8 | DIN 844 | NF | 30° | FLUTE 3-5 | ROUGHING FINISHING | DIN 1835B | ~Ø20 | Ø22~

Series No. 137102

▶ cutting conditions : p.386-387





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**

▶ 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

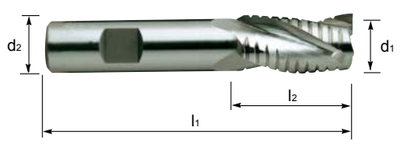
3 FLUTE, SHORT LENGTH, ROUGHING & FINISHING

Clarkson

HSS Co8 | DIN 844 | NF | 30° | FLUTE 3 | ROUGHING FINISHING | DIN 1835B

Series No. 138102

▶ cutting conditions : p.386-387



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		45.0		**1381023000**	**1381213000**
32.0	32.0	53.0	133.0	**1381023200**	**1381213200**
36.0		53.0		**1381023600**	**1381213600**
40.0		63.0	155.0	**1381024000**	**1381214000**

▶ 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

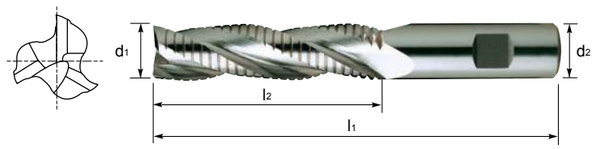
3 FLUTE, LONG LENGTH, ROUGHING & FINISHING

Clarkson

HSS Co8 | DIN 844 | NF | 30° | FLUTE 3 | ROUGHING FINISHING | DIN 1835B

Series No. 139102

▶ cutting conditions : p.386-387



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	TiAlN 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**

▶ 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 SERIES, THROW AWAY, BS STD

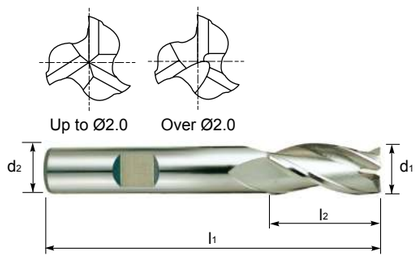
Clarkson

HSS Co8 | BS 122/4 | 30° | FLUTE 3

Series No. 328102

Clarkson No. 24M

▶ cutting conditions : p.376-379



Mil Dia. d_1	Shank Dia. d_2	Length of Cut l_2	Overall Length l_1	Europa Code HSS Co8	Clarkson Code 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

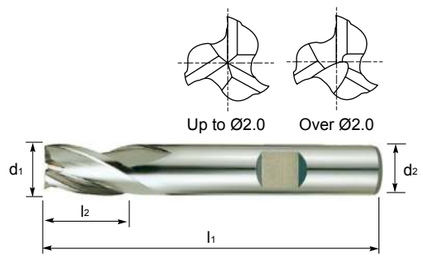
Clarkson

HSS Co8 | BS 122/4 | 30° | FLUTE 3

Series No. 329102

Clarkson No. 24L

▶ cutting conditions : p.376-379



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

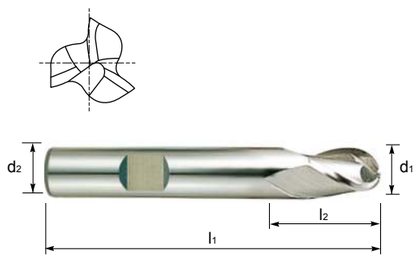
Clarkson

HSS Co8 | BS 122/4 | 30° | FLUTE 3

Series No. 334102

Clarkson No. 24N

▶ cutting conditions : p.376-379



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

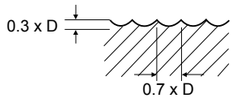
CUTTING DATA

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	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
	11 12	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
	13 14	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		v_c (m/min)	105	100	105	100	100	95	100	100	100
	72		n	11000	8000	5600	4000	3200	2500	2000	1600	1300
	73		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

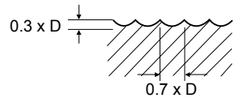
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	20	20	20	15	20	20	15
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15
			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		v_c (m/min)	105	100	100	95	100	100	100
	72		n	5600	4000	3200	2500	2000	1600	1300
	73		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

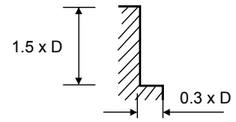
HSSCo FLATTED SHANK

FLATTED SHANK CUTTING CONDITION

Clarkson

132102 (Multiflute, 50º Helix)

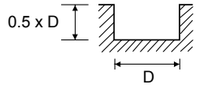
MATERIAL GROUP		HRc		Size (mm)											
				2.0	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**	**25.0**	**30.0**
P	11 12	< 20	v_c (m/min)	30	35	30	30	35	30	30	35	30	30	35	35
			n	5000	3500	2500	2000	1800	1200	1000	900	600	500	450	350
			f_z	0.004	0.007	0.012	0.019	0.016	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
	11 12	20-30	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
			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
	13 14	30-40	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
			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: $n = \frac{v_c * 1000}{\pi * ø}$

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

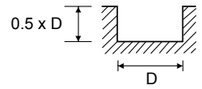
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

Clarkson

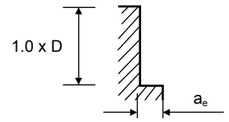
131102 (3 Flute Aluminium Roughing

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 : ø3.0mm - ø10.0mm = 0.25 x D
a_e : ø12.0mm - ø20.0mm = 0.5x 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

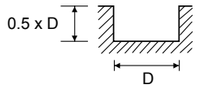
HSSCo FLATTED SHANK

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30	30
			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 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25	25
			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 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	15
			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 72 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

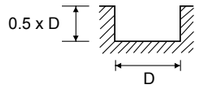
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			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 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			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 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			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 72 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

HSSCo FLATTED SHANK

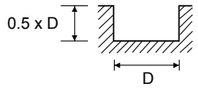
FLATTED SHANK CUTTING CONDITION

Clarkson

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

SLOTTING

MATERIAL GROUP		HRc		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			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 72 73		v_c (m/min)	75	105	100	100	105	100	95	95
			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
			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%
- 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

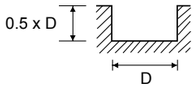
FLATTED SHANK CUTTING CONDITION

Clarkson

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

SLOTTING

MATERIAL GROUP		HRc		Size (mm)							
				14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			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 72 73		v_c (m/min)	95	100	100	100	95	95	95	105
			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
			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%
- 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

HSSCo FLATTED SHANK

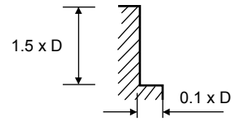
FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			n	4500	3200	2200	1800	1600	1100	900	800
			f_z	0.003	0.006	0.011	0.018	0.023	0.036	0.044	0.056
			f (mm/min)	40	60	75	95	110	120	120	135
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			n	4000	2500	1800	1600	1200	900	800	630
			f_z	0.003	0.006	0.00-	0.014	0.018	0.03	0.038	0.048
			f (mm/min)	35	45	50	65	65	80	90	90
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			n	2200	1600	1100	900	800	560	450	400
			f_z	0.002	0.004	0.009	0.013	0.019	0.03	0.037	0.046
			f (mm/min)	15	20	30	35	45	50	50	55
N	71 72 73		v_c (m/min)	75	105	100	100	105	100	95	95
			n	12000	11000	8000	6300	5600	4000	3100	2500
			f_z	0.005	0.008	0.014	0.019	0.021	0.037	0.048	0.057
			f (mm/min)	180	280	330	350	350	440	450	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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

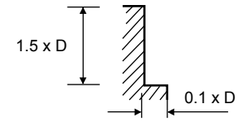
FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			n	700	560	500	450	450	400	350	310
			f_z	0.057	0.071	0.08	0.089	0.089	0.092	0.09	0.086
			f (mm/min)	120	120	120	120	120	110	95	80
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			n	560	450	400	400	350	310	280	250
			f_z	0.054	0.059	0.067	0.067	0.076	0.07	0.071	0.073
			f (mm/min)	90	80	80	80	80	65	60	55
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			n	350	280	250	220	220	180	160	160
			f_z	0.052	0.06	0.067	0.076	0.076	0.065	0.063	0.063
			f (mm/min)	55	50	50	50	50	35	30	30
N	71 72 73		v_c (m/min)	95	100	100	100	95	95	95	105
			n	2200	2000	1800	1600	1400	1200	1100	1100
			f_z	0.061	0.067	0.074	0.075	0.081	0.089	0.091	0.091
			f (mm/min)	400	400	400	360	340	320	300	300



- The feed rate for long and long reach tools should be reduced by up to 50%
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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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

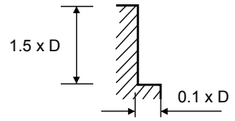
HSSCo FLATTED SHANK

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25	25
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	15
			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 72 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%
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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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

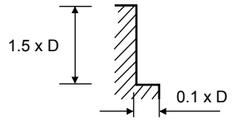
HSSCo FLATTED SHANK

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	20
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			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 72 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%
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a_e - radial depth of cut

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

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

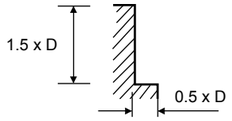
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 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
	11 12	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
	13 14	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		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%
- 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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

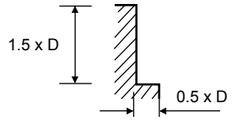
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 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
	11 12	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
	13 14	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		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



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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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

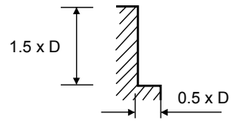
HSSCo FLATTED SHANK

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	**< 20**	v_c (m/min)	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
	11 12	**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
	13 14	**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		v_c (m/min)	85	80	80	75	80	80	80	75	75	80	80	85
	72		n	4500	3100	2500	2000	1800	1600	1400	1200	1100	1000	900	900
	73		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



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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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

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.

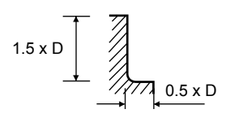
HSSCo FLATTED SHANK

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	**< 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
	11 12	**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
	13 14	**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		v_c (m/min)	80	80	75	80	75	80	80	80
	72		n	3100	2500	2000	1600	1200	1000	800	630
	73		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



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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: $n = \frac{v_c * 1000}{\pi * \varnothing}$

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

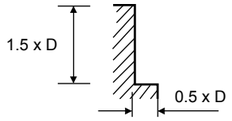
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 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
	11 12	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
	13 14	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



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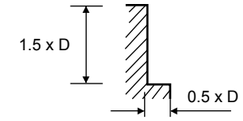
FLATTED SHANK CUTTING CONDITION

Clarkson

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	11 12	< 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	
	11 12	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	
	13 14	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	



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HSSCo FLATTED SHANK

SUPERIOR PERFORMANCE

Clarkson

END MILLS
SCREWED SHANK

IDEAL FOR MATERIAL GROUPS

P N

HSSCo & HSS
SCREWED SHANK

Clarkson

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

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APPLICATION GUIDE

●: Excellent **O**: 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
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2-FLUTE END MILLS

Europa Code	Clarkson Code	Item	Description	Page No.
301201 301202	10M/13M 10PM/13PM		Standard Length HSSCo & HSS ø1.5mm - 50.0mm	P.392-393
302201 302202	11M/16M 11PM		Long Series HSSCo & HSS ø2.0mm - 50.0mm	P.394-395
313201 313202	14M		Standard Length HSSCo & HSS B/N ø2.0mm - 30.0mm	P.402
314201 314202	27M		Long Series HSSCo & HSS B/N ø3.0mm - 25.0mm	P.403

3-FLUTE END MILLS

Europa Code	Clarkson Code	Item	Description	Page No.
304202	-		Standard Length HSSCo ø3.0mm - 50.0mm	P.396
305202	-		Long Series HSSCo ø3.0mm - 50.0mm	P.397
124202	776A		Standard Length Alu Roughing Coarse ø6.0mm - 30.0mm	P.407

MULTI-FLUTE END MILLS

Europa Code	Clarkson Code	Item	Description	Page No.
307201 307202	01M/03M 01PM/03PM		Standard Length HSSCo & HSS ø2.0mm - 50.0mm	P.398-399
308201 308202	02M/04M 02PM/04PM		Long Series HSSCo & HSS ø3.0mm - 50.0mm	P.400-401
118202	776M/777M		Standard Length Roughing Coarse ø6.0mm - 50.0mm	P.404
119202	776L/777L		Long Series Roughing Coarse ø6.0mm - 40.0mm	P.405
121202	776M		Standard Length Roughing Fine ø6.0mm - 32.0mm	P.406
			Imperial End Mills	P.408
			Cutting Data	P.409

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

INDEX

2 FLUTE, STANDARD SERIES

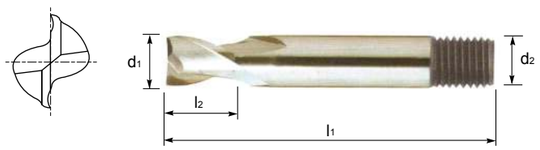
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 2

Series No. 301202, 301201

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

▶ cutting conditions : p.410-411



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

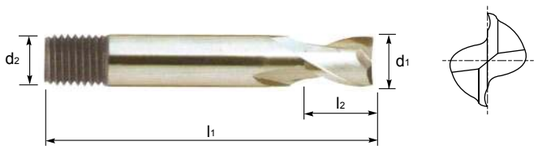
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 2

Series No. 301202, 301201

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

▶ cutting conditions : p.410-411



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

HSSCo & HSS SCREWED SHANK

2 FLUTE, LONG SERIES

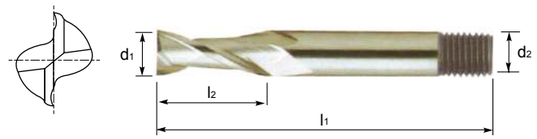
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 2

Series No. 302202, 302201

Clarkson No. 11PM, 11M/16M

▶ cutting conditions : p.410.411



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

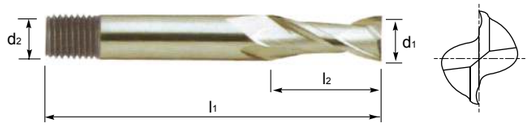
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 2

Series No. 302202, 302201

Clarkson No. 11PM, 11M/16M

▶ cutting conditions : p.410-411



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

HSSCo & HSS SCREWED SHANK

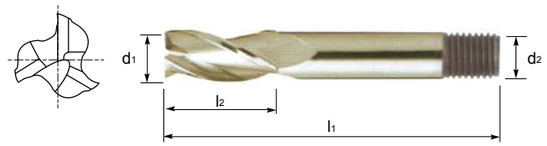
3 FLUTE, STANDARD SERIES

Clarkson

HSS Co8 | BS 122/4 | 30° | FLUTE 3

Series No. 304202

▶ cutting conditions : p.412-413



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	–

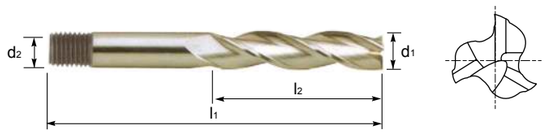
3 FLUTE, LONG SERIES

Clarkson

HSS Co8 | BS 122/4 | 30° | FLUTE 3

Series No. 305202

▶ cutting conditions : p.412-413



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	–

MULTI FLUTE, STANDARD SERIES

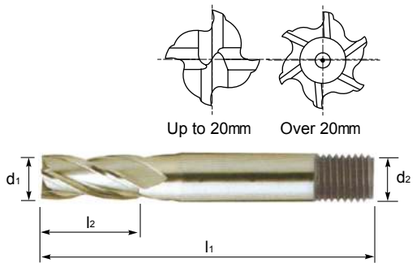
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 4-8

Series No. 307202, 307201

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

▶ cutting conditions : p.414-415



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

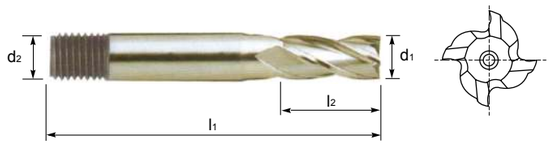
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 4-8

Series No. 307202, 307201

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

▶ cutting conditions : p.414-415



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

HSSCo & HSS SCREWED SHANK

MULTI FLUTE, LONG SERIES

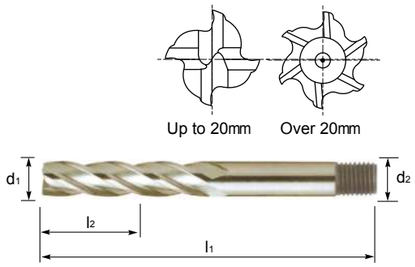
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 4-8

Series No. 308202, 308201

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

▶ cutting conditions : p.414-415



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

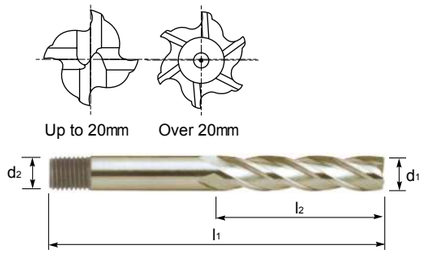
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 4-8

Series No. 308202, 308201

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

▶ cutting conditions : p.414-415



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	–

HSSCo & HSS SCREWED SHANK

2 FLUTE, STANDARD SERIES, BALL NOSE

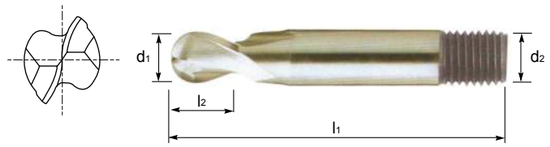
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 2

Series No. 313202, 313201

Clarkson No. 14M

▶ cutting conditions : p.418



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

2 FLUTE, LONG SERIES, BALL NOSE

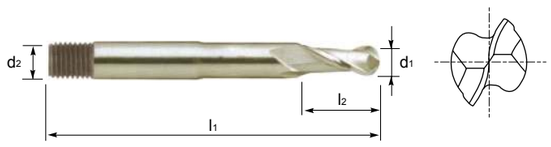
Clarkson

HSS Co8 | HSS | BS 122/4 | 30° | FLUTE 2

Series No. 314202, 314201

Clarkson No. 27M

▶ cutting conditions : p.418



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

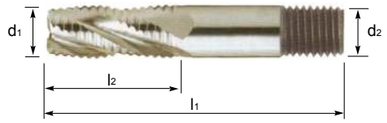
Clarkson

DIN 844 | NR | 30° | FLUTE 3-6 | COARSE

Series No. 118202

Clarkson No. 776M/777M

▶ cutting conditions : p.416-417



Mil Dia. d_1	Shank Dia. d_2	Length of Cut l_2	Overall Length l_1	No.of Flute	Europa Code HSS Co8	Clarkson Code 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	–

MULTI FLUTE LONG LENGTH COARSE PITCH ROUGHING

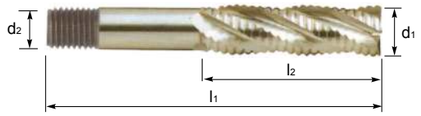
Clarkson

DIN 844 | NR | 30° | FLUTE 3-6 | COARSE

Series No. 119202

Clarkson No. 776L/777L

▶ cutting conditions : p.416-417



Mil Dia. d_1	Shank Dia. d_2	Length of Cut l_2	Overall Length l_1	No.of Flute	Europa Code HSS Co8	Clarkson Code 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

MULTI FLUTE STANDARD LENGTH FINE PITCH ROUGHING

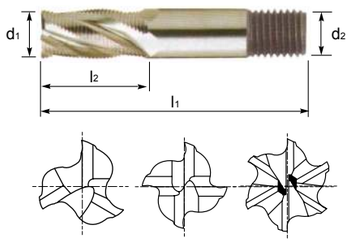
Clarkson

DIN 844 | HR | 30° | FLUTE 3-6 | FINE

Series No. 121202

Clarkson No. 776M

▶ cutting conditions : p.416-417



Mil Dia. d_1	Shank Dia. d_2	Length of Cut l_2	Overall Length l_1	No.of Flute	Europa Code ORDER NO.	Clarkson Code 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

3 FLUTE STANDARD LENGTH COARSE PITCH for ALUMINIUM

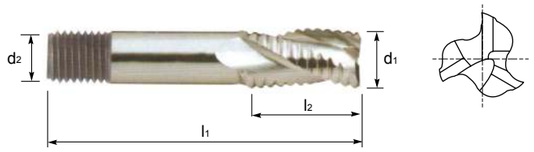
Clarkson

DIN 844 | WR | 30° | FLUTE 3 | COARSE

Series No. 124202

Clarkson No. 776A

▶ cutting conditions : p.416-417



Mil Dia. d_1	Shank Dia. d_2	Length of Cut l_2	Overall Length l_1	Europa Code HSS Co8	Clarkson Code 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

IMPERIAL SIZE END MILLS

Clarkson

The following ranges are available in imperial sizes, although not listed fully in the catalogue. Please contact the sales office for full dimensions.

Code	Item	Description
	2-FLUTE END MILLS	
501201 **501202**		Standard Length HSSco & HSS ø1/16" - 2"
502201 **502202**		Long Series HSSco & HSS ø1/16" - 2"
513201 **513202**		Standard Length HSSco & HSS B/N ø1/16" - 1.1/2"
514201 **514202**		Long Series HSSco & HSS B/N ø1/8" - 1.1/2"
	3-FLUTE END MILLS	
504202		Standard Length HSSco ø1/8" - 2"
505202		Long Series HSSco ø1/8" - 2"
524202		Standard Length Roughing Coarse Pitch ø1/4" - 2"
	MULTI FLUTE END MILLS	
507201 **507202**		Standard Length HSSco & HSS ø1/16" - 2"
508201 **508202**		Long Series HSSco & HSS ø1/16" - 2"
518202		Standard Length Roughing Coarse Pitch ø1/4" - 2"
519202		Long Series Roughing Coarse Pitch ø5/16" - 2"
521202		Standard Length Roughing Fine Pitch ø1/4" - 2"

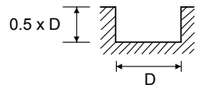
HSSCo & HSS
SCREWED SHANK
CUTTING DATA

SCREWED SHANK CUTTING CONDITION

Clarkson

301201, 301202, 302201, 302202
501201, 501202, 502201, 502202 (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	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30	30
			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 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25	25
			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 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	15
			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		v_c (m/min)	75	105	100	100	105	100	95	95	95
	72		n	12000	11000	8000	6300	5600	4000	3100	2500	2200
	73		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: $n = \frac{v_c * 1000}{\pi * ø}$

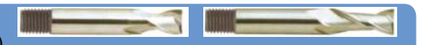
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

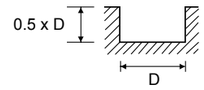
SCREWED SHANK CUTTING CONDITION

Clarkson

301201, 301202, 302201, 302202
501201, 501202, 502201, 502202 (2 Flute)



MATERIAL GROUP		HRc		Size (mm)								
				16.0	18.0	20.0	25.0	30.0	32.0	36.0	40.0	
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30	
			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	
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25	
			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	
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	
			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		v_c (m/min)	100	100	100	95	105	100	105	100	
	72		n	2000	1800	1600	1200	1100	1000	900	800	
	73		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

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.

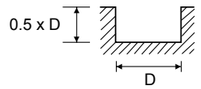
HSSCo & HSS SCREWED SHANK

SCREWED SHANK CUTTING CONDITION

Clarkson

304202, 305202, 504202, 505202 (3 Flute)

MATERIAL GROUP		HRc		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			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 72 73		v_c (m/min)	75	105	100	100	105	100	95	95
			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
			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: $n = \frac{v_c * 1000}{\pi * ø}$

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

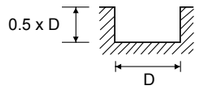
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SCREWED SHANK CUTTING CONDITION

Clarkson

304202, 305202, 504202, 505202 (3 Flute)

MATERIAL GROUP		HRc		Size (mm)							
				14.0	16.0	18.0	20.0	22.0	25.0	28.0	30.0
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			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 72 73		v_c (m/min)	95	100	100	100	95	95	95	105
			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
			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: $n = \frac{v_c * 1000}{\pi * ø}$

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

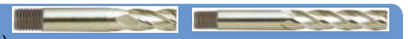
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HSSCo & HSS SCREWED SHANK

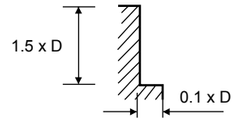
SCREWED SHANK CUTTING CONDITION

Clarkson

307201, 307202, 308201, 308202
507201, 507202, 508201, 508202 (Multiflute)



MATERIAL GROUP		HRc		Size (mm)								
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30	30
			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
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	25	25
			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
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	15
			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 72 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: $n = \frac{v_c * 1000}{\pi * ø}$

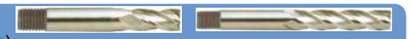
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

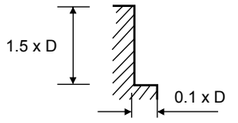
SCREWED SHANK CUTTING CONDITION

Clarkson

307201, 307202, 308201, 308202
507201, 507202, 508201, 508202 (Multiflute)



MATERIAL GROUP		HRc		Size (mm)								
				16.0	18.0	20.0	22.0	25.0	28.0	30.0	32.0	
P	11 12	< 20	v_c (m/min)	30	30	30	30	30	30	30	30	
			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	
	11 12	20-30	v_c (m/min)	25	25	25	25	25	25	25	20	
			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	
	13 14	30-40	v_c (m/min)	15	15	15	15	15	15	15	15	
			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 72 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

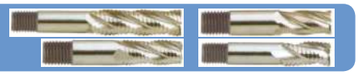
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HSSCo & HSS SCREWED SHANK

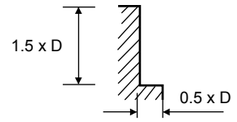
SCREWED SHANK CUTTING CONDITION

Clarkson

118202, 119202, 121202, 124202
518202, 519202, 521202, 524202 (Multiflute Roughing)



MATERIAL GROUP		HRc		Size (mm)							
				6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0
P	11	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			n	1600	1100	900	800	700	560	500	450
	12		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
	11	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			n	1200	900	800	630	560	450	400	400
	12		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
	13	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			n	800	560	450	400	350	280	250	220
	14		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
			n	4500	3100	2500	2000	1800	1600	1400	1200
	72		f_z	0.015	0.025	0.035	0.05	0.058	0.07	0.084	0.104
	73		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

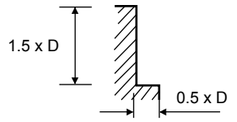
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

SCREWED SHANK CUTTING CONDITION

Clarkson

118202, 119202, 121202, 124202
518202, 519202, 521202, 524202 (Multiflute Roughing)

MATERIAL GROUP		HRc		Size (mm)							
				22.0	25.0	28.0	30.0	32.0	36.0	40.0	50.0
P	11	< 20	v_c (m/min)	30	30	30	30	30	30	30	30
			n	450	400	350	310	280	250	220	180
	12		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
	11	20-30	v_c (m/min)	25	25	25	25	25	25	25	25
			n	350	310	280	250	220	200	180	160
	12		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
	13	30-40	v_c (m/min)	15	15	15	15	15	15	15	15
			n	220	180	160	160	140	120	110	90
	14		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
			n	1100	1000	900	900	800	700	630	500
	72		f_z	0.085	0.09	0.094	0.098	0.104	0.112	0.119	0.123
	73		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: $n = \frac{v_c * 1000}{\pi * ø}$

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

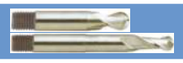
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

HSSCo & HSS SCREWED SHANK

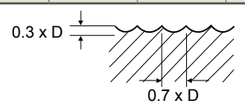
SCREWED SHANK CUTTING CONDITION

Clarkson

313201, 313202, 314201, 314202
513201, 513202, 514201, 514202 (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	11 12	< 20	v_c (m/min)	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
	11 12	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
	13 14	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

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

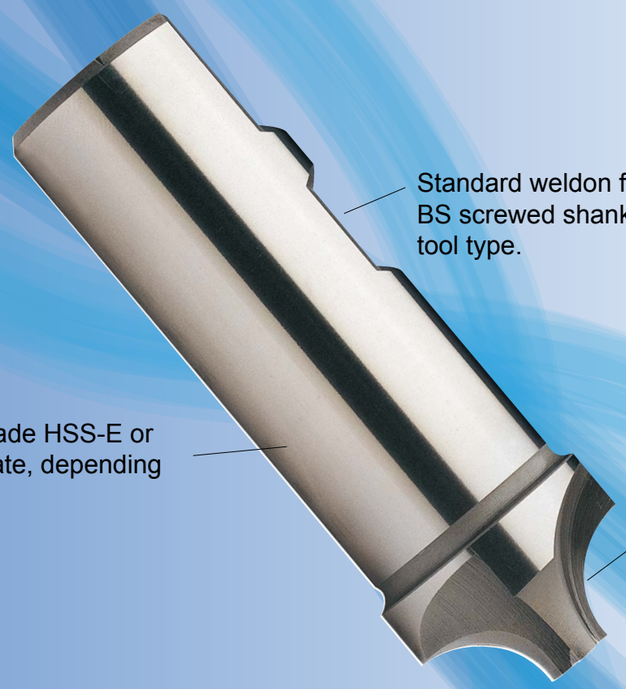
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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

Clarkson

FORM TOOLS
HSS-E & HSS



Standard weldon flatted shank or BS screwed shank, depending on tool type.

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

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

Tools can be coated to extend tool life if required.

IDEAL FOR MATERIAL GROUPS

P N

APPLICATION FORM CUTTERS

Clarkson

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

●: Excellent O: Good

APPLICATION FORM CUTTERS

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		Europa Code	Clarkson Code	Item	Description	Page No.
o	o	o	o																				o	o	o						153116 154116			Dovetail Cutter HSS-E ø16.0mm - 50.0mm Flatted Shank	P.424
o	o	o	o																				o	o	o							26M, 25M		Dovetail Cutter HSS ø16.0mm - 50.0mm Screwed Shank	P.426
o	o	o	o																				o	o	o						156116 155116			Inverted Dovetail Cutter HSS-E ø16.0mm - 38.0mm Flatted shank	P.425
o	o	o	o																				o	o	o							26L, 25L		Inverted Dovetail Cutter HSS ø16.0mm - 50.0mm Screwed Shank	P.427
o	o	o	o																				o	o	o						158116			Woodruff Cutter HSS-E ø10.5mm - 45.5mm Flatted Shank	P.428
o	o	o	o																				o	o	o							20M		Woodruff Cutter HSS ø10.5mm - 45.5mm Screwed Shank	P.429
o	o	o	o																				o	o	o						152116	21M		T-Slot Cutter HSS-E ø12.5mm - 60.0mm Flatted Shank, Screwed Shank	P.432
o	o	o	o																				o	o	o						159102			Corner Rounding Cutter HSSCo8 R1.0mm - R20.0mm Flatted Shank	P.430
o	o	o	o																				o	o	o							29L		Corner Rounding Cutter HSS R1.0mm - R20.0mm Screwed Shank	P.431
																																		Cutting Data	P.433

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

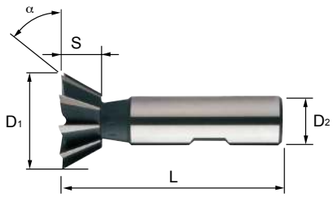
HSS-E DOVETAIL CUTTERS

Clarkson

HSS-E | DIN 1833 | N | 0° | DIN 1835B

Series No. 153116, 154116

▶ cutting conditions : p.434



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

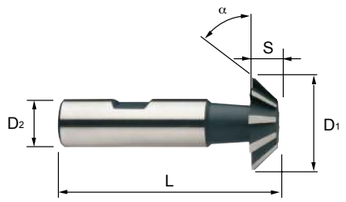
HSS-E INVERTED DOVERTAIL CUTTERS

Clarkson

HSS-E | DIN 1833 | N | 0° | DIN 1835B

Series No. 155116, 156116

▶ cutting conditions : p.434



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

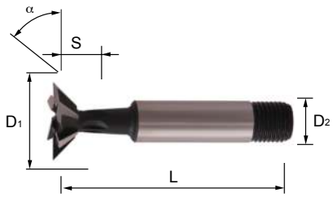
Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	EUROPA CODE Flatted Shank
16.0	6.3	60°	12	60	6	1561161600
20.0	8.0	60°	12	63	6	1561162000
22.0	9.0	60°	12	67	6	1561162200
25.0	10.0	60°	16	67	8	1561162500
28.0	11.0	60°	16	67	8	1561162800
32.0	12.5	60°	16	71	10	1561163200
38.0	16.0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

HSS DOVETAIL CUTTERS

HSS | N | 0º

Series No. 26M, 25M

▶ cutting conditions : p.434



Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	CLARKSON CODE Screwed Shank
13.0	3.0	45º	12	63.5	6	26M32
16.0	4.0	45º	12	66.5	6	26M40
19.0	5.5	45º	12	66.5	6	26M48
22.0	6.5	45º	12	68.5	6	26M56
25.0	7.5	45º	12	70	6	26M64
28.0	8.5	45º	16	71.5	6	26M72
32.0	8.5	45º	16	74.5	8	26M80
35.0	9.5	45º	25	79.5	8	26M88
38.0	10.5	45º	25	80	8	26M96
50.0	15.0	45º	25	896	10	26M00

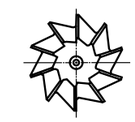
Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	CLARKSON CODE Screwed Shank
13.0	4.0	60º	12	63.5	6	25M32
16.0	5.5	60º	12	66.5	6	25M40
19.0	7.0	60º	12	67.5	6	25M48
22.0	9.5	60º	12	67.5	6	25M56
25.0	12.0	60º	12	70	6	25M64
28.0	12.5	60º	16	73	6	25M72
32.0	13.5	60º	16	74.5	8	25M80
35.0	14.5	60º	25	82.5	8	25M88
38.0	16.0	60º	25	84	8	25M96
50.0	22.0	60º	25	95	10	25M00

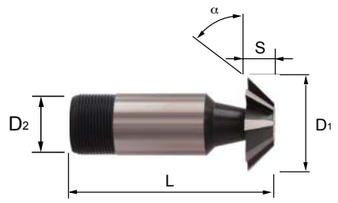
HSS INVERTED DOVERTAIL CUTTERS

HSS | N | 0º

Series No. 26L, 25L

▶ cutting conditions : p.434





Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	CLARKSON CODE Screwed Shank
13.0	3.0	45º	12	63.5	6	26L32
16.0	4.0	45º	12	66.5	6	26L40
19.0	5.5	45º	12	66.5	6	26L48
22.0	6.5	45º	12	68.5	6	26L56
25.0	7.5	45º	12	70	6	26L64
28.0	8.5	45º	16	71.5	6	26L72
32.0	8.5	45º	16	74.5	8	26L80
35.0	9.5	45º	25	79.5	8	26L88
38.0	10.5	45º	25	80	8	26L96
50.0	15.0	45º	25	896	10	26L00

Cutting Diameter	Width	Angle	Shank Diameter	Overall Length	No. Flutes	CLARKSON CODE Screwed Shank
13.0	4.0	60º	12	63.5	6	25L32
16.0	5.5	60º	12	66.5	6	25L40
19.0	7.0	60º	12	67.5	6	25L48
22.0	9.5	60º	12	67.5	6	25L56
25.0	12.0	60º	12	70	6	25L64
28.0	12.5	60º	16	73	6	25L72
32.0	13.5	60º	16	74.5	8	25L80
35.0	14.5	60º	25	82.5	8	25L88
38.0	16.0	60º	25	84	8	25L96
50.0	22.0	60º	25	95	10	25L00

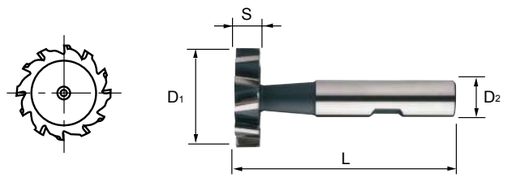
HSS-E WOODRUFF KEYSEAT CUTTERS

Clarkson

HSS-E | DIN 850 | N | 10-12º | DIN 1835B

Series No. 158116

▶ cutting conditions : p.434



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

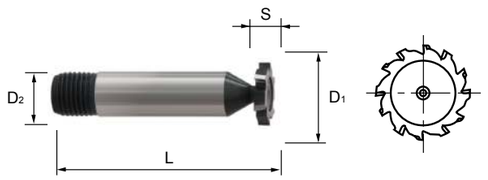
HSS WOODRUFF KEYSEAT CUTTERS

Clarkson

HSS | N | 10-12º

Series No. 20M

▶ cutting conditions : p.434



Cutting Diameter	Width	Shank Diameter	Overall Length	No. Flutes	CLARKSON CODE Screwed Shank
10.5	2.0	12	57	6	20M01
10.5	2.5	12	57	6	20M02
10.5	3.0	12	57	6	20M03
13.5	2.0	12	57	6	20M04
13.5	2.5	12	57	6	20M05
13.5	3.0	12	57	6	20M06
13.5	4.0	12	57	6	20M07
16.5	2.5	12	57	6	20M08
16.5	3.0	12	57	6	20M09
16.5	4.0	12	57	6	20M10
16.5	5.0	12	57	6	20M11
19.5	3.0	12	57	6	20M12
19.5	4.0	12	57	6	20M13
19.5	5.0	12	57	6	20M14
19.5	6.0	12	57	6	20M14-6
22.5	4.0	12	63.5	8	20M15
22.5	5.0	12	63.5	8	20M16
22.5	6.0	12	63.5	8	20M17
25.5	5.0	12	70	8	20M18
25.5	6.0	12	70	8	20M19
25.5	7.0	12	70	8	20M20
25.5	8.0	12	70	8	20M21
28.5	5.0	12	70	8	20M22
28.5	6.0	12	70	8	20M23
28.5	7.0	12	70	8	20M24
28.5	8.0	12	70	8	20M25
28.5	10.0	12	70	8	20M25-10
32.5	5.0	12	70	10	20M26
32.5	6.0	12	70	10	20M27
32.5	7.0	12	70	10	20M28
32.5	8.0	12	70	10	20M29
32.5	10.0	12	70	10	20M29-10
35.5	6.0	12	76	10	20M30
35.5	7.0	12	76	10	20M31
35.5	8.0	12	76	10	20M32
35.5	9.0	12	76	10	20M33
38.5	7.0	12	76	10	20M34
38.5	8.0	12	76	10	20M35
38.5	9.0	12	76	10	20M36
38.5	10.0	12	76	10	20M37
45.5	10.0	12	76	12	20M38

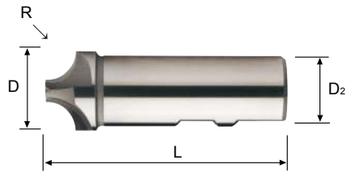
HSS-E 4 FLUTE CORNER ROUNDING CUTTERS

Clarkson

HSS Co8 | DIN 6518 | N | 0° | FLUTE 4 | DIN 1835B

Series No. 159102

▶ cutting conditions : p.435



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

HSS 4 FLUTE CORNER ROUNDING CUTTERS

Clarkson

HSS | N | 0° | FLUTE 4

Series No. 29L

▶ cutting conditions : p.435

Radius	Outside Diameter	Shank Diameter	Overall Length	CLARKSON CODE
				Screwed Shank
R1.0	12.0	12	60.5	29L02
R1.5	12.0	12	60.5	29L03
R2.0	12.0	12	60.5	29L04
R2.5	12.0	12	60.5	29L05
R3.0	12.0	12	60.5	29L06
R3.5	13.0	12	60.5	29L07
R4.0	14.0	12	60.5	29L08
R4.5	16.0	16	60.5	29L09
R5.0	16.0	16	60.5	29L10
R6.0	22.0	16	63.5	29L12
R7.0	22.0	25	73	29L14
R8.0	25.0	25	73	29L16
R9.0	26.0	25	79.5	29L18
R10.0	28.0	25	79.5	29L20
R12.0	35.0	25	82.5	29L24
R14.0	42.0	25	85.5	29L28
R15.0	45.0	25	85.5	29L30
R16.0	48.0	25	87.5	29L32
R18.0	18.5	25	92	29L36
R20.0	52.5	25	92	29L40

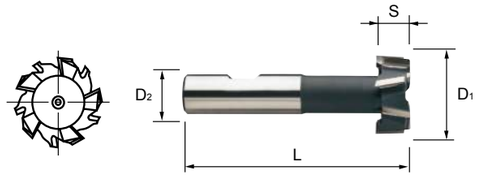
HSS-E T-SLOT CUTTERS

Clarkson

HSS-E | DIN 851 | N | 10º

Series No. 152116, 21M

▶ cutting conditions : p.435



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

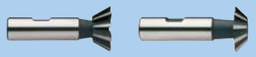
Bolt Size	Cutting Diameter	Width	Shank Diameter	Overall Length	No. Flutes	CLARKSON CODE
						Screwed Shank
M6	12.5	6.0	10	57	6	21M06
M8	16.0	8.0	10	62	6	21M08
M10	18.0	8.0	12	65	6	21M10
M10	19.0	9.0	12	65	6	21M10M
M12	21.0	9.0	12	69	6	21M12
M12	22.0	10.0	12	69	6	21M12M
M14	25.0	11.0	16	79	6	21M14
M16	28.0	12.0	16	76	8	21M16
M18	32.0	14.0	25	98	8	21M18
M20	36.0	16.0	25	100	8	21M20
M22	40.0	18.0	25	108	8	21M22
M24	45.0	20.0	25	112	8	21M24
M28	50.0	22.0	32	124	8	21M28
M36	60.0	28.0	32	139	8	21M36

APPLICATION FORM CUTTERS CUTTING DATA

APPLICATION FORM CUTTERS CUTTING CONDITION

Clarkson

153116, 154116, 155116, 156116
26M, 25M, 26L, 25L (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, 20M (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

APPLICATION FORM CUTTERS CUTTING CONDITION

Clarkson

152116, 21M (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
			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, 29L (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

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

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

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.

EUROPA TOOL

Clarkson

sborn

TECHNICAL DATA
MILLING

- ICON GUIDE
- GENERAL DATA
- TROUBLESHOOTING
- MILLING TECHNIQUES
- MATERIAL CHARTS

ICON GUIDE

TOOL MATERIALS

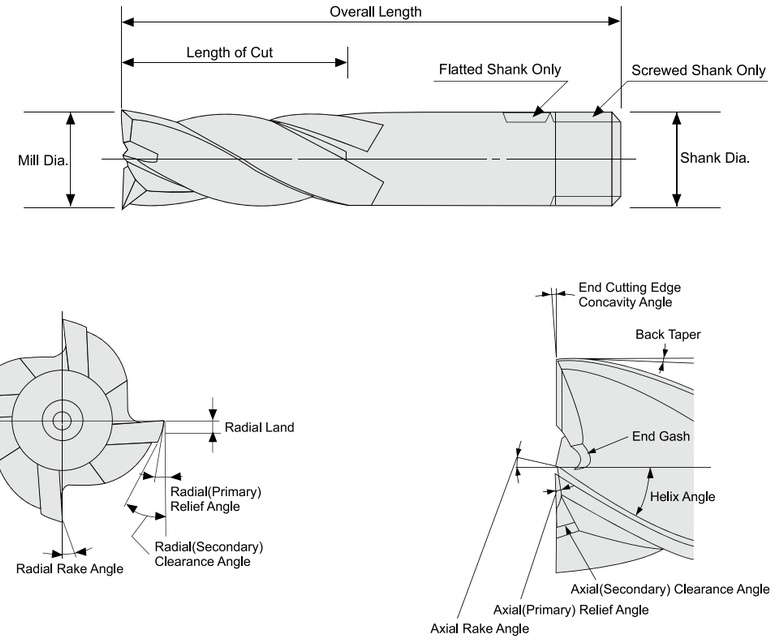
	NG	MG < .5㎛	MG HM	PREMIUM PM	HSS Co8	HSS-E	HSS
	Nano grain carbide	Ultra Micro grain carbide	Micro grain carbide	Powder metallurgy steel	8% Cobalt steel	5% Cobalt steel	High speed steel

MILLING ICONS

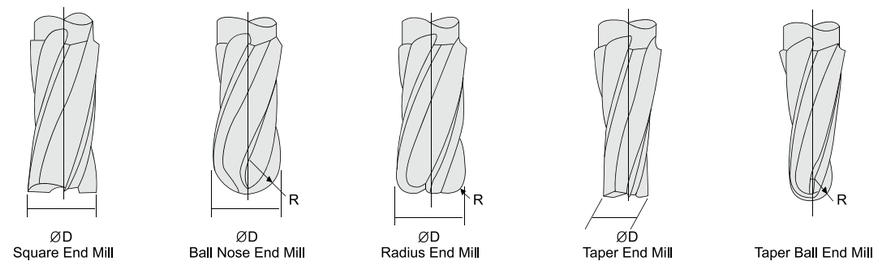
Square end helix angle	0°	10-12°	15°	20°	20°/20°	25°	30°	37°
	40°	42°	45°	50°	55°	M-HELIX		
Ball nose helix angle	15°	20°	25°	30°	40°	50°		
Radius tolerance	R ±0.02	R ±0.005	R ±0.010	R ±0.015				
Number of flutes	FLUTE 1	FLUTE 2	FLUTE 3	FLUTE 4	FLUTE 5	FLUTE 6	FLUTE 3-4	FLUTE 3-5
	FLUTE 4-8	FLUTE 4 & 5	FLUTE 4 & 6	FLUTE 6 & 8				
Shank Type	FLAT	PLAIN						
Milling direction								
Finish type	N	NF	HR	NR	WR			
Roughing periphery type	FINE	COARSE	ALU	ROUGHING FINISHING				
Standards	BS 122/4	DIN 327	DIN 844	DIN 850	DIN 851	DIN 1833	DIN 1889	DIN 6518

GENERAL INFORMATION

End mill geometry



End mill types



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 milimeters 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)
n - RPM (rev/min)
f_n - feed rate (mm/rev)
ø - tool diameter (mm)

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

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

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.

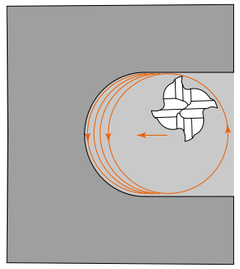
TROUBLESHOOTING

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

MILLING TECHNIQUES

Trochoidal milling

Trochoidal milling should be used as the preferred method for producing slots using high speed machining. Multi-flute tools are normally used to allow higher radial feed rates, and high cutting speeds reduce the amount of time taken to produce the slot. Small radial depths of cut are taken, so the cutter removes thin sections of material as it follows continuous spiral paths along it's radial direction. Low cutting forces are generated as the tool engages, allowing large axial depths of cut. Generally, the tools maximum cutting length is used to ensure wear is uniform, which gives longer tool life than standard slotting techniques. Cutters should be no smaller than half the width of the slot. For further information on this technique, please contact us directly.



Waterline milling

Waterline milling is a form of contour milling mainly used when machining thin wall pockets such as those in aerospace rib components. The material is removed in a series of steps or levels, much as if draining water from the pocket. It is only suitable for pockets with steep angled or parallel walls. The material is removed from either side of the wall alternately to give support to the wall. The depth of material removed with each step is normally identical on each side of the wall (fig.1), but for additional support the passes can be made at differing depths (fig.2). This is sometimes referred to as step-supported milling.

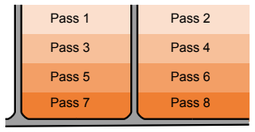


fig.1

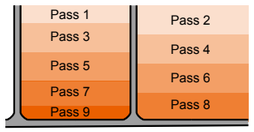
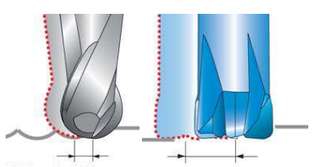


fig.2

High feed milling

High feed milling is a form of roughing which allows for high metal removal rates using small depths of cut at high speeds. Generally the tools used are straight fluted with corner radii, and produce a thin chip which carries heat away from the component surface. Ideally suited to mould and die applications, our tools will allow radial depths of cut up to ten times higher than conventional ball nosed mould and die tools. They can also be used for high speed finishing, producing a mirror finish. The tools are also much more rigid when machining sloping wall cavities, as the cutting forces are directed axially, so reducing the risk of vibration and increasing stability.

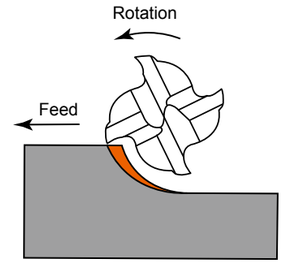


TECHNICAL DATA

MILLING TECHNIQUES

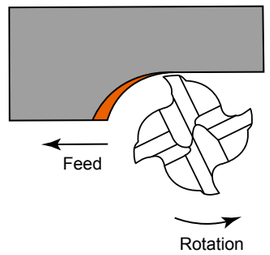
Climb milling (Down & Side milling)

Climb milling should be used as the preferred method for general machining when machine and workpiece stability are suitable. The cutter rotates along the same direction as the feed, causing the chips to be ejected behind the cutter. Using this method, the chip width starts at it's maximum and ends at zero, so heat generated while cutting is generally transferred to the chip. The shear plane is also smoother which causes less friction, increases tool life and gives a better surface finish. In horizontal milling, climb milling creates downward force so workpiece is held more securely to the machine bed.
If the machine or workpiece are not rigid, conventional milling should be used.



Conventional milling (Up milling)

Conventional milling should be used if machine or workpiece rigidity is not good. The cutter rotates against the line of feed, causing chips to be ejected forwards. This can lead to chips being re-cut and surface finish to be poor. Using this method, the chip width starts at zero and finishes at it's maximum width, so heat generated while cutting tends to be transferred to the workpiece. This can cause work hardening, which leads to faster tool wear. In horizontal milling, conventional milling can cause the workpiece to lift, meaning fixturing has to be more extensive to negate this.
If rigidity allows, climb milling should be used.



Although climb milling should always be the preferred choice, there are times when conventional milling gives better results. For example, castings or case hardened parts can be cut more effectively with conventional milling as the cut starts beneath the skin of the material, so providing fixturing is adequate it can lead to improved surface finish and tool life. Tighter tolerances can sometimes also be held when slot milling by using conventional milling, but this will be dependant on set-up rigidity.

MATERIAL CHART

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					
	GERMANY		FRANCE AFNOR	GREAT BRITAIN B.S.	EN & OTHER CLASSIFICATIONS	U.S.A. AISI
	W.Nr	DIN				
10 STEEL **P**	**11. Magnetic soft steels - Hardness < 120 HB 30 - Tensile strength < 400 N/mm²**					
	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					
	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					
	13.1 - Steels, tempered - Hardness < 250 HB 30 - Tensile strength < 850 N/mm²					
	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

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	W.Nr	DIN				
10 STEEL **P**	**14. Alloy steels - Hardness < 250 HB 30, < 25 HRC - Tensile strength < 850 N/mm²**					
	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	Z 130 WKCV 12-05-04-04	BT 15		T 15
	1.3207	S 10-4-3-10	Z130 WKCDV10-10-04-04-03	BT 42		T 42
	1.3243	S 6-5-2-5	Z85 WDKCV 06-05-05-04-02	BM 35		M 35
	1.3247	S 2-10-1-8	Z110 DKCWV 09-08-04-02-01	BM 42		M 42
	1.3343	S 6-5-2	Z 85 WDCV 06-05-04-02	BM 2		M 2
	1.3344	S 6-5-3	Z 120 WDCV 06-05-04-03			M 3 / 2
	1.3348	S 2-9-2	Z 100 DCWV 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	EN 16, 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 - 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	S 95, S 97, S 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			

TECHNICAL DATA

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	W.Nr	DIN				
10 HARDENED STEEL **H**	15.3 -Hardened tempered steels - Hardness may differ according to presentation and dimensions of material					
	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		
	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					
	1.2713	100 Mn Cr W 12			Hardox 400	M42
	1.3247	X 210 Cr 12			Hardox 500	4140
	1.2080				Hardox 600	8130
	1.3343				P20	
20 STAINLESS STEEL **M**	**21. Free machining stainless steels - Hardness < 250 HB 30 - Tensile strength < 850 N/mm²**					
	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					
	1.4300	X 12 Cr Ni 18 8		320 S 12		
	1.4301	X 5 Cr Ni 18 10	Z 6 CN 18-09	304 S 15	EN 80, EN 58 + C	304
	1.4311	X 2 CrNiN 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					
	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/mm²					
	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/mm²					
	1.4460	X 8 CrNiMo 27 5	Z 5 CND 27-05 Az			329
	1.4582	X 4 CrNiMoNb 25 7				
	1.4821	X 20 CrNiSi 25 4				17-4PH

TECHNICAL DATA

MATERIAL CHART

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	GERMANY		FRANCE AFNOR	GREAT BRITAIN B.S.	EN & OTHER CLASSIFICATIONS	U.S.A. AISI
	W.Nr	DIN				
30 CAST IRON **K**	**31. Grey graphite cast irons - Hardness < 150 HB 30 - Tensile strength < 500 N/mm²**					
	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/mm²					
		GF - 150				
		GD - 260				
	32. Grey graphite cast irons - Hardness 150 - 300 HB 30 - Tensile strength 500 - 1,000 N/mm²					
	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/mm²					
		GF - 150				
		GD - 260				
	33. Nodular graphite, malleable cast irons - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²					
	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				
	0.8135	GTS-35				
	0.8145	GTS-45				
	0.8155	GTS-55				
	0.8165	GTS-65				
	33.1 - Meehanite - Hardness < 200 HB 30 -Tensile strength < 700 N/mm²					
		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					
	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/mm²					
		SH 800		420/12, P 440/7		
		SH 1000				
40 TITANIUM **S**	**41. Titanium, unalloyed - Hardness < 200 HB 30 - Tensile strength < 700 N/mm²**					
	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					
		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				

MATERIAL CHART

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					
	GERMANY		FRANCE AFNOR	GREAT BRITAIN B.S.	EN & OTHER CLASSIFICATIONS	U.S.A. AISI
	W.Nr	DIN				
40 TITANIUM **S**	**43. Titanium alloys - Hardness 270-300 HB 30 - Tensile strength 900-1,300 N/mm²**					
		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**					
	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					
	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	Hastelloy C		3027-76	Hastelloy C	
	2.4816	Inconel 600, 617, 625			Haynes Alloys 263	
	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					
	2.4631	Nimonic 80 A			Nimonic 80	
	2.4632	Nimonic 90				
	2.4634	Nimonic 105				
	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**					
	2.0060	E - Cu 57				
	2.0070	SE - Cu			Commerially 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					
	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					
	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)				

MATERIAL CHART

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Materials are grouped according to machinability and are not necessarily identical in chemical composition.

ISO GROUP	STANDARDS					
	GERMANY		FRANCE AFNOR	GREAT BRITAIN B.S.	EN & OTHER CLASSIFICATIONS	U.S.A. AISI
	W.Nr	DIN				
60 COPPER **N**	63.2 - Bronzes					
	2.1020	Cu Sn 6				
	2.1030	Cu Sn 8				
	2.1080	Cu Sn 6 Zn 6				
	63.3 - Copper alloys tempered by forging					
	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**					
	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					
	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				
	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					
	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					
	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**					
				Nylon		Nylon
				PVC Cellulose		PVC
				Acetate	Acetal	
	82. Thermosetting Plastics					
				Tufnol		
				Bakelite		Bakelite
	83. Reinforced Plastics					
				CFRP, GFRP		
				Printed Circuit Board		
				Kevlar		Kevlar

TECHNICAL DATA

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