MILLING

PREMIER LINE milling tools.

Premier Line:
High performance cutting tools.

The Europa Premier Line milling range has been assembled to provide high performance solutions to todays demanding machining applications.

The majority of the tools are solid carbide, but there are HSS-PM options for less demanding or less stable conditions. All tools can be run on the latest CNC machinery for maximum benefit, but they work equally well on older machines, operating at lower speeds with the same high efficiency.

The tools in this catalogue are suitable for a wide range of milling applications, please refer to our other catalogues for drilling, threading and indexable tooling.

Icon guide

Side cutting	Slotting	Corner radius	Profiling	Pocketing
Trochoidal milling	Back milling	Planing	Rib processing	
MG HM	FHA 45°	ZEFP 5	KCH 45°	RE
Material	Helix angle	Number of flutes	Chamfer angle	Corner radius
NECK	ALU		DIN 6535HB	
Neck relief	Knuckle form	Maching direction	Shank type	

MAIN INDEX

Tool images are for illustration purposes only and do not show the full range of tools within the product group. See individual index of each group for full details.

General information - P.331-348

ISO	MATERIAL	VDI 3323	PRODUCT GROUP	PULSAR BLUE	PULSAR	PULSAR DMX	MASTERMILL VX	MASTERMILL VXD	MASTERMILL VX5	MASTERMILL VX6 / VX6C	ET1	MASTERMILL AL-HPC	ALU-XP	GRAPHEX	SABRE	ISO
			MATERIAL	NG HM	MG HM	MG HM	MG HM	MG HM	MG HM	MG HM	MG HM	MG HM	MG HM	MG HM	HSS PM	
			TOOL TYPE													
			PAGE NO.	5-58	59-123	125-186	187-197	198-199	200-205	206-213	225-240	241-254	255-281	283-302	303-329	
ISO	MATERIAL	VDI 3323	HARDNESS (HRC)	●: Primary application o: Secondary application				●: Primary application o: Secondary application								ISO
P	Non-alloy steel	1-5	<25		○		●			●	○				●	P
P	Low alloy steel	6-9	25-35	○	●		●			●	○				●	P
P	High alloy steel	10-11	35-40	●	●	●	●			●						P
M	Ferritic / Martensitic Stainless steel	12-13			○		●	●	●	●	●				●	M
M	Austenitic Stainless steel	14					●	●	●	●	●					M
K	Grey Cast iron	15-16			○	●	●			●						K
K	Nodular Cast iron	17-18			○	●	○			●						K
N	Aluminium (HSM)	21-25										●				N
N	Aluminium	21-25										●	●			N
N	Copper Copper alloys	26-28		○								●	○			N
N	Plastics/Acrylics	29.1										●	○			N
N	CFRP/GFRP	29.2														N
N	Synthetic Graphite	30												●		N
S	Heat Resistant and Super Alloys	31-35					●	○	○	●	○				○	S
S	Titanium	36-37					○	●	●	○	○					S
H	Hardened steel	38-39	40-55		●	●										H
H	Hardened steel	38-39	55-65	●	○											H
H	Hardened steel	38-39	65-70	●												H

Material Group Examples

Steel	VDI 3323	Non-alloy steel	1-5	Low alloy steel	6-9	High alloy steel	10-11		
P		EN3A, 4, 5, 6, 7, 8 040A10 230Mo7		EN9, 10 EN43 070M20 060A62 080M46		S95, 98, 99 D2 H13 EN24 B02			
Stainless Steel	VDI 3323	Ferritic/Martensitic Annealed	12	Martensitic Quenched/Tempered	13	Austenitic	14		
M		403 410 430		410S 430F 321		304 316 15-5PH 17-4PH Duplex/Super Duplex			
Cast Iron	VDI 3323	Grey cast iron	15, 16	Nodular cast iron	17, 18	Malleable cast iron	19, 20		
K		GG10 GG20 GG30 GG40		GGG40 GGG50 Meehanite		GTS35 GTS45 GTS55			
Aluminium	VDI 3323	Aluminium, not curable	21	Aluminium, curable, hardened	22	Aluminium, Si 0.5-12%	23, 24	Aluminium, Si >12%	25
N		Al99 Al99.5 AlMg1		AlCuMg1 AlMgSi1 7050 7075		HE9, 30 LM6, 9, 20, 24, 25 5052 6063		G-AlSi10Mg G-AlSi12 G-MgAl6 LM5	
Copper	VDI 3323	Copper, Bronze short chip alloys	26	Copper, Bronze long chip alloys	27	Copper, Bronze Cu - Al - Fe alloys	28		
N		Commercially pure C101 CZ120 PB104		CZ106 CZ108 CuZn37		Ampco18 Ampco20 Ampco26			
Non metallic	VDI 3323	Thermosetting plastics	29.1	Thermosetting and reinforced plastics	29.2	Non-metals	30		
N		Acetal Nylon		CFRP, GFRP Circuit Board Kevlar Tufnol		Synthetic Graphite Hard rubber			
Nickel	VDI 3323	HRSA, FE based aged or annealed	31, 32	HRSA, Ni/Co based aged or annealed	33	HRSA, Ni/Co based cast	34	HRSA, Ni/Co based cast	35
S		NA15 NA17 GX40NiCrSi38-18		Nimonic 75 Hastelloy C-4 Inconel 625 Incoloy 825 Monel 400		Monel k-500 Inconel Inconel 718		Hastelloy b Hastelloy C Inconel X-750	
Titanium	VDI 3323	Titanium unalloyed	36	Titanium alloys alpha + beta alloys	37				
S		Pure Titanium Ti1 2TA1		TiAl6V4 TA10-13 TiAl3V2.5 TA45-51 TA11					
Hardened Material	VDI 3323	Hardened steels	38	Hardened steels	39	Chilled Cast Iron	40	Hardened Cast Iron	41
H		45- 55HRc Hardox400 Hardox500 P20		>55HRc Hardox 600		Ni-Hard 1 Ni-Hard 2		GX300CrMo15-3	

▶ For full material group tables, refer to pages ????

PULSAR BLUE

Designed specifically for use in dry cutting conditions for steels up to HRc70

APPLICATION GUIDE

INDEX

P			M		K		N					S		H	MACHINING GUIDE	Code	Item	Description	Page No.
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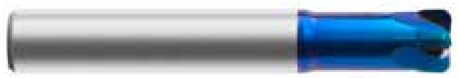
HIGH FEED END MILLS																			
	○	●												●		110350		Short Length 4 flute ø2.0mm - 12.0mm	P.8
	○	●												●		111350		Long Length 4 Flute ø2.0mm - 16.0mm	P.9
2-FLUTE END MILLS																			
	○	●						○						●		100450		Rib Processing ø0.1mm - 4.0mm	P.10-12
	○	●												●		101850		Rib Processing Corner Radius ø1.0mm - 8.0mm	P.14-15
	○	●												●		102350		Rib Processing Corner Radius ø0.5mm - 2.0mm	P.13
	○	●						○						●		106350		Rib Processing Ball Nose, ø6.0 Shank ø0.5mm - 2.0mm	P.25
	○	●						○						●		109350		Rib Processing Ball Nose ø0.1mm - 4.0mm	P.22-24
	○	●												●		100350		Miniature ø0.3mm - 2.0mm	P.16
	○	●												●		104350 112350		Miniature Ball Nose ø0.1mm - 2.0mm	P.19
	○	●												●		101350		Extended Neck Stub Length ø0.3mm - 20.0mm	P.18
	○	●												●		101450		Extended Neck Short Length ø0.1mm - 20.0mm	P.17
	○	●												●		100550 105350		Extended Neck Ball Nose, Stub Length ø1.0mm - 25.0mm	P.20-21
3-FLUTE END MILLS																			
	○	●												●		107350		Centre Match Ball Nose ø3.0mm - 20.0mm	P.26
4-FLUTE END MILLS																			
	○	●												●		101550		Extended Neck ø1.0mm - 20.0mm	P.28
	○	●												●		103350		Extended Neck Corner Radius, Stub ø1.0mm - 20.0mm	P.29
	○	●												●		101650		Extended Neck Corner Radius, Short ø3.0mm - 12.0mm	P.30
	○	●												●		101750		Extended Neck Corner Radius, Long ø6.0mm - 12.0mm	P.31
	○	●												●		101950		Centre Match Ball Nose ø3.0mm - 20.0mm	P.27
6 & MULTIFLUTE END MILLS																			
	○	●												●		108350		Extended Neck Corner Rad, 45º Helix ø6.0mm - 20.0mm	P.32
	○	●												●		102950		Long Series 45º Helix ø6.0mm - 25.0mm	P.33
	○	●												●		103950		Extra Long Series 45º Helix ø6.0mm - 25.0mm	P.34
																		Cutting Data	P.35

▶For material group examples, refer to page 4
▶For full material group tables, refer to pages 334-347

HIGH FEED CORNER RADIUS SHORT LENGTH

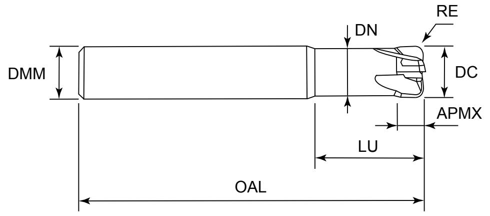
NG HM | ZEFP 4 | RE | FHA 0° | DIN 6535HA

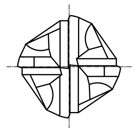


Series No. 110350

▶ cutting conditions : p.40-41

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.





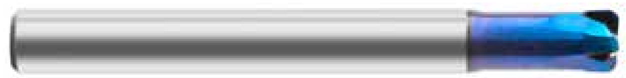
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1103500200	**2.0**	0.5	6	1.0	6.0	50	1.8
1103500300	**3.0**	0.5	6	1.2	8.0	50	2.8
1103500400	**4.0**	0.5	6	1.5	10.0	50	3.8
1103500600	**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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	-0.005	+0.005	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

HIGH FEED CORNER RADIUS LONG LENGTH

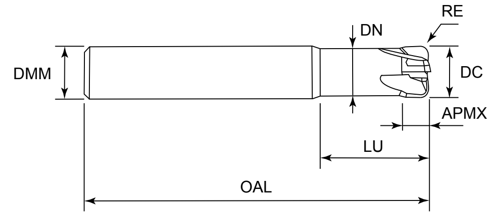
NG HM | ZEFP 4 | RE | FHA 0° | DIN 6535HA

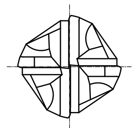


Series No. 111350

▶ cutting conditions : p.40-41

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.



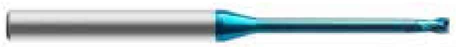


EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1113500200	**2.0**	0.5	6	1.0	6.0	70	1.8
1113500300	**3.0**	0.5	6	1.2	8.0	70	2.8
1113500400	**4.0**	0.5	6	1.5	10.0	70	3.8
1113500500	**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

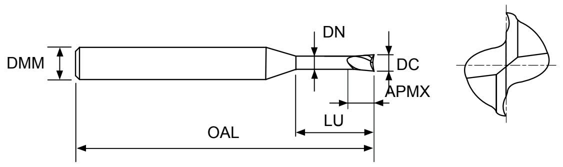
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	-0.005	+0.005	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 100450



▶ cutting conditions : p.36-37

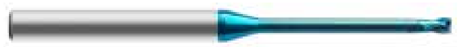
Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

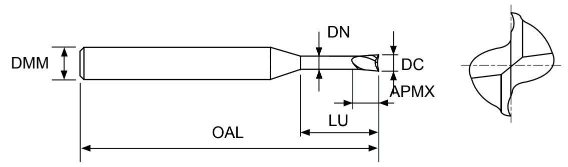
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1004500010	**0.1**	4	0.15	0.3	45	0.085
1004500011	**0.1**	4	0.15	0.5	45	0.085
1004500020	**0.2**	4	0.3	0.5	45	0.17
1004500021	**0.2**	4	0.3	1.0	45	0.17
1004500022	**0.2**	4	0.3	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

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.012	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●						○						●

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK





Series No. 100450

▶ cutting conditions : p.36-37

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

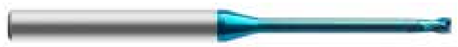
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1004500083	**0.8**	4	1.2	8.0	45	0.75
1004500084	**0.8**	4	1.2	10.0	45	0.75
1004500085	**0.8**	4	1.2	12.0	45	0.75
1004500100	**1.0**	4	1.5	4.0	45	0.95
1004500101	**1.0**	4	1.5	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

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.012	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●						○						●

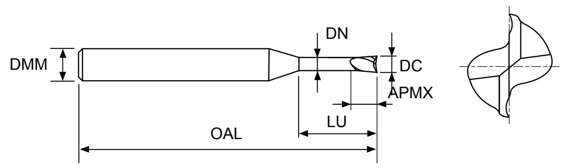
RIB PROCESSING

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 100450

▶ cutting conditions : p.36-37



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Designed for high precision milling operation.
Higher wear-resistance.

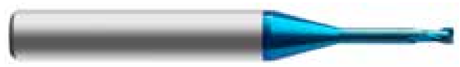
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1004500206	**2.0**	4	3.0	18.0	55	1.95
1004500207	**2.0**	4	3.0	20.0	55	1.95
1004500208	**2.0**	4	3.0	25.0	60	1.95
1004500209	**2.0**	4	3.0	30.0	70	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

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●						○						●

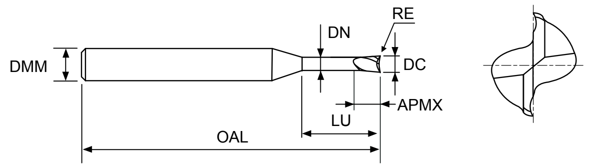
RIB PROCESSING CORNER RADIUS

NG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK



Series No. 102350

▶ cutting conditions : p.46-47



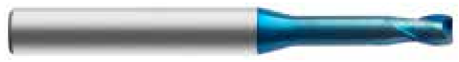
Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	-0.010	+0.010	h6

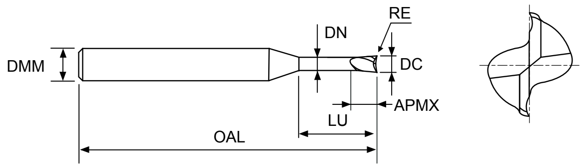
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●													●

NG HM | ZEFP 2 | RE | FHA 30º | DIN 6535HA | NECK



Series No. 101850

▶ cutting conditions : p.46-47



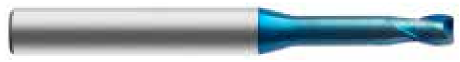
Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
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
1018500400	**4.0**	0.5	6	4.0	12	55	3.85
1018500903	**4.0**	0.5	6	4.0	16	55	3.85
1018500904	**4.0**	0.5	6	4.0	20	55	3.85
1018501012	**4.0**	1.0	6	4.0	12	55	3.85
1018501016	**4.0**	1.0	6	4.0	16	55	3.85

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.012	-0.010	+0.010	h6

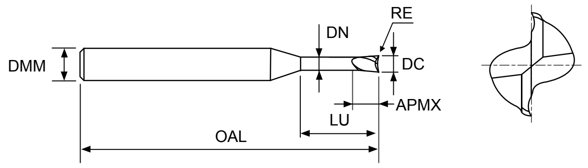
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

NG HM | ZEFP 2 | RE | FHA 30º | DIN 6535HA | NECK



Series No. 101850

▶ cutting conditions : p.46-47



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 ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1018500921	**6.0**	0.3	6	7.0	20	60	5.85
1018500600	**6.0**	0.5	6	7.0	20	60	5.85
1018500905	**6.0**	1.0	6	7.0	20	60	5.85
1018500906	**6.0**	1.5	6	7.0	20	60	5.85
1018502020	**6.0**	2.0	6	7.0	20	60	5.85
1018500922	**8.0**	0.3	6	9.0	25	60	7.70
1018500929	**8.0**	0.5	6	9.0	25	60	7.70
1018500800	**8.0**	1.0	6	9.0	25	60	7.70
1018500907	**8.0**	1.5	6	9.0	25	60	7.70
1018502025	**8.0**	2.0	6	9.0	25	60	7.70
1018500923	**10.0**	0.3	10	11.0	32	60	9.70
1018500532	**10.0**	0.5	10	11.0	32	60	9.70
1018501000	**10.0**	1.0	10	11.0	32	60	9.70
1018500908	**10.0**	1.5	10	11.0	32	60	9.70
1018502032	**10.0**	2.0	10	11.0	32	60	9.70
1018500538	**12.0**	0.5	12	12.0	38	80	11.70
1018501200	**12.0**	1.0	12	12.0	38	80	11.70
1018501909	**12.0**	1.5	12	12.0	38	80	11.70
1018502038	**12.0**	2.0	12	12.0	38	80	11.70

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.012	-0.010	+0.010	h6

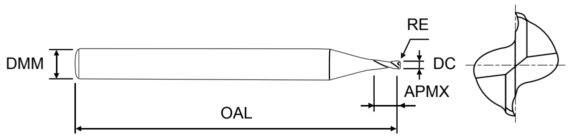
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

MINIATURE

NG HM | ZEFP 2 | RE | FHA 30º | DIN 6535HA

Series No. 100350

▶ cutting conditions : p.48



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.

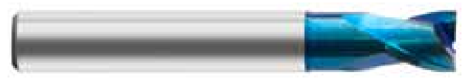
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1003500030	**0.3**	-	6	0.45	50
1003500040	**0.4**	-	6	0.6	50
1003500050	**0.5**	0.05	6	0.7	50
1003500060	**0.6**	0.05	6	0.9	50
1003500080	**0.8**	0.05	6	1.2	50
1003500100	**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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
	RETOLL	**RETOLU**	
0.00 / -0.012	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

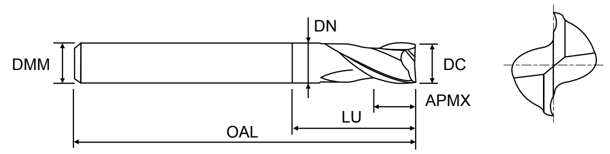
EXTENDED NECK SHORT LENGTH

NG HM | ZEFP 2 | FHA 30º | DIN 6535HA | NECK



Series No. 101450

▶ cutting conditions : p.50-53



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.

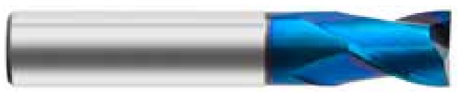
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1014500010	**0.1**	4	0.2	-	40	-
1014500020	**0.2**	4	0.4	-	40	-
1014500030	**0.3**	4	0.6	-	40	-
1014500040	**0.4**	4	0.8	-	40	-
1014500050	**0.5**	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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.3 - 6.0	0.00 / -0.012	h6
8.0 - 20.0	0.00 / -0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

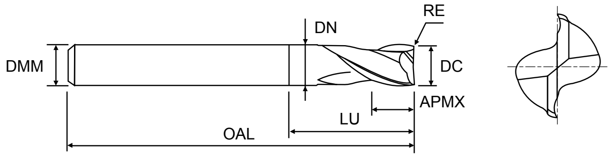
EXTENDED NECK STUB LENGTH CORNER RADIUS

NG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK



Series No. 101350

▶ cutting conditions : p.50-53



Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
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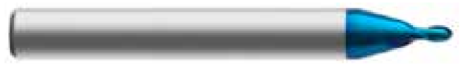
Higher wear-resistance.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1013500030	**0.3**	-	3	0.45	-	40	-
1013500040	**0.4**	-	3	0.6	-	40	-
1013500050	**0.5**	0.05	3	0.7	-	40	-
1013500907	**0.5**	0.05	4	0.7	-	40	-
1013500060	**0.6**	0.05	3	0.9	-	40	-
1013500908	**0.6**	0.05	4	0.9	-	40	-
1013500909	**0.7**	0.05	3	0.9	-	40	-
1013500080	**0.8**	0.05	3	1.2	-	40	-
1013500910	**0.8**	0.05	4	1.2	-	40	-
1013500911	**0.9**	0.05	4	1.2	-	40	-
1013500100	**1.0**	0.10	3	1.5	-	40	-
1013500901	**1.0**	0.10	4	1.5	-	40	-
1013500903	**1.0**	0.10	6	1.5	-	40	-
1013500150	**1.5**	0.10	3	2.2	-	40	-
1013500904	**1.5**	0.10	6	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
1013500905	**2.0**	0.10	6	3.0	6.0	40	1.9
1013500250	**2.5**	0.10	3	4.0	6.0	40	2.4
1013500906	**2.5**	0.10	6	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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.3 - 6.0	0.00 / -0.012	-0.010	+0.010	h6
8.0 - 20.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

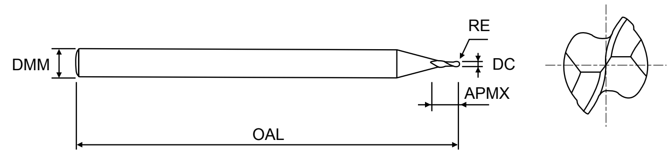
MINIATURE BALL NOSE



NG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 104350, 112350

▶ 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.

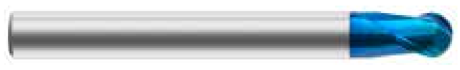
EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1123500010	**0.1**	0.05	4	0.2	40
1123500020	**0.2**	0.10	4	0.3	40
1123500030	**0.3**	0.15	4	0.5	40
1043500040	**0.4**	0.20	6	0.4	50
1123500040	**0.4**	0.20	4	0.6	40
1043500050	**0.5**	0.25	6	0.5	50
1123500050	**0.5**	0.25	4	0.7	40
1043500060	**0.6**	0.30	6	0.6	50
1123500060	**0.6**	0.30	4	0.9	40
1123500070	**0.7**	0.35	4	1.1	40
1043500080	**0.8**	0.40	6	0.8	50
1123500080	**0.8**	0.40	4	1.2	40
1123500090	**0.9**	0.45	4	1.4	40
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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	-0.005	+0.005	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

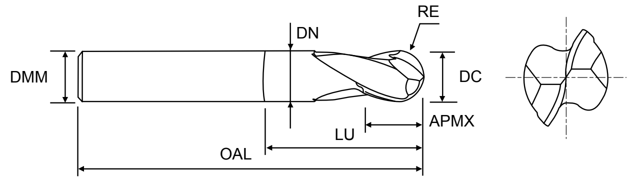
EXTENDED NECK BALL NOSE

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 100550, 105350

▶ cutting conditions : p.44-45



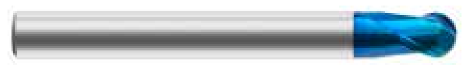
Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1053500100	**1.0**	0.50	4	1.0	2.2	50	0.95
1005500100	**1.0**	0.50	6	1.5	3.0	50	0.95
1053500120	**1.2**	0.60	4	1.2	2.6	50	1.10
1053500150	**1.5**	0.75	4	1.5	3.0	50	1.45
1005500150	**1.5**	0.75	6	2.0	4.0	50	1.45
1053500200	**2.0**	1.00	6	2.0	4.0	50	1.95
1005500200	**2.0**	1.00	6	2.5	5.0	50	1.95
1005500250	**2.5**	1.25	6	3.0	7.0	50	2.40
1053500300	**3.0**	1.50	6	3.0	6.0	60	2.85
1005500300	**3.0**	1.50	6	4.0	10.0	60	2.85
1005500350	**3.5**	1.75	6	4.5	10.0	60	3.35
1005500400	**4.0**	2.00	6	5.0	10.0	60	3.85
1053500400	**4.0**	2.00	6	4.0	8.0	70	3.85
1005500450	**4.5**	2.25	6	5.5	10.0	60	4.35
1005500500	**5.0**	2.50	6	6.0	12.0	60	4.85
1053500500	**5.0**	2.50	6	5.0	10.0	80	4.85
1005500550	**5.5**	2.75	6	6.5	12.0	60	5.35
1005500600	**6.0**	3.00	6	7.0	15.0	60	5.85
1053500600	**6.0**	3.00	6	6.0	12.0	90	5.85
1005500903	**6.0**	3.00	6	9.0	30.0	90	5.85
1053500700	**7.0**	3.50	8	7.0	14.0	90	6.85
1005500901	**8.0**	4.00	8	9.0	15.0	60	7.70
1005500800	**8.0**	4.00	8	9.0	15.0	80	7.70
1053500800	**8.0**	4.00	8	8.0	16.0	100	7.70
1005500904	**8.0**	4.00	8	12.0	30.0	100	7.70

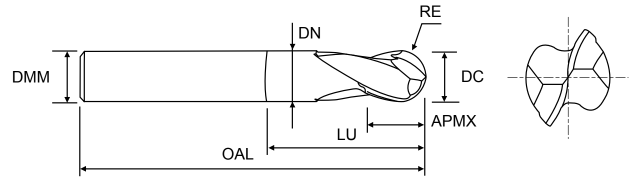
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
1.0 - 6.0	0.00 / -0.012	-0.005	+0.005	h6
7.0 - 25.0	0.00 / -0.012	-0.010	+0.010	

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		○	●												●

EXTENDED NECK BALL NOSE



NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 100550, 105350

▶ 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 **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1053500900	**9.0**	4.50	10	9.0	18.0	100	8.70
1005500902	**10.0**	5.00	10	11.0	25.0	60	9.70
1005501000	**10.0**	5.00	10	11.0	25.0	80	9.70
1053501000	**10.0**	5.00	10	10.0	20.0	100	9.70
1005500905	**10.0**	5.00	10	15.0	30.0	100	9.70
1005501200	**12.0**	6.00	12	14.0	25.0	80	11.70
1053501200	**12.0**	6.00	12	12.0	24.0	110	11.70
1053501400	**14.0**	7.00	14	14.0	28.0	110	13.80
1053501600	**16.0**	8.00	16	16.0	32.0	140	15.80
1053501800	**18.0**	9.00	18	18.0	36.0	140	17.80
1053502000	**20.0**	10.00	20	20.0	40.0	160	19.80
1053502500	**25.0**	12.50	25	25.0	50.0	180	24.80

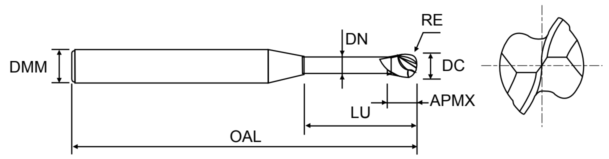
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
1.0 - 6.0	0.00 / -0.012	-0.005	+0.005	h6
7.0 - 25.0	0.00 / -0.012	-0.010	+0.010	

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		○	●												●

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No. 109350

▶ cutting conditions : p.28-39



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 **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	-0.005	+0.005	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		○	●						○						●

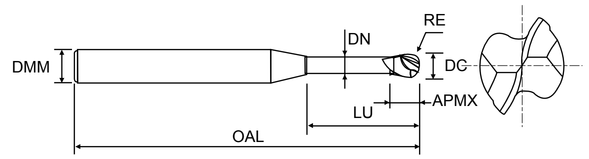
RIB PROCESSING BALL NOSE

EUROPA TOOL

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No. 109350

▶ cutting conditions : p.38-39



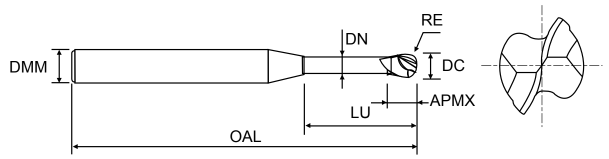
Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	-0.005	+0.005	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		○	●						○						●

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 109350

▶ cutting conditions : p.38-39

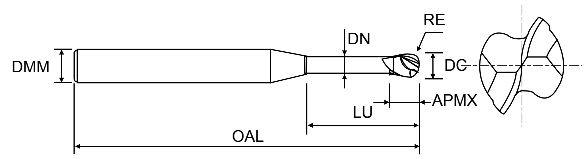
Designed to machine high hardened materials
Suitable for dry cutting, high speed cutting.
Excellent workpiece finish.
Designed for high precision milling operation.
Higher wear-resistance.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	-0.005	+0.005	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		○	●						○						●

NG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 106350

▶ cutting conditions : p.38-39

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.

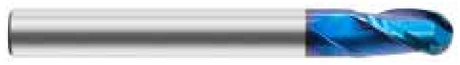
EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1063500050	**0.5**	0.25	6	0.5	1.5	50	0.45
1063500901	**0.5**	0.25	6	0.5	3.3	50	0.45
1063500060	**0.6**	0.3	6	0.6	2.0	50	0.55
1063500902	**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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.012	-0.005	+0.005	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		○	●						○						●

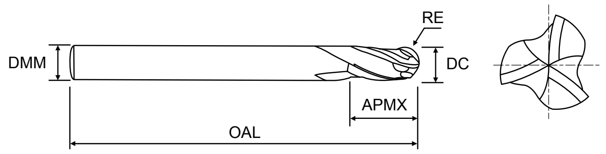
BALL NOSE, CENTRE MATCHED

NG HM | ZEFP 3 | FHA 30° | DIN 6535HA



Series No. 107350

▶ cutting conditions : p.42



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 **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	0.00 / -0.012	-0.005	+0.005	h6
8.0 - 20.0	0.00 / -0.012	-0.010	+0.010	

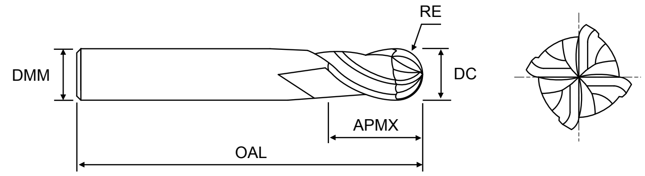
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

BALL NOSE, CENTRE MATCHED

NG HM | ZEFP 4 | FHA 30° | DIN 6535HA

Series No. 101950

▶ cutting conditions : p.42



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.

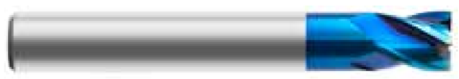
EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1019500300	**3.0**	1.5	6	8	60
1019500400	**4.0**	2.0	6	8	70
1019500500	**5.0**	2.5	6	10	80
1019500600	**6.0**	3.0	6	12	90
1019500800	**8.0**	4.0	8	14	100
1019501000	**10.0**	5.0	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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	0.00 / -0.012	-0.005	+0.005	h6
8.0 - 20.0	0.00 / -0.012	-0.010	+0.010	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

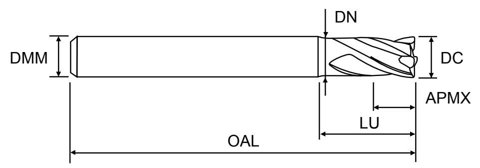
EXTENDED NECK

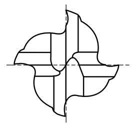
NG HM | ZEFP 4 | FHA 30° | DIN 6535HA | NECK



Series No. 101550

▶ cutting conditions : p.54-55





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.

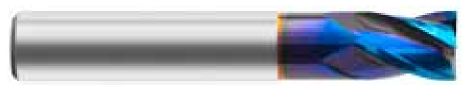
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1015500100	**1.0**	6	1.5	3.0	50	0.95
1015500200	**2.0**	6	2.0	5.0	50	1.95
1015500300	**3.0**	6	3.0	8.0	55	2.85
1015500400	**4.0**	6	4.0	10.0	55	3.85
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

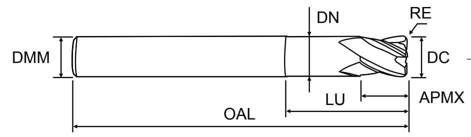
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
1.0 - 6.0	0.00 / -0.012	h6
8.0 - 20.0	0.00 / -0.015	

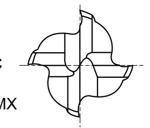
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

EXTENDED NECK CORNER RADIUS STUB LENGTH

NG HM | ZEFP 4 | RE | FHA 30° | DIN 6535HA | NECK







Series No. 103350

▶ cutting conditions : p.54-55

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

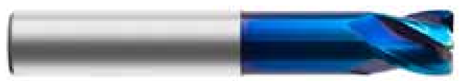
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1033500100	**1.0**	0.10	3	1.5	-	40	-
1033500901	**1.0**	0.10	6	1.5	-	40	-
1033500150	**1.5**	0.10	3	2.2	-	40	-
1033500902	**1.5**	0.10	6	2.2	-	40	-
1033500200	**2.0**	0.10	3	3.0	6.0	40	1.9
1033500903	**2.0**	0.10	6	3.0	6.0	40	1.9
1033500250	**2.5**	0.10	3	4.0	6.0	40	2.4
1033500904	**2.5**	0.10	6	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

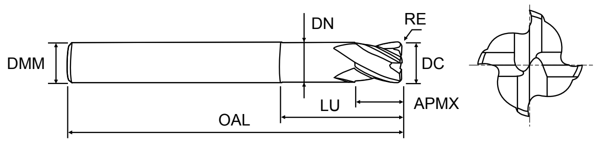
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
1.0 - 6.0	0.00 / -0.012	-0.010	+0.010	h6
8.0 - 20.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

EXTENDED NECK CORNER RADIUS SHORT LENGTH

NG HM | ZEFP 4 | RE | FHA 30° | DIN 6535HA | NECK





Series No. 101650

▶ cutting conditions : p.49

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

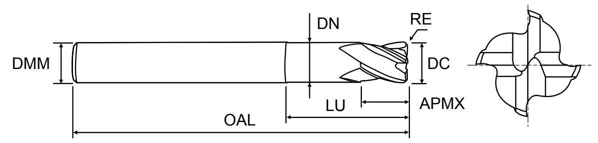
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1016500300	**3.0**	0.3	6	4.0	12.0	55	2.85
1016500901	**3.0**	0.3	6	4.0	16.0	55	2.85
1016500902	**3.0**	0.3	6	4.0	20.0	55	2.85
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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	0.00 / -0.012	-0.010	+0.010	h6
8.0 - 12.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

EXTENDED NECK CORNER RADIUS LONG LENGTH

NG HM | ZEFP 4 | RE | FHA 30° | DIN 6535HA | NECK



Series No. 101750

▶ cutting conditions : p.49

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

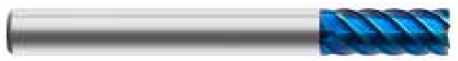
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1017500605	**6.0**	0.5	6	9.0	20.0	90	5.85
1017600601	**6.0**	1.0	6	9.0	20.0	90	5.85
1017500805	**8.0**	0.5	8	12.0	25.0	100	7.7
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

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	-0.015	+0.015	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

EXTENDED NECK CORNER RADIUS FINISHING

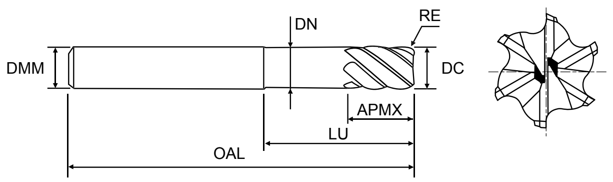
NG HM | ZEFP 6 | RE | FHA 45º | DIN 6535HA | NECK



Series No. 108350

▶ cutting conditions : p.56

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 **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1083500916	**6.0**	0.25	6	6.0	14.0	50	5.7
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

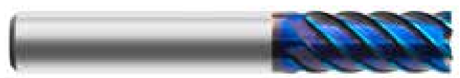
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1083500901	**6.0**	0.5	6	13.0	70
1083500910	**6.0**	0.5	6	26.0	70
1083500902	**8.0**	0.5	8	19.0	90
1083500911	**8.0**	0.5	8	36.0	90
1083500903	**10.0**	0.5	10	22.0	100
1083500904	**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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
6.0	0.00 / -0.02	-0.010	+0.010	h6
8.0 - 20.0	0.00 / -0.02	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

FINISHING, LONG SERIES

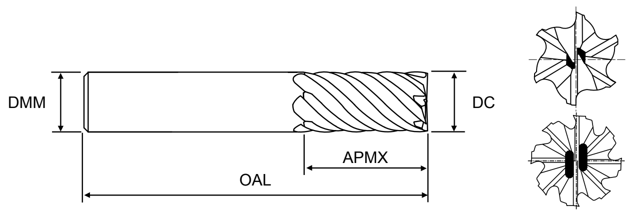
NG HM | ZEFP 6 | ZEFP 8 | FHA 45º | DIN 6535HA



Series No. 102950

▶ cutting conditions : p.57

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

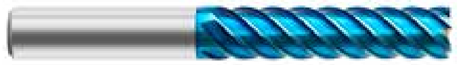


EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**
1029500600	**6.0**	6	13.0	57	6
1029500800	**8.0**	8	19.0	63	6
1029501000	**10.0**	10	22.0	72	6
1029501200	**12.0**	12	26.0	83	6
1029501400	**14.0**	14	26.0	83	6
1029501600	**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

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

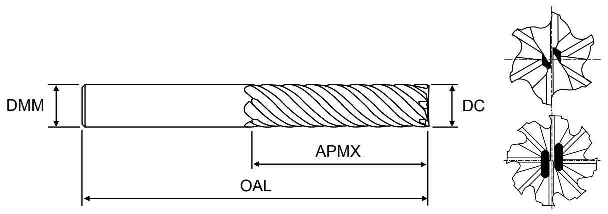
NG HM | ZEFP 6 | ZEFP 8 | FHA 45º | DIN 6535HA



Series No. 103950

▶ cutting conditions : p.58

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



EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**
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

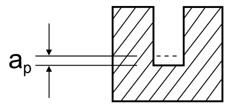
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good		○	●												●

PULSAR BLUE
CUTTING DATA

100450 (2 Flute Rib Processing)

VDI MATERIAL GROUP		HRc		Size (mm) 0.1	0.2	0.3	0.4	0.5	0.6	0.8
P	10-11	30-40	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
			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
N	26-28		a_p (mm)	0.016	0.016	0.018	0.031	0.033	0.035	0.041
			v_c (m/min)	15	31	46	62	74	82	90
			n	47770	49360	48830	49360	47130	43520	35820
			f_z	0.003	0.005	0.006	0.008	0.011	0.012	0.014
			f (mm/min)	285	490	585	790	1035	1045	1000
H	38	40-55	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
			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
	39	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
			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



▶ The data shown is based on medial length tools. Please adust 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

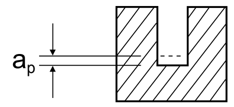
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

100450 (2 Flute Rib Processing)

VDI MATERIAL GROUP		HRc		Size (mm) 1.0	1.2	1.5	2.0	3.0	4.0
P	10-11	30-40	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
			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
N	26-28		a_p (mm)	0.033	0.068	0.08	0.138	0.228	0.3
			v_c (m/min)	89	93	94	102	104	104
			n	28340	24680	19955	16240	11040	8280
			f_z	0.018	0.021	0.026	0.033	0.079	0.079
			f (mm/min)	1020	1030	1035	1070	1740	1305
H	38	40-55	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
			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
	39	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
			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



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

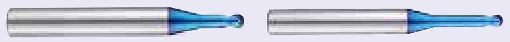
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

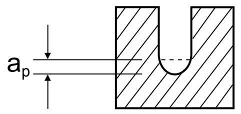
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

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



VDI MATERIAL GROUP		HRc		Size (mm)						
				0.1	0.2	0.3	0.4	0.5	0.6	0.8
P	10-11	30-40	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
			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
N	26-28		a_p (mm)	0.016	0.016	0.012	0.034	0.026	0.03	0.06
			v_c (m/min)	15	31	46	62	78	86	102
			n	47770	49360	48830	49360	49680	45640	40600
			f_z	0.009	0.019	0.03	0.044	0.05	0.059	0.08
			f (mm/min)	860	1875	2930	4340	4965	5385	6495
H	38	40-55	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
			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
	39	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
			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



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

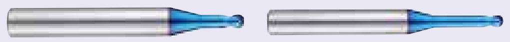
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

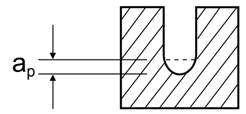
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

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



VDI MATERIAL GROUP		HRc		Size (mm)					
				1.0	1.2	1.5	2.0	3.0	4.0
P	10-11	30-40	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
			f_z	0.07	0.083	0.105	0.14	0.244	0.318
			f (mm/min)	2940	2730	2630	2720	3365	3340
N	26-28		a_p (mm)	0.066	0.042	0.059	0.138	0.228	0.3
			v_c (m/min)	115	126	107	115	136	120
			n	36620	33435	22715	18310	14435	9550
			f_z	0.09	0.102	0.133	0.177	0.314	0.39
			f (mm/min)	6590	6820	6040	6480	9065	7450
H	38	40-55	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
			f_z	0.061	0.078	0.095	0.12	0.223	0.29
			f (mm/min)	1980	2025	2015	1985	2460	2400
	39	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
			f_z	0.057	0.07	0.084	0.1	0.21	0.265
			f (mm/min)	1850	1820	1780	1655	2315	2150



▶ The data shown is based on medial length tools. Please adust 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: $n = \frac{v_c * 1000}{\pi * ø}$

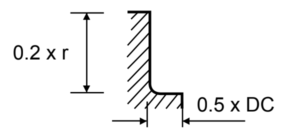
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

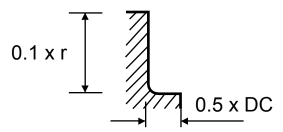
110350, 111350 (4 Flute High Feed)  

VDI MATERIAL GROUP		HRc	NORMAL SPEED	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
				Size (mm)								
P	10-11	30-40	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
			f (mm/min)	6495	5350	7000	7130	7700	7700	7650	7695	7610
H	38	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
			f (mm/min)	3780	4140	4455	4775	4775	4775	4775	4760	5030
	38	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
			f (mm/min)	2225	2865	3185	3290	3525	3485	3500	3520	3480
	39	55-65	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
			f (mm/min)	990	1070	1260	1620	1855	1835	1870	1855	1700
	39	65-70	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
			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: $n = \frac{v_c * 1000}{\pi * ø}$

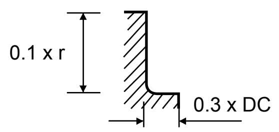
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

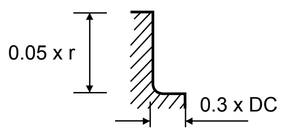
110350, 111350 (4 Flute High Feed)  

VDI MATERIAL GROUP		HRc	HIGH SPEED	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
				Size (mm)								
P	10-11	30-40	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
			f (mm/min)	14790	15840	17595	17960	18570	18430	18405	18600	18410
H	38	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
			f (mm/min)	9895	9985	12135	12660	13970	13945	13935	14010	13925
	38	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
			f (mm/min)	7925	13585	9315	9870	11045	10935	11020	11025	10940
	39	55-65	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
			f (mm/min)	4500	4620	5475	5995	6365	6665	6830	6965	6965
	39	65-70	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
			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

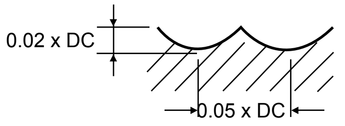
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

107350 (3 Flute B/N centre match)

VDI MATERIAL GROUP		HRc		Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	10-11	30-40	v_c (m/min)	300	305	315	340	340	340	340	340	340
			n	31845	24280	20060	18045	13535	10825	9020	6765	5410
			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	38	40-50	v_c (m/min)	255	255	265	285	285	285	285	285	285
			n	27070	20300	16875	15125	11345	9075	7560	5670	4535
			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
	38	50-55	v_c (m/min)	185	185	195	230	230	230	230	230	230
			n	19635	14725	12420	12205	9155	7325	6100	4575	3660
			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
	39	55-65	v_c (m/min)	175	180	185	210	210	210	210	210	210
			n	18575	14330	11780	11145	8360	6685	5570	4180	3340
			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
	39	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
			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

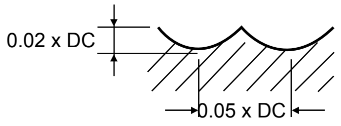
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

101950 (4 Flute B/N centre match)

VDI MATERIAL GROUP		HRc		Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	10-11	30-40	v_c (m/min)	340	340	340	340	340	340	340	340	340
			n	36090	27070	21655	18045	13535	10825	9020	6765	5410
			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	38	40-50	v_c (m/min)	285	285	285	285	285	285	285	285	285
			n	30255	22690	18150	15125	11345	9075	7560	5670	4535
			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
	38	50-55	v_c (m/min)	230	230	230	230	230	230	230	230	230
			n	24415	18310	14650	12205	9155	7325	6100	4575	3660
			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
	39	55-65	v_c (m/min)	210	210	210	210	210	210	210	210	210
			n	22290	16720	13375	11145	8360	6685	5570	4180	3340
			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
	39	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
			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: $n = \frac{v_c * 1000}{\pi * ø}$

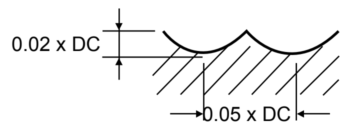
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

100550, 104350, 105350, 112350 (2 Flute B/N) 

VDI MATERIAL GROUP		HRc		Size (mm)								
				0.4	0.5	0.6	0.8	1.0	1.2	1.5	2.0	3.0
P	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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: $n = \frac{v_c * 1000}{\pi * ø}$

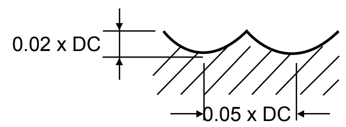
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

100550, 104350, 105350, 112350 (2 Flute B/N) 

VDI MATERIAL GROUP		HRc		Size (mm)							
				4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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

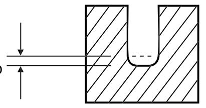
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

101850, 102350 (2 Flute Crn Rad Rib Processing)

VDI MATERIAL GROUP		HRc		Size (mm) 0.5	0.6	0.8	1.0	1.2	1.5	2.0
P	10-11	30-40	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	38	40-55	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
	39	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 adust 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

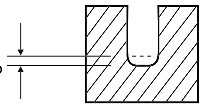
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

101850, 102350 (2 Flute Crn Rad Rib Processing)

VDI MATERIAL GROUP		HRc		Size (mm) 3.0	4.0	6.0	8.0
P	10-11	30-40	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	38	40-55	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
	39	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 adust 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.

CUTTING DATA

100350 (2 Flute Miniature)

VDI MATERIAL GROUP		HRc		Size (mm) 0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5	2.0
P	10-11	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	38	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
	38	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
	39	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
	39	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

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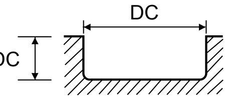

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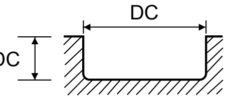


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

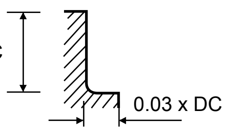
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

101650, 101750 (4 Flute Crn Rad Extended Neck)

VDI MATERIAL GROUP		HRc		Size (mm) 3.0	4.0	6.0	8.0	10.0	12.0
P	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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: $n = \frac{v_c * 1000}{\pi * ø}$

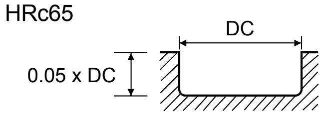
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

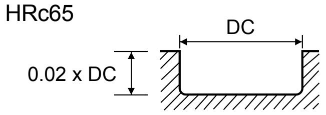
101350, 101450 (2 Flute Extended Neck) **SLOTTING**

VDI 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	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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



> 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: $n = \frac{v_c * 1000}{\pi * ø}$

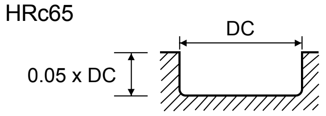
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

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

VDI 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	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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



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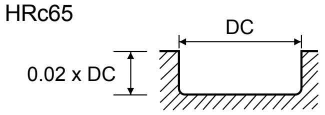
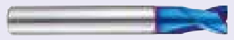


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

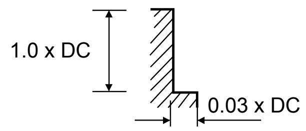
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

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

VDI MATERIAL GROUP		HRc		Size (mm)						
				1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**
P	10-11	**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	38	**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
	38	**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
	39	**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
	39	**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
	39	**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



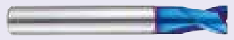
▶ Profiling is not recommended for tools below 1.0mm.

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

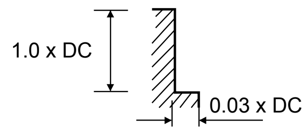
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

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

VDI MATERIAL GROUP		HRc		Size (mm)						
				5.0	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
P	10-11	**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	38	**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
	38	**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
	39	**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
	39	**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
	39	**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

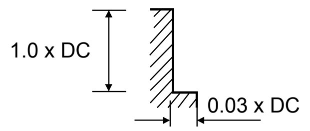
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

103350, 101550 (4 Flute Extended Neck)

	VDI MATERIAL GROUP	HRc		Size (mm)							
				1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
P	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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

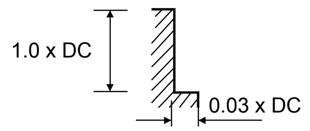
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

103350, 101550 (4 Flute Extended Neck)

	VDI MATERIAL GROUP	HRc		Size (mm)						
				5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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: $n = \frac{v_c * 1000}{\pi * ø}$

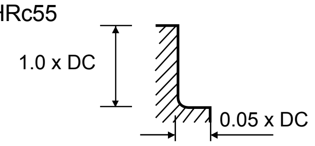
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

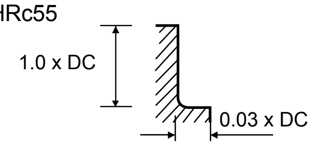
108350 (6 Flute 45º Corner Radius)

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
P	10-11	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	38	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
	38	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
	39	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
	39	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
	39	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

< HRc55



> HRc55



▶ The data shown is based on medial length tools. Please adust 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

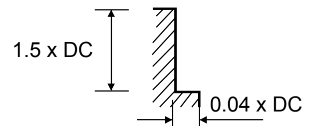
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

102950 (6 Flute 45º Long Length)

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	10-11	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	38	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
	39	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
	39	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

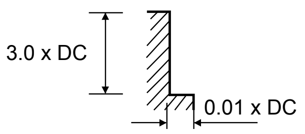
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

103950 (6 Flute 45º Extra Length) 

VDI MATERIAL GROUP		HRc		Size (mm)						
				6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	10-11	30-40	v_c (m/min)	60	60	60	60	60	60	60
			n	3185	2385	1910	1590	1190	955	760
			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	38	40-55	v_c (m/min)	60	60	60	60	60	60	60
			n	3185	2385	1910	1590	1190	955	760
			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
	39	55-65	v_c (m/min)	50	50	50	50	50	50	50
			n	2650	1990	1590	1325	995	795	635
			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.

PULSAR

Designed specifically for use in dry cutting conditions

P			M		K		N					S		H	MACHINING GUIDE	Code	Item	Description	Page No.
1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39					
																HIGH FEED END MILLS			
○	○	●			○	○								●		153320		Full Radius 2 Flute ø3.0mm - 16.0mm	P.64
○	○	●			○	○								●		152320		Economy 2 Flute ø3.0mm - 16.0mm	P.65
○	○	●			○	○								●		154320		Economy 4 Flute ø3.0mm - 16.0mm	P.66
																2-FLUTE END MILLS			
	●	●			○	○								●		100320		Miniature ø0.4mm - 1.5mm	P.67
○	●	●	○		○	○								●		100120 100320		Short Length ø1.0mm - 25.0mm	P.68-69
○	●	●			○	○								●		102120 102320		Long Length ø4.0mm - 20.0mm	P.70
○	●	●			○	○								●		155120 155320		Long Length Corner Radius ø4.0mm - 20.0mm	P.71
○	●	●			○	○								●		107320 108320		Rib Processing ø0.6mm - 3.0mm	P.72
○	●	●			○	○								●		105320		Miniature Ball Nose ø0.6mm - 1.5mm	P.73
○	●	●												●		116120 116320		Stub Length >HRc55 Ball Nose ø1.0mm - 25.0mm	P.74
○	●	●			○	○								●		118120 118320		Short Length Ball Nose ø3.0mm - 20.0mm	P.75
○	●	●			○	○								●		112120 112320		Long Length Ball Nose ø1.0mm - 25.0mm	P.76
○	●	●			○	○								●		114320		Long Reach Ball Nose ø2.0mm - 20.0mm	P.77
○	●	●			○	○								●		143320		Rib Processing Ball Nose ø0.6mm - 4.0mm	P.78
																3-FLUTE END MILLS			
○	●	●	○											●		103120 103320		Miniature ø1.0mm - 20.0mm	P.79
																4-FLUTE END MILLS			
○	●	●	○											●		109120 109320		Short Length ø2.0mm - 25.0mm	P.80-81
○	●	●												●		111120 111320		Long Length ø2.0mm - 25.0mm	P.82
○	●	●												●		156120 156320		Stub Length Corner Radius ø2.0mm - 16.0mm	P.83
○	●	●	○		○	○								●		157120 157320		Long Length Corner Radius ø3.0mm - 16.0mm	P.84
○	●	●			○	○								●		115120 115320		Long Length Ball Nose ø1.0mm - 25.0mm	P.85

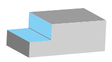
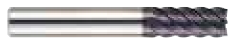
CONTINUED OVERLEAF

▶ For material group examples, refer to page 4

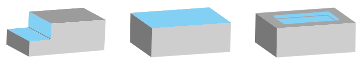
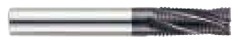
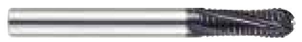
▶ For full material group tables, refer to pages 334-347

INDEX

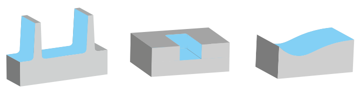
6 & 8 FLUTE END MILLS

P			M		K		N					S		H	MACHINING GUIDE	Code	Item	Description	Page No.
1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39					
○	●	●			○	○								●		149120 149320		Long Length 45º Helix ø6.0mm - 25.0mm	P.86
○	●	●			○	○								●		150120 150320		Extra Long Length 45º Helix ø6.0mm - 25.0mm	P.87
○	●	●			○	○								●		158120 158320		Long Length 45º Helix, Corner Rad ø6.0mm - 20.0mm	P.88

ROUGHING END MILLS

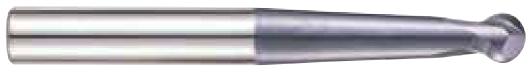
1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	MACHINING GUIDE	Code	Item	Description	Page No.
○	●	●	○		○	○								●		148120 148320		Short Length Multiflute ø6.0mm - 25.0mm	P.89
○	●	●	○		○	○								●		147120 147320		Long Length Multiflute ø6.0mm - 25.0mm	P.90
○	●	●			○	○								●		145120 145320		Long Length Ball Nose ø6.0mm - 20.0mm	P.91

TAPER END MILLS

1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	MACHINING GUIDE	Code	Item	Description	Page No.
○	●	●			○	○								●		120320		Rib Processing ø1.0mm - 2.0mm	P.92-93
○	●	●			○	○								●		130320		Rib Processing Ball Nose ø1.0mm - 2.0mm	P.94-95
																		Cutting Data	P.97

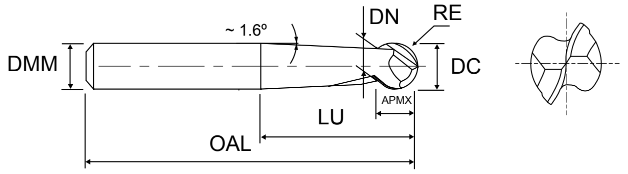
▶ For material group examples, refer to page 4
▶ For full material group tables, refer to pages 334-347

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 153320

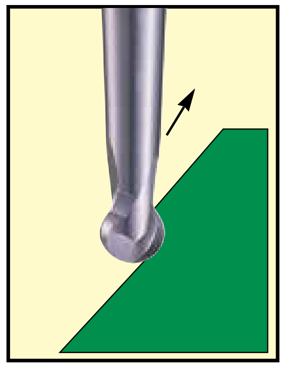
▶ cutting conditions : p.98



EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

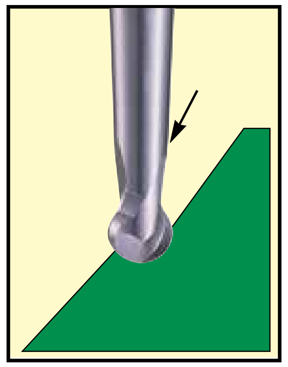
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.010	+0.010	h6

ADVANCED TECHNIQUE



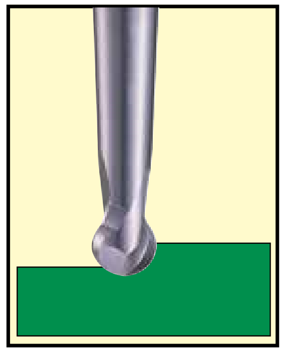
Favorable Back Milling

NORMAL TECHNIQUE

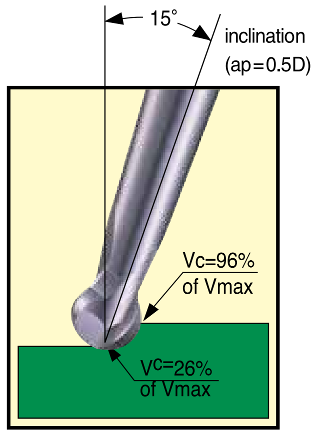


Normal Ball Nose

- 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.



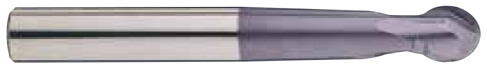
Normal Ball Nose



Favorable Profiling

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

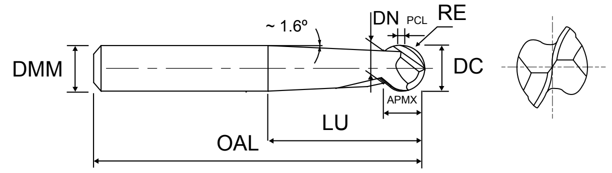
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	○	●			○	○								●



MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No. 152320

▶ cutting conditions : p.98



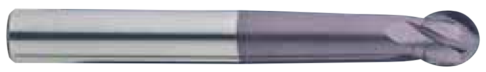
Designed with small flat for ease of regrind. Cannot be used for back milling, but is suitable for inclined profiling,

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**	FLAT **PCL**
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 **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.010	+0.010	h6

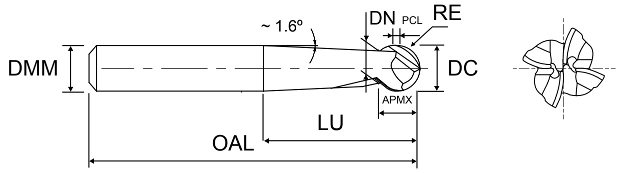
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	○	●			○	○								●

MG HM | ZEFP 4 | FHA 30° | DIN 6535HA | NECK



Series No. 154320

▶ cutting conditions : p.99

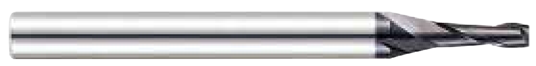


Designed with small flat for ease of regrind. Cannot be used for back milling, but is suitable for inclined profiling,

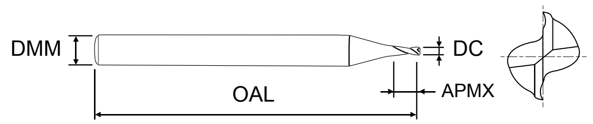
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN	FLAT PCL
1543200300	**3.0**	1.5	6.0	4.0	30.0	80.0	2.5	1.5
1543200400	**4.0**	2.0		5.0	30.0		3.3	
1543200500	**5.0**	2.5		6.0	43.0		4.1	2
1543200600	**6.0**	3.0		7.0	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 TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.010	+0.010	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	○	●			○	○								●



MG HM | ZEFP 2 | FHA 30° | DIN 6535HA



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 ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

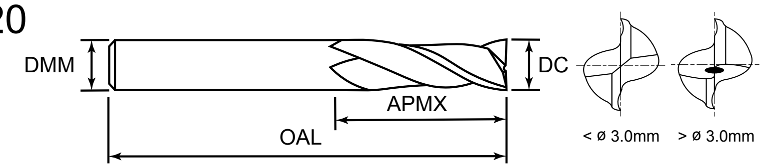
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good		●	●												●

SHORT LENGTH

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | DIN 6535HB

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.

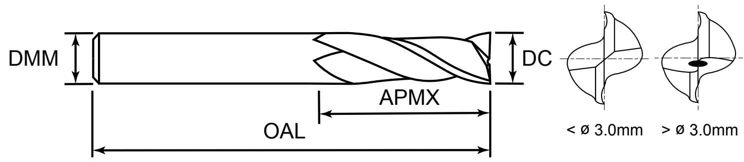
EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
-	1003200100	1.0	4	2.5	40
-	1003200150	1.5		4.0	
-	1003200200	2.0		6.0	
-	1003200250	2.5		8.0	
1001200300	1003200300	3.0	6	8.0	45
1001200350	1003200350	3.5		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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○		○	○								●

SHORT LENGTH

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | DIN 6535HB



Series No. 100120, 100320

▶ cutting conditions : p.100

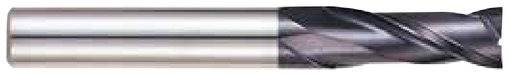
Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

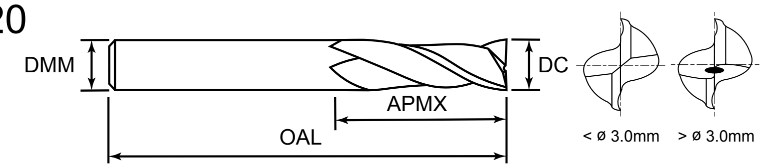
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○		○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | DIN 6535HB



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 **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
-	**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

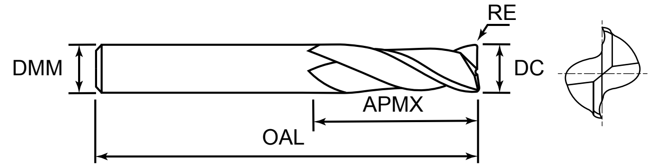
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | DIN 6535HB

Series No. 155120, 155320

▶ cutting conditions : p.102



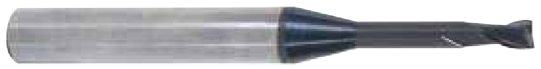
Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGT OF CUT **APMX**	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

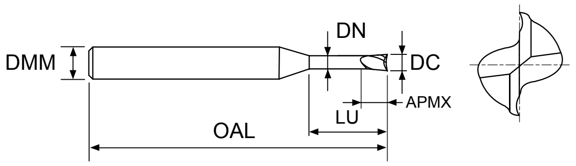
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●												●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 107320, 108320

▶ cutting conditions : p.108

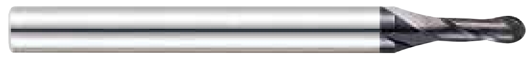


Designed to machine tool steels, alloy steels,
mould steels and other hardened materials.
Superior workpiece finishes, increased feed rates.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	h6

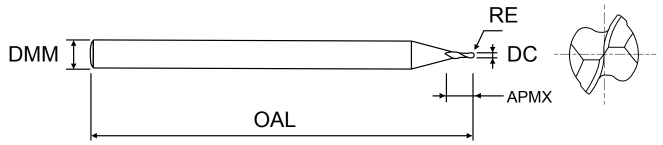
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●



MG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 105320

▶ cutting conditions : p.107



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

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGT OF CUT **APMX**	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
	RETOLL	**RETOLU**	
0.00 / -0.03	-0.010	+0.010	h6

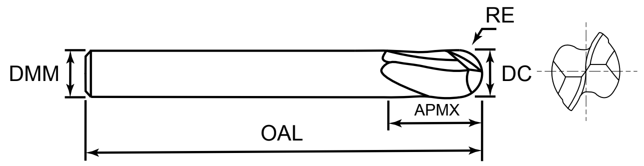
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

STUB CUT LENGTH BALL NOSE >HRC55

MG HM | ZEFP 2 | FHA 15° | DIN 6535HA | DIN 6535HB

Series No. 116120, 116320

▶ cutting conditions : p.106



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

EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGT OF CUT APMX	OVERALL LENGTH OAL
-	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 TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.010	+0.010	h6

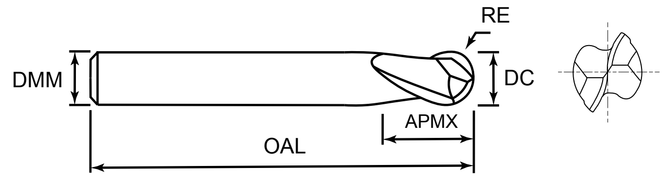
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●												●

SHORT LENGTH BALL NOSE

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | DIN 6535HB

Series No. 118120, 118320

▶ cutting conditions : p.103



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

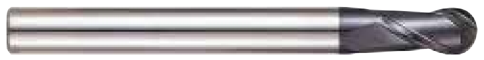
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGT OF CUT APMX	OVERALL LENGTH OAL
1181200300	1183200300	3.0	1.5	6	4.0	50
1181200400	1183200400	4.0	2.0		5.0	54
1181200500	1183200500	5.0	2.5		6.0	
1181200600	1183200600	6.0	3.0		7.0	
1181200700	1183200700	7.0	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 TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.020	+0.020	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●			○	○								●

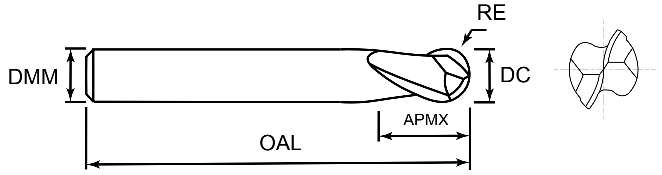
LONG LENGTH BALL NOSE

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | DIN 6535HB



Series No. 112120, 112320

▶ cutting conditions : p.104



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

EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGT OF CUT **APMX**	OVERALL LENGTH **OAL**
-	**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

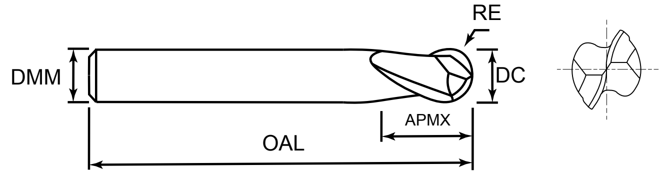
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.020	+0.020	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●			○	○								●

LONG REACH BALL NOSE

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | DIN 6535HB

Series No. 114320



▶ cutting conditions : p.105

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

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGT OF CUT **APMX**	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.020	+0.020	h6

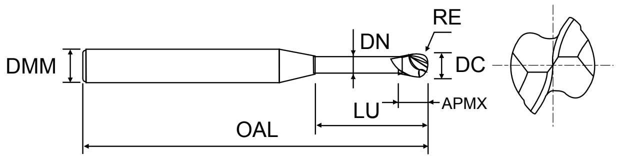
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●			○	○								●

EUROPA TOOL

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No. 143320

▶ cutting conditions : p.109



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

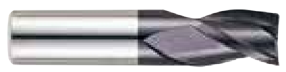
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1433200060	**0.6**	0.3	3	0.9	6	35	0.55
1433200080	**0.8**	0.4	4	1.2	6	45	0.75
1433200081	**0.8**	0.4	4	1.2	8	45	0.75
1433200100	**1.0**	0.5	4	1.5	6	45	0.97
1433200101	**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

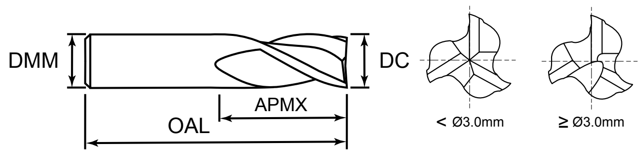
Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.02	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

EUROPA TOOL

MG HM | ZEFP 3 | FHA 30° | DIN 6535HA | DIN 6535HB





Series No. 103120, 103320

▶ cutting conditions : p.110-111

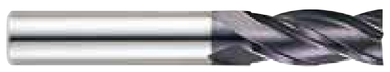
The miniature end mill is universally adopted as the most cost effective system for small milling cutters and has the advantages of 2 flute and 4 flute end mills.

EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
-	**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

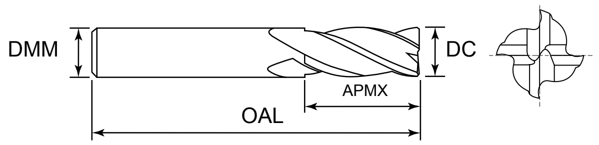
Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○											●

MG HM | ZEFP 4 | FHA 30° | DIN 6535HA | DIN 6535HB



Series No. 109120, 109320



▶ cutting conditions : p.112

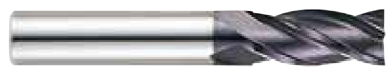
Designed to machine tool steels, alloy steels, mould steels and other hardened materials.
4 flutes allow for better workpiece finishes.

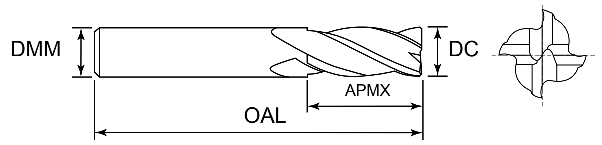
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
-	1093200200	2.0	4	6.0	40
-	1093200250	2.5		8.0	
1091200300	1093200300	3.0	6	8.0	45
1091200350	1093200350	3.5		10.0	
1091200400	1093200400	4.0		11.0	
1091200450	1093200450	4.5		11.0	
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○											●

MG HM | ZEFP 4 | FHA 30° | DIN 6535HA | DIN 6535HB





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.

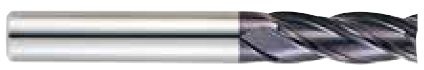
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1091201050	1093201050	10.5	12	22.0	75
1091201100	1093201100	11.0		22.0	
1091201150	1093201150	11.5		22.0	
1091201200	1093201200	12.0		26.0	
1091201300	1093201300	13.0		26.0	85
1091201400	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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○											●

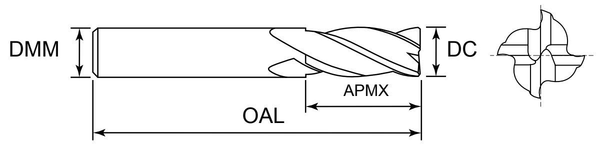
LONG LENGTH

MG HM | ZEFP 4 | FHA 30° | DIN 6535HA | DIN 6535HB



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.

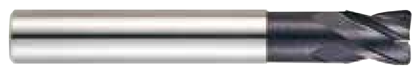
EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
-	**1113200200**	**2.0**	4	8.0	40
1111200300	**1113200300**	**3.0**	6	12.0	50
1111200400	**1113200400**	**4.0**		15.0	
1111200500	**1113200500**	**5.0**		20.0	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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●												●

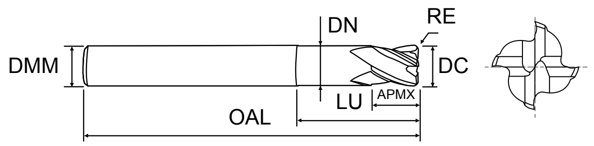
STUB CUT LENGTH CORNER RADIUS

MG HM | ZEFP 4 | RE | FHA 30° | DIN 6535HA | DIN 6535HB | NECK



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.

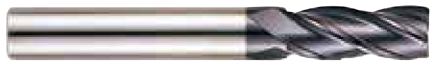
EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1561200200	**1563200200**	**2.0**	0.2	6	2.5	5.0	50	1.9
1561200250	**1563200250**	**2.5**	0.25		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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●												●

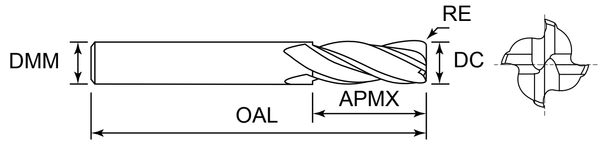
LONG LENGTH CORNER RADIUS

MG HM | ZEFP 4 | RE | FHA 30º | DIN 6535HA | DIN 6535HB



Series No. 157120, 157320

▶ cutting conditions : p.114



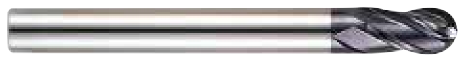
Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○		○	○								●

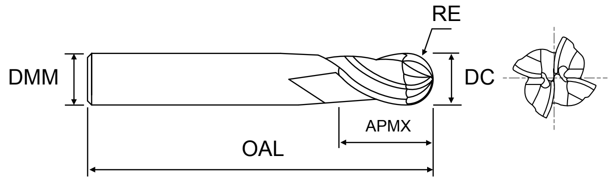
LONG LENGTH BALL NOSE



MG HM | ZEFP 4 | FHA 30º | DIN 6535HA | DIN 6535HB

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.

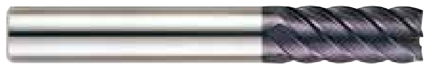
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
-	**1153200100**	**1.0**	0.5	4	2.5	50
-	**1153200150**	**1.5**	0.75		4	
1151200200	**1153200200**	**2.0**	1.0	6	5	
1151200300	**1153200300**	**3.0**	1.5		8	60
1151200400	**1153200400**	**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 TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

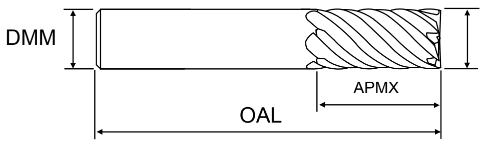
LONG LENGTH 45º HELIX

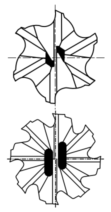
MG HM | ZEFP 6 | ZEFP 8 | FHA 45º | DIN 6535HA | DIN 6535HB



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.

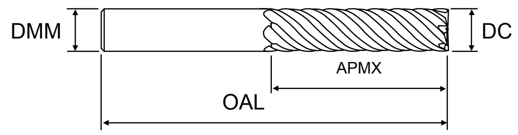
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1491200600	**1493200600**	**6.0**	6	13.0	57	6
1491200700	**1493200700**	**7.0**	8	16.0	63	6
1491200800	**1493200800**	**8.0**		19.0		6
1491200900	**1493200900**	**9.0**	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

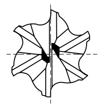
Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

EXTRA LONG LENGTH 45º HELIX

MG HM | ZEFP 6 | FHA 45º | DIN 6535HA | DIN 6535HB





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.

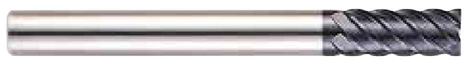
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1501200600	**1503200600**	**6.0**	6	26.0	70
1501200800	**1503200800**	**8.0**	8	36.0	90
1501201000	**1503201000**	**10.0**	10	46.0	100
1501201200	**1503201200**	**12.0**	12	56.0	110
1501201600	**1503201600**	**16.0**	16	66.0	130
1501202000	**1503202000**	**20.0**	20	76.0	140
1501202500	**1503202500**	**25.0**	25	92.0	180

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

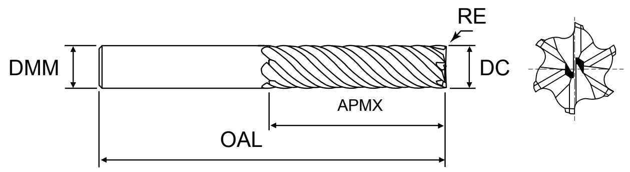
LONG LENGTH 45º HELIX CORNER RADIUS

MG HM | ZEFP 6 | RE | FHA 45º | DIN 6535HA | DIN 6535HB



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.

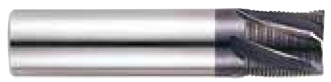
EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1581200600	**1583200600**	**6.0**	0.5	6	13.0	70
1581200800	**1583200800**	**8.0**	0.5	8	19.0	90
1581201000	**1583201000**	**10.0**	0.5	10	22.0	100
1581209001	**1583209001**	**10.0**	1.0		22.0	
1581201200	**1583201200**	**12.0**	0.5	12	26.0	110
1581209002	**1583209002**	**12.0**	1.0		26.0	
1581201600	**1583201600**	**16.0**	1.0	16	32.0	130
1581209003	**1583209003**	**16.0**	1.5		32.0	
1581202000	**1583202000**	**20.0**	1.0	20	38.0	140
1581209004	**1583209004**	**20.0**	1.5		38.0	
1581209005	**1583209005**	**20.0**	2.0		38.0	

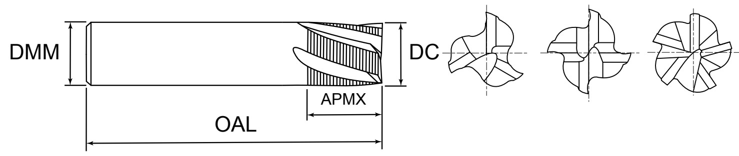
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●			○	○								●

SHORT LENGTH 20º HELIX ROUGHING

MG HM | ZEFP 3 | ZEFP 4 | ZEFP 5 | FHA 20º | FINE | DIN 6535HA | DIN 6535HB





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.

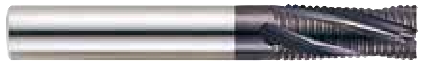
EUROPA CODE **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**
1481200600	**1483200600**	**6.0**	6	7.0	54	3
1481200700	**1483200700**	**7.0**	8	8.0	58	3
1481200800	**1483200800**	**8.0**		9.0		3
1481200900	**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

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
6.0 - 10.0	0.00 / -0.058	h6
12.0 - 18.0	0.00 / -0.070	
20.0, 25.0	0.00 / -0.084	

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●	○		○	○								●

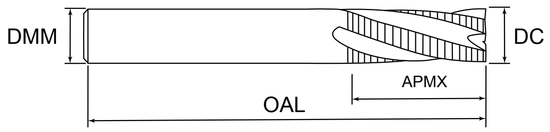
LONG LENGTH 20º HELIX ROUGHING

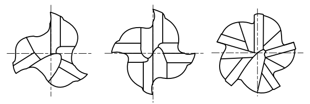
MG HM | ZEFP 3 | ZEFP 4 | ZEFP 5 | FHA 20º | FINE | DIN 6535HA | DIN 6535HB



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.

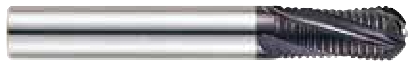
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1471200600	**1473200600**	**6.0**	6	16.0	57	3
1471200700	**1473200700**	**7.0**	8	16.0	63	3
1471200800	**1473200800**	**8.0**		16.0		3
1471200900	**1473200900**	**9.0**	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

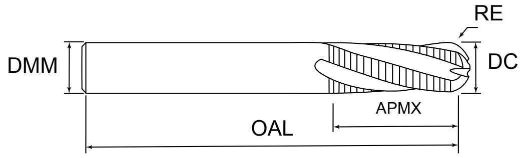
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
6.0 - 10.0	0.00 / -0.058	h6
12.0 - 18.0	0.00 / -0.070	
20.0, 25.0	0.00 / -0.084	

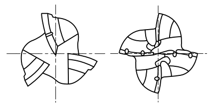
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●	○		○	○								●

LONG LENGTH BALL NOSE ROUGHING

MG HM | ZEFP 3 | ZEFP 4 | FHA 20º | FINE | DIN 6535HA | DIN 6535HB







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 ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
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

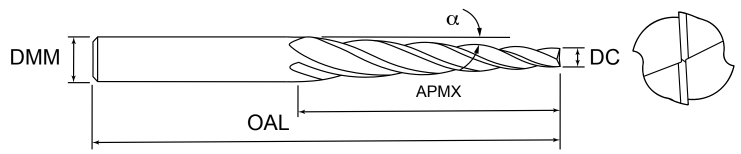
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
6.0 - 10.0	0.00 / -0.058	-0.02	+0.02	h6
12.0 - 18.0	0.00 / -0.070			
20.0	0.00 / -0.084			

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

MG HM | ZEFP 4 | FHA 25° | DIN 6535HA

Series No. 120320

▶ cutting conditions : p.122



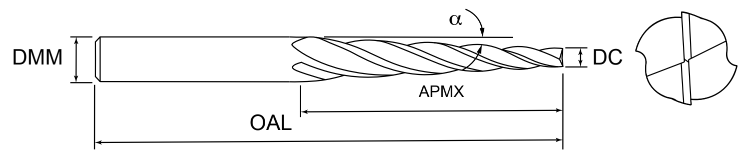
Designed to machine tool steels, alloy steels, mould steels and other hardened materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	TAPER α	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	α Tolerance	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	±5'	0.00 / -0.008

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●			○	○								●

MG HM | ZEFP 4 | FHA 25° | DIN 6535HA



Series No. 120320

▶ cutting conditions : p.122

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

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	TAPER α	OVERALL LENGTH **OAL**
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

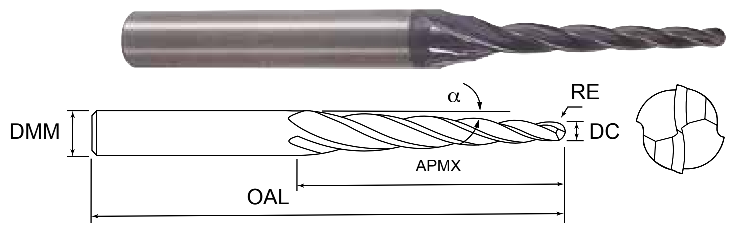
Mill Dia. Tolerance **TCDC**(mm)	α Tolerance	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	±5'	0.00 / -0.008

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	●	●			○	○								●

MG HM | ZEFP 4 | FHA 25° | DIN 6535HA

Series No. 130320

▶ cutting conditions : p.123



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

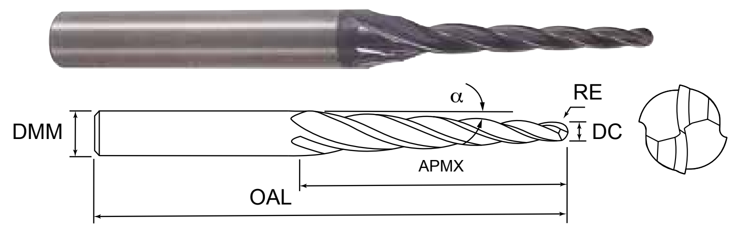
EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	TAPER α	OVERALL LENGTH **OAL**
1303200100	**1.0**	0.5	4	8.0	30'	45
1303200101	**1.0**	0.5	4	12.0	30'	45
1303200102	**1.0**	0.5	4	8.0	1°	45
1303200103	**1.0**	0.5	4	12.0	1°	45
1303200104	**1.0**	0.5	4	8.0	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 **TCDC**(mm)	α Tolerance	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	±5'	-0.01	+0.01	0.00 / -0.008

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

TAPER RIB PROCESSING BALL NOSE

MG HM | ZEFP 4 | FHA 25° | DIN 6535HA



Series No. 130320

▶ cutting conditions : p.123

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

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	TAPER α	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	α Tolerance	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	±5'	-0.01	+0.01	0.00 / -0.008

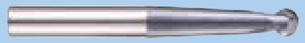
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	●	●			○	○								●

EUROPA TOOL

PULSAR

CUTTING DATA

152320, 153320 (2 Flute Sphere)

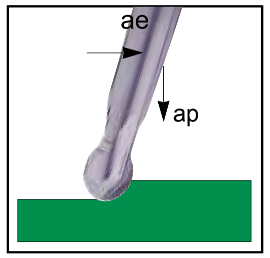



VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	6-11	30-40	v_c (m/min)	310	315	315	300	300	315	300	275
			n	33000	25000	20000	16000	12000	10000	8000	5500
			f_z	0.039	0.044	0.05	0.056	0.067	0.07	0.081	0.1
			f (mm/min)	2600	2200	2000	1800	1600	1400	1300	1100
K	15-20		v_c (m/min)	330	325	330	320	325	330	340	300
			n	35000	26000	21000	17000	13000	10500	9000	6000
			f_z	0.04	0.044	0.05	0.056	0.065	0.069	0.078	0.1
			f (mm/min)	2800	2300	2100	1900	1700	1450	1400	1200
H	38-39	45-65	v_c (m/min)	115	115	110	115	115	110	115	100
			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

VDI MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	6-11	30-40	v_c (m/min)	415	415	425	415	425	410	415	400
			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
K	15-20		v_c (m/min)	445	440	440	435	450	440	450	450
			n	47000	35000	28000	23000	18000	14000	12000	9000
			f_z	0.039	0.046	0.05	0.057	0.064	0.071	0.075	0.089
			f (mm/min)	3700	3200	2800	2600	2300	2000	1800	1600
H	38-39	45-65	v_c (m/min)	160	165	155	150	150	155	150	165
			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

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 DC
▶ ae = 0.02 x DC



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.

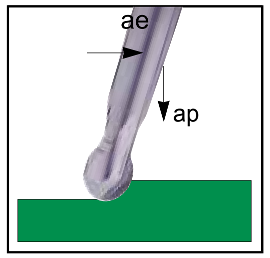
154320 (4 Flute Sphere)

VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	6-11	30-40	v_c (m/min)	310	315	315	300	300	315	300	375
			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
K	15-20		v_c (m/min)	330	325	330	320	325	330	340	300
			n	35000	26000	21000	17000	13000	10500	9000	6000
			f_z	0.039	0.042	0.048	0.059	0.067	0.071	0.078	0.117
			f (mm/min)	5400	4300	4000	4000	3500	3000	2800	2800
H	38-39	45-65	v_c (m/min)	115	115	110	115	115	110	115	100
			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

VDI MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	6-11	30-40	v_c (m/min)	415	415	425	415	425	410	415	400
			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
K	15-20		v_c (m/min)	445	440	440	435	450	440	450	450
			n	47000	35000	28000	23000	18000	14000	12000	9000
			f_z	0.038	0.044	0.05	0.055	0.064	0.07	0.077	0.086
			f (mm/min)	7100	6100	5600	5100	4600	3900	3700	3100
H	38-39	45-65	v_c (m/min)	160	165	155	150	150	155	150	165
			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

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 DC
▶ ae = 0.02 x DC

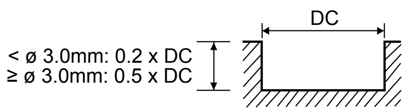


All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

CUTTING DATA

100120, 100320 (2 Flute Short)

VDI 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	1-9	< 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
	10-11	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
M	12, 13		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	15-20		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
H	38	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
	39	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



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: $n = \dfrac{v_c * 1000}{\pi * ø}$

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

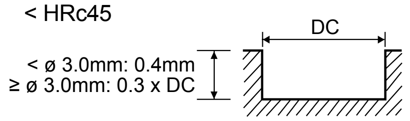
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

CUTTING DATA

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	1-9	< 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
	10-11	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
K	15-20		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
H	38-39	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

< HRc45



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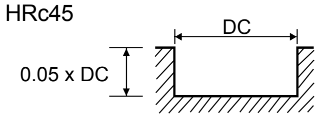


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

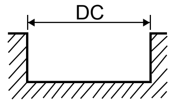
To calculate cutting speed from RPM: $v_c = \dfrac{n * \pi * ø}{1000}$

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.

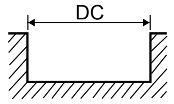
155120, 155320 (2 Flute Long, Corner Radius)

VDI MATERIAL GROUP		HRc		Size (mm) 4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-9	< 30	v_c (m/min)	65	70	75	75	80	80	85	80
			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
	10-11	30-45	v_c (m/min)	45	45	50	50	50	50	55	50
			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
K	15-20		v_c (m/min)	65	70	75	75	80	80	85	80
			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
H	38	45-55	v_c (m/min)	25	30	30	30	30	30	35	30
			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
	39	55-65	v_c (m/min)	20	20	20	20	20	20	20	20
			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

< 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: $n = \frac{v_c * 1000}{\pi * ø}$

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

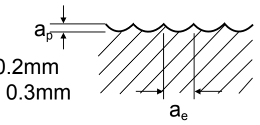
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

118120, 118320 (2 Flute Short, Ball Nose)

VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	6-11	30-40	v_c (m/min)	95	105	115	130	145	160	175	190	205
			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
K	15-20		v_c (m/min)	125	130	145	160	180	200	220	240	260
			n	13100	10500	9140	8490	7160	6370	5840	4770	4140
			f_z	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			f (mm/min)	680	740	820	1020	1290	1530	1750	1720	1660
H	38-39	45-65	v_c (m/min)	45	55	60	60	62	65	65	70	70
			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

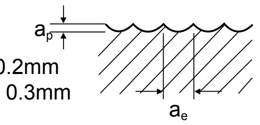
< HRc45

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



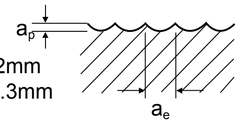
> HRc45

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



VDI MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	6-11	30-40	v_c (m/min)	200	265	330	395	420	440	460	480	500
			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
K	15-20		v_c (m/min)	200	265	330	395	420	440	460	480	500
			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	38-39	45-65	v_c (m/min)	160	170	190	200	210	220	230	240	250
			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

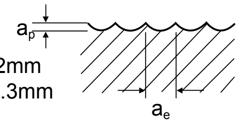
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x DC



112120, 112320 (2 Flute Long, Ball Nose)

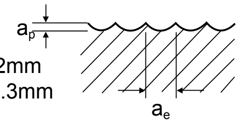
VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm)										
				1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	6-11	30-40	v_c (m/min)	40	65	95	105	115	130	145	160	175	190	205
			n	12720	10700	10000	8400	7300	6900	5770	5090	4640	3780	3260
			f_z	0.008	0.023	0.023	0.032	0.04	0.06	0.08	0.1	0.12	0.14	0.16
			f (mm/min)	200	490	460	530	580	830	920	1020	1110	1060	1040
K	15-20		v_c (m/min)	50	90	125	130	145	160	180	200	220	240	260
			n	15760	14400	13100	10500	9140	8490	7160	6370	5840	4770	4140
			f_z	0.008	0.026	0.026	0.035	0.045	0.06	0.09	0.12	0.15	0.18	0.2
			f (mm/min)	250	750	680	740	820	1020	1290	1530	1750	1720	1660
H	38-39	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
			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

< HRc45



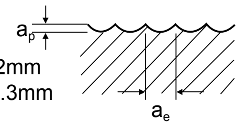
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.2 x DC

> HRc45



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

VDI MATERIAL GROUP		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	6-11	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	0.026	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
K	15-20		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	0.026	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	38-39	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	0.016	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

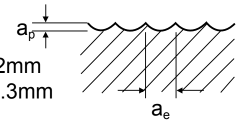


a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x DC

114320 (2 Flute Long Reach, Ball Nose)

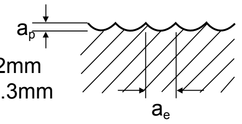
VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm)									
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	6-11	30-40	v_c (m/min)	60	75	85	90	105	115	130	140	150	165
			n	9250	8000	6720	5840	5500	4600	4070	3700	3000	2600
			f_z	0.014	0.023	0.031	0.039	0.055	0.08	0.101	0.12	0.142	0.16
			f (mm/min)	260	370	420	460	600	740	820	890	850	830
K	15-20		v_c (m/min)	80	100	105	115	130	145	160	175	190	205
			n	12600	10500	8400	7310	6800	5700	5100	4700	3800	3300
			f_z	0.017	0.026	0.035	0.045	0.06	0.09	0.12	0.149	0.182	0.202
			f (mm/min)	420	540	590	660	820	1030	1220	1400	1380	1330
H	38-39	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
			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

< HRc45



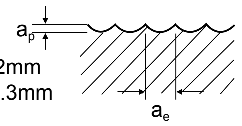
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.2 x DC

> HRc45



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

VDI MATERIAL GROUP		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	6-11	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
			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
K	15-20		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
			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	38-39	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
			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

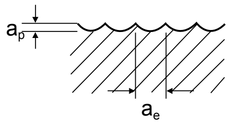


a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x DC

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

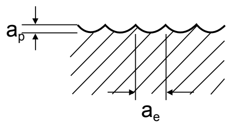
VDI MATERIAL GROUP		HRc	NORMAL SPEED	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
				Size (mm)										
H	38	45-50	v_c (m/min)	65	90	120	135	150	160	175	190	205	220	220
			n	20000	14500	12700	10600	9400	8600	7000	6050	5450	4350	3500
			f_z	0.012	0.028	0.043	0.052	0.059	0.067	0.0775	0.083	0.092	0.1	0.099
			f (mm/min)	460	800	1100	1100	1100	1150	1050	1000	1000	870	690
	38	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
			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
	39	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
			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
	39	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
			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 DC
a_p: ø5.0mm - 8.0mm = 0.25mm
a_p: ø10.0mm - 20.0mm = 0.3mm
a_e: 0.1 x DC



VDI MATERIAL GROUP		HRc	HIGH SPEED	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
				Size (mm)										
H	38	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
			f (mm/min)	770	1300	1750	1700	1650	1750	1550	1450	1420	1230	1000
	38	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
			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
	39	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
			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 DC
a_p: ø5.0mm - 8.0mm = 0.25mm
a_p: ø10.0mm - 20.0mm = 0.3mm
a_e: 0.05 x DC



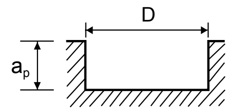
CUTTING DATA

100320 (2 Flute Miniature)

VDI MATERIAL GROUP		HRc		0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
				Size (mm)											
P	10-11	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
			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	38	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
			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

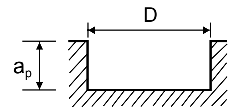
< HRc45

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

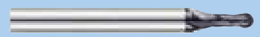


> HRc45

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



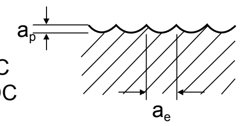
105320 (2 Flute Miniature, Ball Nose)



VDI MATERIAL GROUP		HRc		0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
				Size (mm)									
P	6-11	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
			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
K	15-20		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
			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	38	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
			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

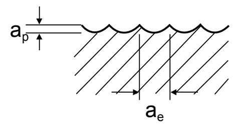
< HRc45

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



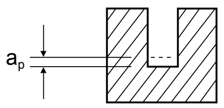
> HRc45

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



107320, 108320 (2 Flute Rib Processing)

VDI MATERIAL GROUP		HRc		Size (mm) 0.8	1.0	1.2	1.4	1.5	1.6	1.8	2.0	2.5	3.0
P	1-9	< 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
			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
	10-11	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
			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
K	15-20		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
			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
H	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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

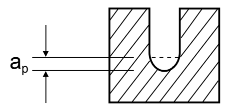
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

143320 (2 Flute Rib Processing, Ball Nose)

VDI MATERIAL GROUP		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	1-9	< 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
			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
	10-11	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
			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
K	15-20		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
			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
H	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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

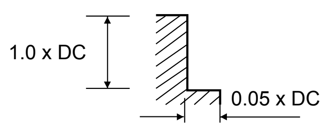
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

103120, 103320 (3 Flute Miniature) PROFILING

VDI 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	1-9	< 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
	10-11	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
M	12, 13		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
H	38	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
	39	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



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.

CUTTING DATA

103120, 103320 (3 Flute Miniature) SLOTTING

VDI 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	1-9	< 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
	10-11	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
M	12, 13		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
H	38	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
	39	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

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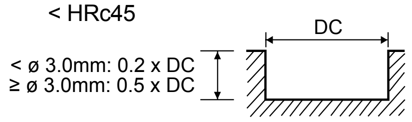

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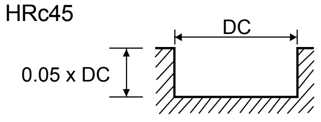


v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

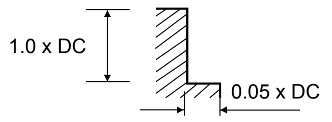
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

109120, 109320 (4 Flute Short Length)

VDI 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	1-9	< 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
	10-11	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
M	12, 13		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
H	38	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
	39	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



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: $n = \frac{v_c * 1000}{\pi * ø}$

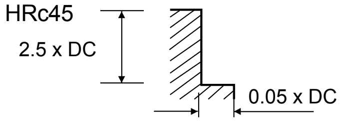
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

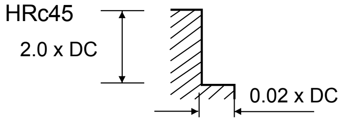
111120, 111320 (4 Flute Long Length)

VDI 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	1-9	< 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
	10-11	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	38	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
	39	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

< HRc45



> HRc45



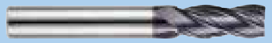
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

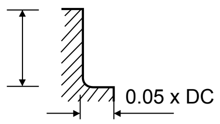
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

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

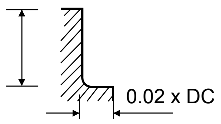


VDI MATERIAL GROUP		HRc		Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-9	< 30	v_c (m/min)	60	65	70	75	75	80	80	85
			n	6620	5360	4580	3950	3000	2520	2060	1740
			f_z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023
			f (mm/min)	170	210	215	215	230	230	180	160
	10-11	30-45	v_c (m/min)	40	45	45	50	50	50	50	55
			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
K	15-20		v_c (m/min)	60	65	70	75	75	80	80	85
			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
H	38	45-55	v_c (m/min)	25	25	30	30	30	30	30	35
			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
	39	55-65	v_c (m/min)	20	20	20	20	20	20	20	20
			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

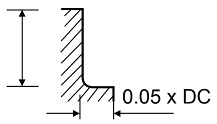
< HRc45



HRc45-55



> 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

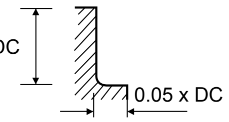
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

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

VDI MATERIAL GROUP		HRc		Size (mm)								
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-9	< 30	v_c (m/min)	85	100	115	120	125	125	125	125	135
			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
	10-11	30-45	v_c (m/min)	55	65	70	70	75	75	75	75	80
			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
K	15-20		v_c (m/min)	85	100	115	120	125	125	125	125	135
			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
H	38	45-55	v_c (m/min)	40	40	45	45	45	50	50	50	55
			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
	39	55-65	v_c (m/min)	-	20	20	25	25	25	25	25	25
			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



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: $v_c = \frac{n * \pi * ø}{1000}$

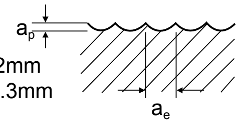
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

115120, 115320 (4 Flute Long, Ball Nose) 

VDI MATERIAL GROUP		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	6-11	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
			f (mm/min)	300	480	690	800	870	1250	1380	1530	1650	1600	1560
K	15-20		v_c (m/min)	50	100	125	130	145	160	180	200	220	240	260
			n	15760	15760	13100	10500	9140	8490	7160	6370	5840	4770	4140
			f_z	0.006	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136	0.151
			f (mm/min)	380	800	1020	1110	1230	1530	1950	2300	2600	2600	2500
H	38-39	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
			f (mm/min)	130	160	220	270	270	280	330	340	370	370	375

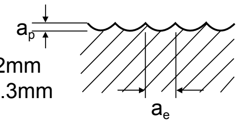
< HRc45

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



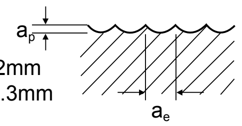
> HRc45

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



VDI MATERIAL GROUP		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	6-11	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
			f (mm/min)	1950	220	3000	4400	5400	6000	6000	5850	5850	5180	4770
K	15-20		v_c (m/min)	80	130	200	265	330	395	420	440	460	480	500
			n	2500	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
			f (mm/min)	1950	220	3000	4400	5400	6000	6000	5850	5850	5180	4770
H	38-39	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
			f (mm/min)	1200	1400	1560	1750	1800	1880	1880	1800	1740	1500	1380

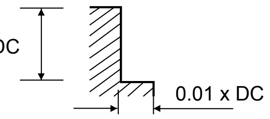
a_p: ø1.0mm - 6.0mm = 0.2mm
a_p: ø8.0mm - 20.0mm = 0.3mm
a_e: 0.05 x DC



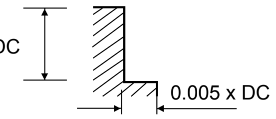
150120, 150320 (6 Flute Extra Length, 45° Helix) 

VDI MATERIAL GROUP		HRc		Size (mm)						
				6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	6-11	30-40	v_c (m/min)	40	40	40	40	40	40	40
			n	2230	1670	1330	1110	840	670	540
			f_z	0.035	0.045	0.055	0.06	0.065	0.07	0.074
			f (mm/min)	470	450	440	400	33	280	240
H	38	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
			f (mm/min)	350	330	300	270	230	200	170
	38-39	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
			f (mm/min)	250	240	230	210	170	150	130
	39	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
			f (mm/min)	200	180	160	150	130	120	95

< HRc50



> HRc50



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

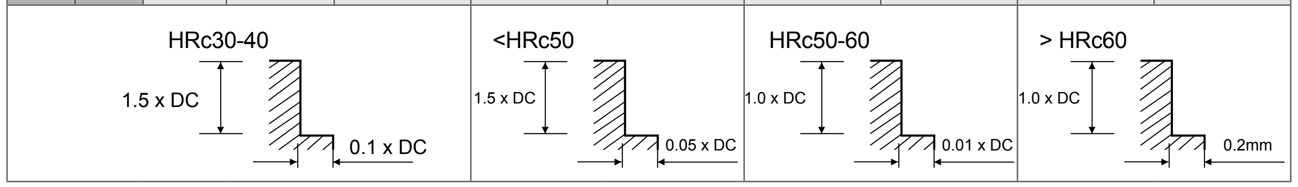
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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

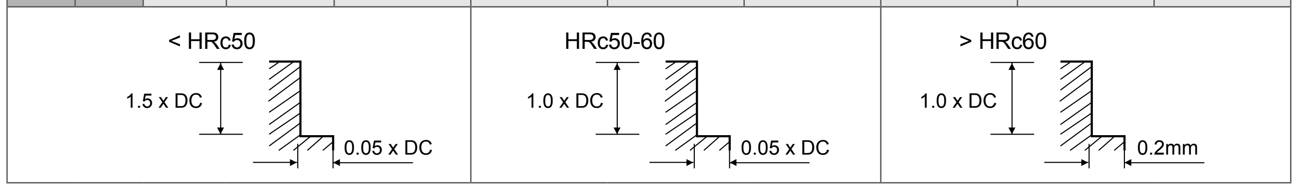
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

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

VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	6-11	30-40	v_c (m/min)	105	105	105	105	105	105	120
			n	5560	4200	3360	2840	2100	1680	1500
			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
H	38	< 50	v_c (m/min)	75	75	75	75	75	75	85
			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
	38-39	50-60	v_c (m/min)	30	30	30	30	30	30	35
			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
	39	> 60	v_c (m/min)	20	20	20	20	20	20	20
			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



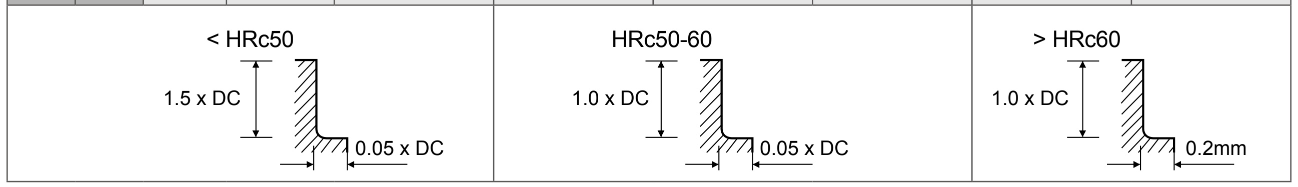
VDI MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
H	38	< 50	v_c (m/min)	315	315	315	315	315	315	355
			n	16800	12600	9980	8400	6300	5040	4500
			f_z	0.06	0.081	0.1	0.1	0.1	0.076	0.075
			f (mm/min)	6090	6090	5990	5040	3780	3050	2700
	38-39	50-60	v_c (m/min)	160	160	160	160	160	160	175
			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
	39	> 60	v_c (m/min)	80	80	80	80	80	80	90
			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



CUTTING DATA

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

VDI MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
H	38	< 50	v_c (m/min)	315	315	315	315	315	315
			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
	38-39	50-60	v_c (m/min)	160	160	160	160	160	160
			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
	39	> 60	v_c (m/min)	80	80	80	80	80	80
			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



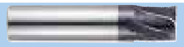
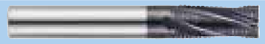
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

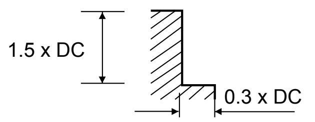
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

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

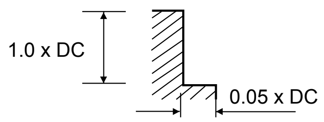



VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-9	< 30	v_c (m/min)	295	290	290	300	300	300	340
			n	15600	11600	9200	8000	6000	4800	4300
			f_z	0.05	0.067	0.063	0.075	0.1	0.113	0.1
			f (mm/min)	2320	2320	2320	2400	2400	2160	2150
	10-11	30-45	v_c (m/min)	235	230	240	225	240	225	250
			n	12400	9200	7600	6000	4800	3600	3200
			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
M	12, 13		v_c (m/min)	160	160	160	160	165	150	170
			n	8400	6300	5100	4200	3300	2400	2160
			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	15-20		v_c (m/min)	295	290	290	300	300	300	340
			n	15600	11600	9200	8000	6000	4800	4300
			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
H	38	45-55	v_c (m/min)	65	60	65	65	60	65	70
			n	3400	2400	2000	1680	1200	1000	900
			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
	39	55-65	v_c (m/min)	45	45	40	45	40	40	45
			n	2400	1800	1300	1200	800	660	600
			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

< HRc45



> HRc45



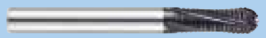
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

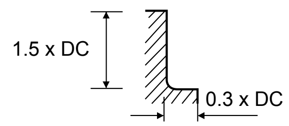
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

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

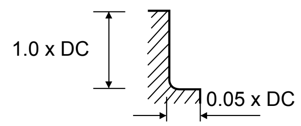


VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
P	1-9	< 30	v_c (m/min)	300	300	3000	295	300	300
			n	8000	6800	6000	5200	4800	4700
			f_z	0.075	0.088	0.1	0.112	0.113	0.112
			f (mm/min)	2400	2400	2400	2320	2160	2140
	10-11	30-38	v_c (m/min)	225	230	240	250	225	225
			n	6000	5200	4800	4400	3600	3500
			f_z	0.033	0.04	0.04	0.041	0.039	0.038
			f (mm/min)	800	840	760	720	560	540
K	15-20		v_c (m/min)	300	300	3000	295	300	300
			n	8000	6800	6000	5200	4800	4700
			f_z	0.075	0.088	0.1	0.112	0.113	0.112
			f (mm/min)	2400	2400	2400	2320	2160	2140
H	38	38-45	v_c (m/min)	160	160	165	155	150	150
			n	4200	3600	3300	2700	2400	2300
			f_z	0.034	0.04	0.039	0.039	0.038	0.037
			f (mm/min)	570	570	510	420	360	350
	38	45-55	v_c (m/min)	65	60	60	60	65	60
			n	1680	1400	1200	1100	1000	950
			f_z	0.039	0.036	0.033	0.034	0.038	0.036
			f (mm/min)	260	200	160	150	150	140
	39	55-65	v_c (m/min)	45	40	40	40	40	40
			n	1200	900	800	700	660	630
			f_z	0.04	0.036	0.034	0.036	0.038	0.038
			f (mm/min)	190	130	110	100	100	100

< 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: $n = \frac{v_c * 1000}{\pi * ø}$

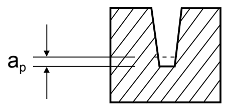
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

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

Material	VDI MATERIAL GROUP	HRc		Size (mm) 1.0	1.2	1.5	2.0
P	1-9	< 30	a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
			n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
			f (mm/min)	700	700	700	700
	10-11	30-45	a_p (mm)	0.025	0.032	0.04	0.05
			v_c (m/min)	45	50	45	50
			n	15000	13000	10000	8000
			f_z	0.008	0.01	0.013	0.016
			f (mm/min)	500	500	500	500
K	15-20		a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
			n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
			f (mm/min)	700	700	700	700
H	38	45-55	a_p (mm)	0.015	0.018	0.022	0.03
			v_c (m/min)	30	30	30	30
			n	10000	8000	6500	5000
			f_z	0.008	0.009	0.012	0.015
			f (mm/min)	300	300	300	300



▶ The data shown is based on medial length tools. Please adust 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: $n = \frac{v_c * 1000}{\pi * ø}$

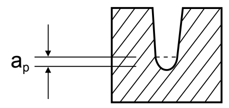
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

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

Material	VDI MATERIAL GROUP	HRc		Size (mm) 1.0	1.2	1.5	2.0
P	1-9	< 30	a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
			n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
			f (mm/min)	700	700	700	700
	10-11	30-45	a_p (mm)	0.025	0.032	0.04	0.05
			v_c (m/min)	45	50	45	50
			n	15000	13000	10000	8000
			f_z	0.008	0.01	0.013	0.016
			f (mm/min)	500	500	500	500
K	15-20		a_p (mm)	0.03	0.037	0.045	0.06
			v_c (m/min)	65	60	60	65
			n	20000	16000	13000	10000
			f_z	0.009	0.011	0.013	0.018
			f (mm/min)	700	700	700	700
H	38	45-55	a_p (mm)	0.015	0.018	0.022	0.03
			v_c (m/min)	30	30	30	30
			n	10000	8000	6500	5000
			f_z	0.008	0.009	0.012	0.015
			f (mm/min)	300	300	300	300



▶ The data shown is based on medial length tools. Please adust 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 for high speed cutting of pre-hardened steels up to HRc55

INDEX

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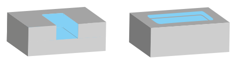
●	●	●	○		○	○								●		116365		Standard Length ø0.2mm - 20.0mm	P.128-129
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●	●	●	○		○	○								●		120365		Extended Neck ø0.4mm - 6.0mm	P.134-135
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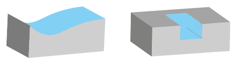
●	●	●	○		○	○								●		100365		Standard Length Ball Nose ø0.1mm - 20.0mm	P.142-143
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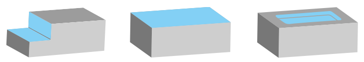
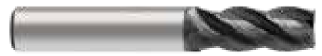
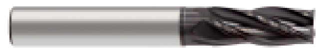
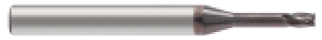
●	●	●			○	○								●		104365		Standard Length Heavy Cut ø1.0mm - 20.0mm	P.147
●	●	●	○		○	○								●		122365		Standard Length ø1.0mm - 20.0mm	P.146
●	●	●	○		○	○								●		124365		Long Length ø1.0mm - 25.0mm	P.148-149
●	●	●			○	○								●		112365		Standard Length Corner Radius ø3.0mm - 16.0mm	P.150-151
●	●	●	○		○	○								●		126365		Extended Neck ø1.0mm - 10.0mm	P.156
●	●	●			○	○								●		114365		Extended Neck Corner Radius ø1.0mm - 12.0mm	P.152-155

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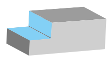
●	●	●	○		○	○								●		106365		Standard Length 45° Helix ø6.0mm - 20.0mm	P.141

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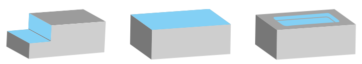
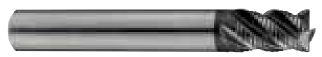
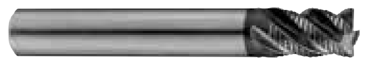
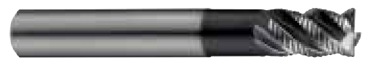
●	●	●			●	●										167123 167323		Short Length Corner Radius ø6.0mm - 20.0mm	P.157
●	●	●			●	●										168123 168323		Long Length Corner Radius ø6.0mm - 20.0mm	P.158
●	●	●			●	●										169123 169323		Extended Neck Corner Radius ø6.0mm - 20.0mm	P.159
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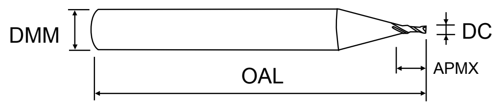
▶ For material group examples, refer to page 4
▶ For full material group tables, refer to pages 334-347

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA



Series No. 116365

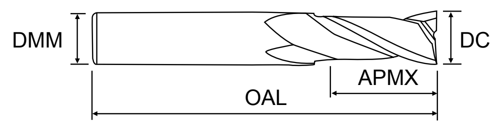
▶ cutting conditions : p.172-175

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 **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	h6
above ø6.0	0.00 / -0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	○		○	○								●



MG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 116365

▶ cutting conditions : p.172-175

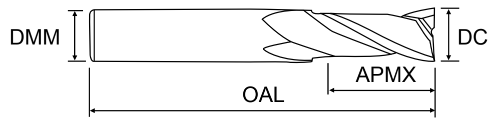
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Sharp edge geometry at end tooth increases cutting performance.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	h6
above ø6.0	0.00 / -0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	○		○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA



Series No. 118365

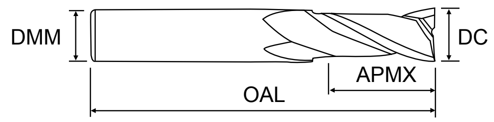
▶ cutting conditions : p.176

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

EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●



MG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 118365

▶ cutting conditions : p.176

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

EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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

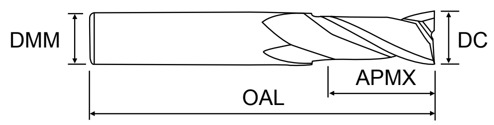
Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

LONG LENGTH

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 118365



▶ cutting conditions : p.176

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

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
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

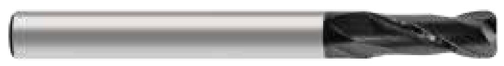
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

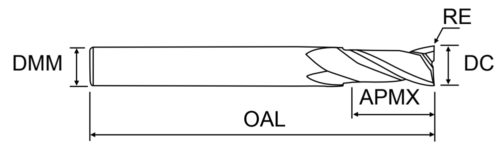
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

STANDARD LENGTH CORNER RADIUS

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA

Series No. 108365





▶ 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.

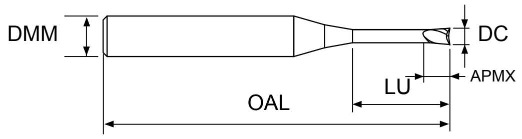
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1083650200	**2.0**	0.5	6	6.0	50
1083650300	**3.0**	0.5	6	8.0	60
1083650400	**4.0**	0.5	6	10.0	70
1083650500	**5.0**	0.5	6	13.0	90
1083650600	**6.0**	0.5	6	15.0	60
1083650601	**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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No. 120365



▶ cutting conditions : p.178-179

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.

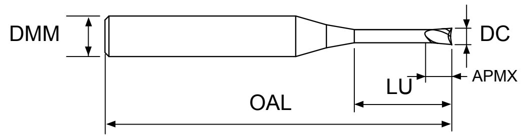
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
1203650040	**0.4**	4	0.6	2.0	40
1203650041	**0.4**	4	0.6	3.0	40
1203650042	**0.4**	4	0.6	4.0	40
1203650043	**0.4**	4	0.6	5.0	40
1203650050	**0.5**	4	0.7	2.0	45
1203650051	**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

Mill Dia. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	h6
above ø6.0	0.00 / -0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	○		○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No. 120365



▶ cutting conditions : p.178-179

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.

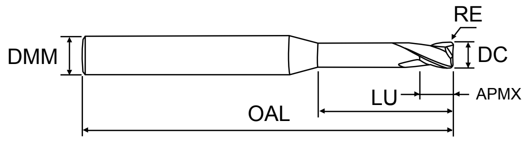
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
1203650180	**1.8**	4	2.7	8.0	50
1203650181	**1.8**	4	2.7	10.0	50
1203650182	**1.8**	4	2.7	12.0	50
1203650200	**2.0**	4	3.0	6.0	50
1203650201	**2.0**	4	3.0	8.0	50
1203650202	**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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	h6
above ø6.0	0.00 / -0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	○		○	○								●

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK

Series No. 110365



▶ cutting conditions : p.168-169

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

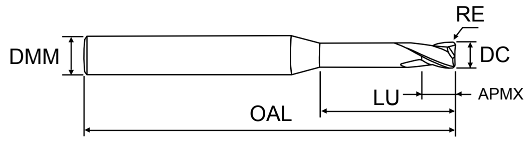
EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL
1103650020	**0.2**	0.02	4	0.3	1.0	40
1103650021	**0.2**	0.05	4	0.3	1.0	40
1103650030	**0.3**	0.02	4	0.5	1.0	40
1103650031	**0.3**	0.02	4	0.5	2.0	40
1103650032	**0.3**	0.05	4	0.5	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. DC(mm)	Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK

Series No. 110365



▶ cutting conditions : p.168-169

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

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL
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. DC(mm)	Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

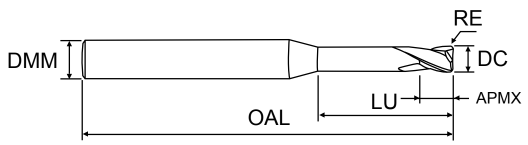
EXTENDED NECK CORNER RADIUS

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK

Series No. 110365

▶ cutting conditions : p.168-169

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



EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
		RETOLL	**RETOLU**	
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

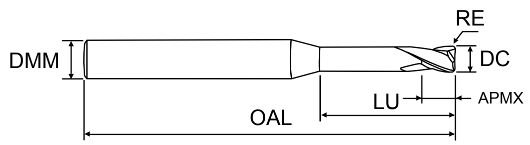
EXTENDED NECK CORNER RADIUS

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK

Series No. 110365

▶ cutting conditions : p.168-169

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



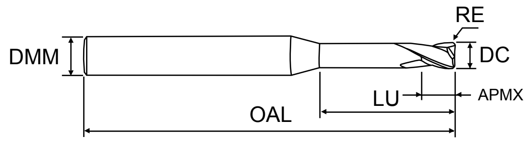
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
1103650210	**2.0**	0.3	4	3.0	10.0	50
1103650211	**2.0**	0.3	4	3.0	12.0	50
1103650212	**2.0**	0.5	4	3.0	6.0	50
1103650213	**2.0**	0.5	4	3.0	8.0	50
1103650214	**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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
		RETOLL	**RETOLU**	
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

EXTENDED NECK CORNER RADIUS

MG HM | ZEFP 2 | RE | FHA 30º | DIN 6535HA | NECK



Series No. 110365

▶ cutting conditions : p.168-169

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

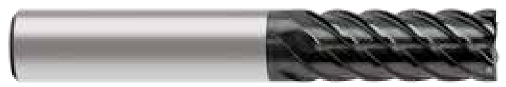
EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL
1103650400	4.0	0.1	6	6.0	10.0	50
1103650401	4.0	0.1	6	6.0	12.0	50
1103650402	4.0	0.1	6	6.0	16.0	60
1103650403	4.0	0.2	6	6.0	10.0	50
1103650404	4.0	0.2	6	6.0	12.0	50
1103650405	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

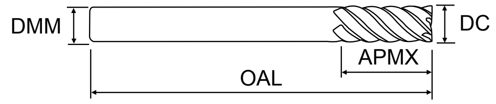
Mill Dia. DC(mm)	Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

STANDARD LENGTH 45º HELIX

MG HM | ZEFP 6 | FHA 45º | DIN 6535HA





Series No. 106365

▶ cutting conditions : p.177

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 ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

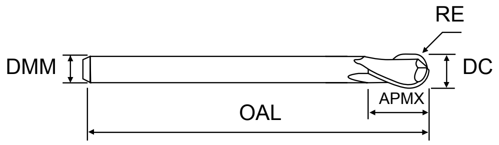
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 100365

▶ cutting conditions : p.162-163

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



EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

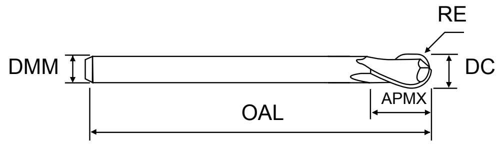
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA

Series No. 100365

▶ cutting conditions : p.162-163

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

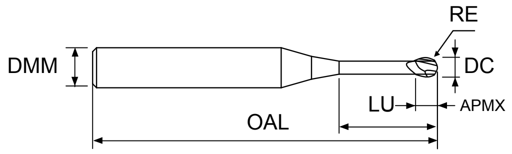


EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1003650800	**8.0**	4.0	8	12.0	50
1003650801	**8.0**	4.0	8	12.0	90
1003650802	**8.0**	4.0	8	14.0	100
1003650803	**8.0**	4.0	8	14.0	150
1003651000	**10.0**	5.0	10	15.0	60
1003651001	**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. **DC**(mm)	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 102365

▶ 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.

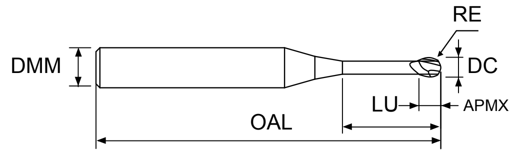
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL
1023650020	**0.2**	0.1	4	0.2	1.0	40
1023650030	**0.3**	0.15	4	0.3	1.0	40
1023650040	**0.4**	0.2	4	0.4	1.0	40
1023650050	**0.5**	0.25	4	0.5	2.0	45
1023650051	**0.5**	0.25	4	0.5	4.0	45
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

Mill Dia. DC(mm)	Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

EXTENDED NECK BALL NOSE

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 102365

▶ 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.

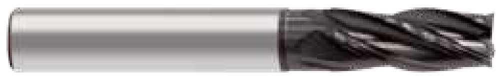
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL
1023650200	**2.0**	1.0	4	2.0	6.0	50
1023650201	**2.0**	1.0	4	2.0	8.0	50
1023650202	**2.0**	1.0	4	2.0	10.0	50
1023650203	**2.0**	1.0	4	2.0	12.0	50
1023650204	**2.0**	1.0	4	2.0	14.0	50
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. DC(mm)	Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
up to ø6.0	0.00 / -0.012	-0.010	+0.010	h6
above ø6.0	0.00 / -0.015	-0.015	+0.015	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

STANDARD LENGTH

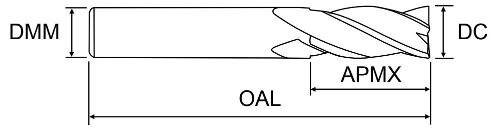
MG HM | ZEFP 4 | M-HELIX | DIN 6535HA



Series No. 122365

▶ cutting conditions : p.182-184

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.



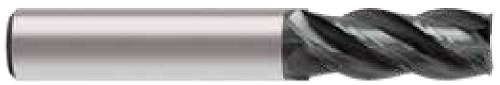
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1223650100	**1.0**	6	2.5	50
1223650150	**1.5**	6	4.0	50
1223650200	**2.0**	6	6.0	50
1223650250	**2.5**	6	7.0	50
1223650300	**3.0**	6	8.0	50
1223650350	**3.5**	6	10.0	50
1223650400	**4.0**	6	10.0	50
1223650450	**4.5**	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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	○		○	○								●

STANDARD LENGTH HEAVY CUT

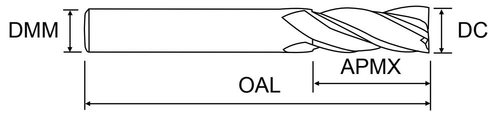
MG HM | ZEFP 4 | M-HELIX | DIN 6535HA



Series No. 104365

▶ cutting conditions : p.182-184

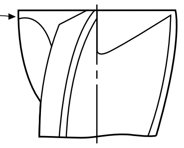
New coating and new geometry give outstanding cutting ability and wear resistance.
Multiple helix geometry 3.0mm and above.
Special gash land geometry on end teeth and protected corner to allow high depths of cut.



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

Corner protected



ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

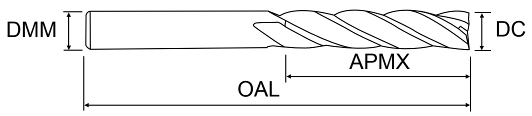
EUROPA TOOL

MG HM | ZEFP 4 | FHA 30° | DIN 6535HA

Series No. 124365

▶ cutting conditions : p.180-181

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



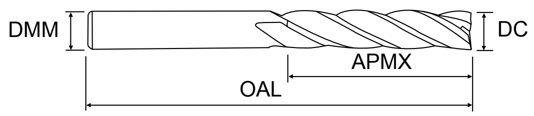
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1243650100	**1.0**	6	3.0	60
1243650101	**1.0**	6	4.0	60
1243650102	**1.0**	6	6.0	60
1243650150	**1.5**	6	6.0	60
1243650200	**2.0**	6	8.0	60
1243650201	**2.0**	6	10.0	60
1243650202	**2.0**	6	12.0	60
1243650203	**2.0**	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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	●	○		○	○								●

EUROPA TOOL

MG HM | ZEFP 4 | FHA 30° | DIN 6535HA



Series No. 124365

▶ cutting conditions : p.180-181

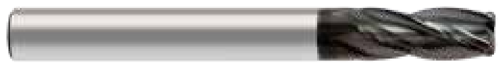
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.

EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	●	○		○	○								●

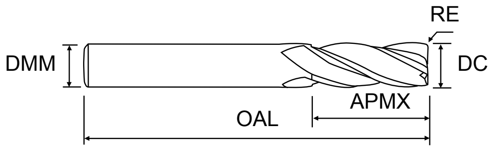
MG HM | ZEFP 4 | RE | M-HELIX | DIN 6535HA



Series No. 112365

▶ 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.
Multiple helix geometry 3.0mm and above.



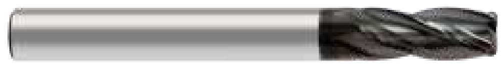
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1123650300	**3.0**	0.3	6	8.0	60
1123650301	**3.0**	0.5	6	8.0	60
1123650400	**4.0**	0.3	6	10.0	70
1123650401	**4.0**	0.5	6	10.0	70
1123650402	**4.0**	1.0	6	10.0	70
1123650500	**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 **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
	RETOLL	**RETOLU**	
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

STANDARD LENGTH CORNER RADIUS

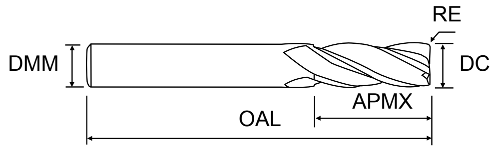
MG HM | ZEFP 4 | RE | M-HELIX | DIN 6535HA



Series No. 112365

▶ 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.
Multiple helix geometry 3.0mm and above.



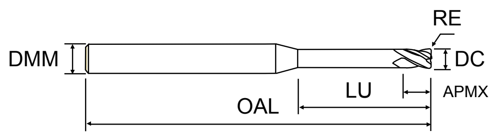
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1123651200	**12.0**	0.5	12	30.0	80
1123651201	**12.0**	1.0	12	30.0	80
1123651202	**12.0**	0.5	12	30.0	110
1123651203	**12.0**	1.0	12	30.0	110
1123651204	**12.0**	1.5	12	30.0	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 **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
	RETOLL	**RETOLU**	
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

MG HM | ZEFP 4 | RE | M-HELIX | DIN 6535HA | NECK

Series No. 114365



▶ cutting conditions : p.170

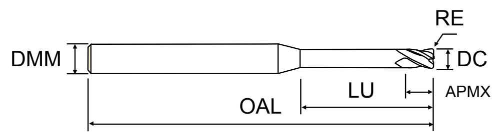
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

EXTENDED NECK CORNER RADIUS



MG HM | ZEFP 4 | RE | M-HELIX | DIN 6535HA | NECK

Series No. 114365

▶ cutting conditions : p.170

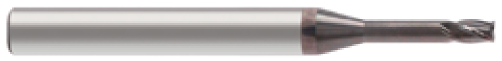
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.
Multiple helix geometry 3.0mm and above.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
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 **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

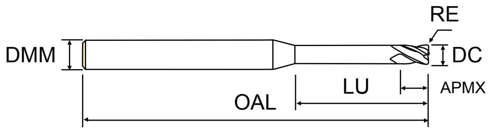
MG HM | ZEFP 4 | RE | M-HELIX | DIN 6535HA | NECK



Series No. 114365

▶ cutting conditions : p.170

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.

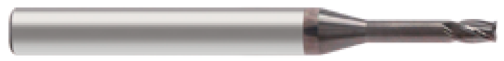


EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
1143650304	**3.0**	0.2	6	4.5	10.0	50
1143650305	**3.0**	0.2	6	4.5	12.0	50
1143650306	**3.0**	0.2	6	4.5	16.0	60
1143650307	**3.0**	0.2	6	4.5	20.0	60
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 **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

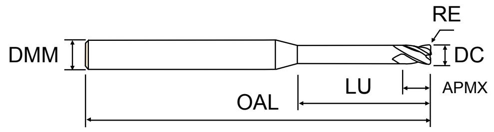
MG HM | ZEFP 4 | RE | M-HELIX | DIN 6535HA | NECK



Series No. 114365

▶ cutting conditions : p.170

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.

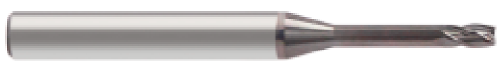


EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**
1143650409	**4.0**	0.3	6	6.0	10.0	50
1143650410	**4.0**	0.3	6	6.0	12.0	50
1143650411	**4.0**	0.3	6	6.0	16.0	60
1143650412	**4.0**	0.3	6	6.0	20.0	60
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 **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			○	○								●

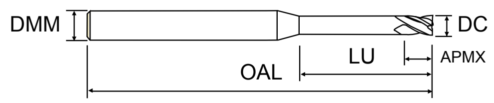
MG HM | ZEFP 4 | FHA 30° | DIN 6535HA | NECK



Series No. 126365

▶ cutting conditions : p.171

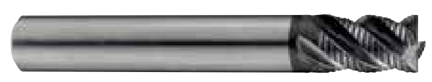
New coating and new geometry give outstanding cutting ability and wear resistance.
Excellent performance in pre-hardened steels and alloy steels <HRc55.



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL
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	4	3.0	8.0	50
1263650201	2.0	4	3.0	10.0	50
1263650202	2.0	4	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

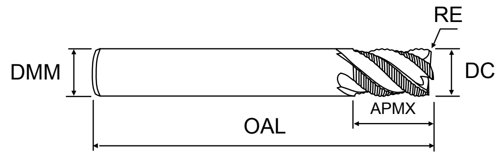
Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	●	○		○	○								●

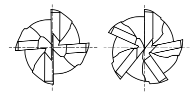


MG HM | ZEFP 4 | ZEFP 5 | RE | M-HELIX | FINE | DIN 6535HA | DIN 6535HB

Series No. 167123, 167323



▶ cutting conditions : p.185-186



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.

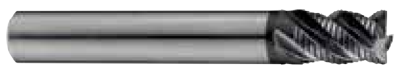
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1671230600	1673230600	6.0	0.5	6	9.0	57	4
1671230800	1673230800	8.0	0.5	8	12.0	63	4
1671231000	1673231000	10.0	0.5	10	15.0	72	4
1671231200	1673231200	12.0	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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.05	h6

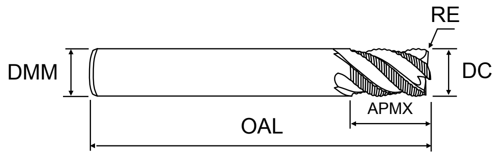
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	●			●	●								

LONG LENGTH ROUGHING

MG HM | ZEFP 4 | ZEFP 5 | RE | M-HELIX | FINE | DIN 6535HA | DIN 6535HB

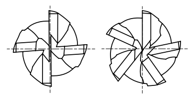


Series No. 168123,168323



▶ cutting conditions : p.185-186

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 **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**
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

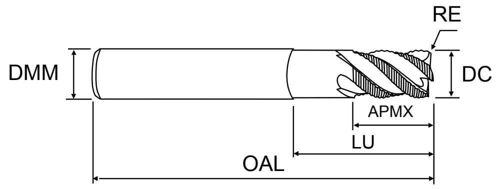
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.05	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			●	●								

EXTENDED NECK ROUGHING

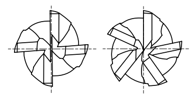
MG HM | ZEFP 4 | ZEFP 5 | RE | M-HELIX | FINE | DIN 6535HA | DIN 6535HB | NECK

Series No. 169123, 169323



▶ cutting conditions : p.185-186

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 **ORDCODE FLAT**	EUROPA CODE **ORDCODE PLAIN**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**
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 **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.05	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●			●	●								

EUROPA TOOL

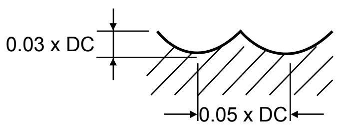
PULSAR DMX

CUTTING DATA

CUTTING DATA

100365 (2 Flute Ball Nose)

VDI MATERIAL GROUP		HRc		Size (mm) 0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.5	2.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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: $n = \frac{v_c * 1000}{\pi * ø}$

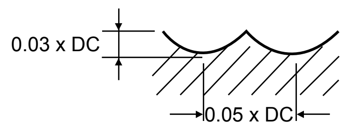
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

100365 (2 Flute Ball Nose)

VDI MATERIAL GROUP		HRc		Size (mm) 2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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

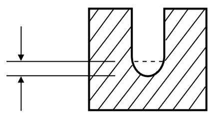
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

102365 (2 Flute Extended Neck, Ball Nose)

VDI MATERIAL GROUP		HRc		Size (mm)								
				0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.5
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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

a_p


▶ The data shown is based on medial length tools. Please adust 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

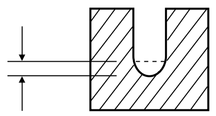
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

102365 (2 Flute Extended Neck, Ball Nose)

VDI MATERIAL GROUP		HRc		Size (mm)							
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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

a_p


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

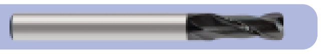
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

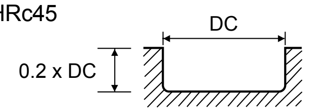
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

108365 (2 Flute Corner Radius)

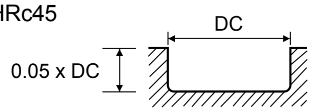


VDI MATERIAL GROUP		HRc		Size (mm)								
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-11	< 35	v_c (m/min)	113	125	135	144	149	151	158	155	156
			n	18000	13240	10720	9160	7900	6000	5040	4120	3100
			f_z	0.007	0.011	0.016	0.023	0.032	0045	0.054	0.051	0.058
			f (mm/min)	260	280	340	420	500	540	540	420	360
K	15-20		v_c (m/min)	113	125	135	144	149	151	158	155	156
			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	38	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
			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
	38	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
			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

< HRc45



> HRc45



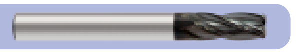
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

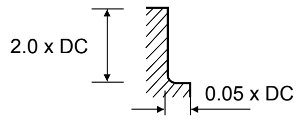
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

112365 (4 Flute Corner Radius)

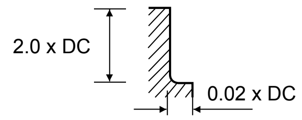


VDI MATERIAL GROUP		HRc		Size (mm)							
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-11	< 35	v_c (m/min)	125	135	144	149	151	158	155	156
			n	13240	10720	9160	7900	6000	5040	4120	3100
			f_z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023
			f (mm/min)	340	420	430	430	460	460	360	280
K	15-20		v_c (m/min)	125	135	144	149	151	158	155	156
			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	38	35-45	v_c (m/min)	81	86	91	95	96	103	105	106
			n	8560	6820	5800	5040	3800	3280	2780	2100
			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
	38	45-55	v_c (m/min)	50	54	60	62	63	63	63	64
			n	5280	4300	3800	3280	2520	2020	1680	1280
			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

< 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

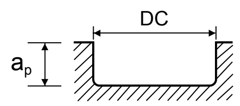
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

110365 (2 Flute Extended Neck, Corner Radius)

VDI MATERIAL GROUP		HRc		Size (mm)							
				0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.2
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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

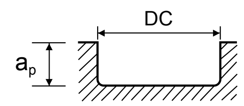
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

110365 (2 Flute Extended Neck, Corner Radius)

VDI MATERIAL GROUP		HRc		Size (mm)						
				1.5	2.0	3.0	4.0	6.0	8.0	10.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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: $n = \frac{v_c * 1000}{\pi * ø}$

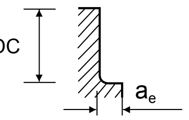
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

114365 (4 Flute Extended Neck, Corner Radius)

VDI MATERIAL GROUP		HRc		Size (mm) 1.0	1.2	1.5	2.0	3.0	4.0	6.0	8.0	10.0	12.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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

1.0 x DC



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

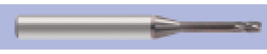
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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

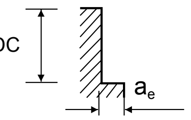
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

126365 (4 Flute Extended Neck)



VDI MATERIAL GROUP		HRc		Size (mm) 1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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

1.0 x DC



▶ The data shown is based on medial length tools. Please adust 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: $v_c = \frac{n * \pi * ø}{1000}$

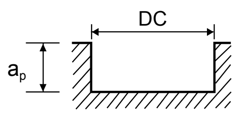
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

116365 (2 Flute) 

VDI MATERIAL GROUP		HRc		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
				Size (mm)								
P	1-11	< 35	v_c (m/min)	26	37	49	57	60	62	63	66	68
			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
M	12, 13		v_c (m/min)	13	18	25	28	30	31	31	33	34
			n	21000	19500	19500	18000	16000	14000	12500	11750	10750
			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	15-20		v_c (m/min)	26	37	49	57	60	62	63	66	68
			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	38	35-45	v_c (m/min)	16	22	29	34	36	37	38	40	41
			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
	38	45-55	v_c (m/min)	11	15	20	23	24	25	25	27	27
			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

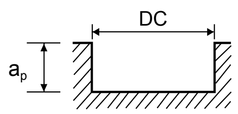
< HRc45

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



> HRc45

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



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: $v_c = \frac{n * \pi * ø}{1000}$

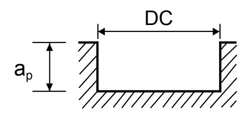
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

116365 (2 Flute) 

VDI MATERIAL GROUP		HRc		1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
				Size (mm)							
P	1-11	< 35	v_c (m/min)	71	73	80	84	91	95	98	99
			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
M	12, 13		v_c (m/min)	35	40	43	44	47	49	50	50
			n	7500	6300	5460	4620	4250	3990	3520	3160
			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	15-20		v_c (m/min)	71	73	80	84	91	95	98	99
			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	38	35-45	v_c (m/min)	42	48	52	52	56	58	59	59
			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
	38	45-55	v_c (m/min)	28	32	33	32	35	37	37	36
			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

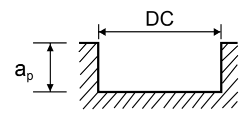
< HRc45

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



> HRc45

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



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: $v_c = \frac{n * \pi * ø}{1000}$

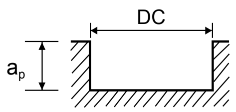
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

116365 (2 Flute)  

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	6.5	7.0	8.0	8.5	9.0	9.5	10.0
P	1-11	< 35	v_c (m/min)	105	107	107	106	106	105	104	102
			n	5560	5220	4880	4200	3965	3730	3495	3260
			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
M	12, 13		v_c (m/min)	54	54	54	53	53	53	53	53
			n	2840	2655	2470	2100	1995	1890	1785	1680
			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
K	15-20		v_c (m/min)	105	107	107	106	106	105	104	102
			n	5560	5220	4880	4200	3965	3730	3495	3260
			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	38	35-45	v_c (m/min)	63	64	65	63	64	64	64	63
			n	3360	3150	2940	2520	2390	2260	2130	2000
			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
	38	45-55	v_c (m/min)	38	39	40	42	43	43	43	43
			n	2000	1920	1840	1680	1600	1520	1440	1360
			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

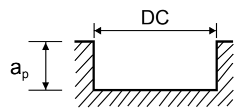
< HRc45

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



> HRc45

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



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.

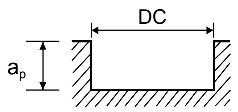
CUTTING DATA

116365 (2 Flute)  

VDI MATERIAL GROUP		HRc		Size (mm) 10.5	11.0	12.0	13.0	14.0	15.0	16.0	20.0
P	1-11	< 35	v_c (m/min)	103	104	103	106	109	110	111	106
			n	3130	3000	2740	2605	2470	2335	2200	1680
			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
M	12, 13		v_c (m/min)	53	53	51	52	53	53	23	53
			n	1600	1520	1360	1285	1210	1135	1060	840
			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
K	15-20		v_c (m/min)	103	104	103	106	109	110	111	106
			n	3130	3000	2740	2605	2470	2335	2200	1680
			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	38	35-45	v_c (m/min)	63	64	63	65	67	68	68	67
			n	1920	1840	1680	1600	1520	1440	1360	1060
			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
	38	45-55	v_c (m/min)	43	44	44	45	45	45	45	43
			n	1310	1260	1160	1095	1030	965	0.022	680
			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

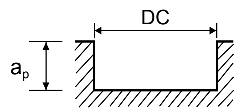
< HRc45

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



> HRc45

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



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: $v_c = \frac{n * \pi * ø}{1000}$

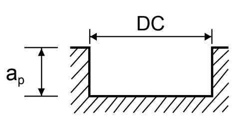
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

118365 (2 Flute, Long Length)

VDI MATERIAL GROUP		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	1-11	< 35	v_c (m/min)	45	48	51	54	54	65	62	72	72	77	75	85
			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
K	15-20		v_c (m/min)	45	48	51	54	54	65	62	72	72	77	75	85
			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	38	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
			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
	38	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
			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

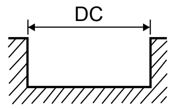
< HRc45

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



> HRc45

0.05 x DC



▶ The data shown is based on medial length tools. Please adust 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: $v_c = \frac{n * \pi * ø}{1000}$

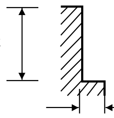
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

106365 (6 Flute, 45º Helix)

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
P	1-11	< 35	v_c (m/min)	105	106	106	107	106	106
			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
K	15-20		v_c (m/min)	105	106	106	107	106	106
			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	38	35-45	v_c (m/min)	73	74	73	75	74	73
			n	1370	2940	2320	2000	1480	1160
			f_z	0.059	0.078	0.098	0.097	0.099	0.099
			f (mm/min)	3880	1370	1370	1160	880	690
	38	45-55	v_c (m/min)	30	29	31	32	32	31
			n	1580	1160	1000	840	640	500
			f_z	0.022	0.03	0.035	0.036	0.034	0.037
			f (mm/min)	210	210	210	180	130	110

< HRc35

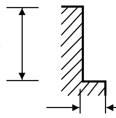
1.5 x DC



0.1 x DC

HRc35 - 45

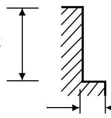
1.5 x DC



0.05 x DC

> HRc45

1.0 x DC



0.05 x DC

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

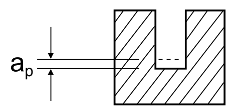
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

120365 (2 Flute Extended Neck)

VDI MATERIAL GROUP		HRc		Size (mm) 0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.5
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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

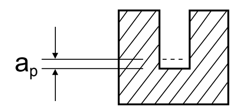
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

120365 (2 Flute Extended Neck)

VDI MATERIAL GROUP		HRc		Size (mm) 1.8	2.0	2.5	3.0	4.0	5.0	6.0
P	1-11	< 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
			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
K	15-20		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
			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	38	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
			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
	38	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
			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



▶ The data shown is based on medial length tools. Please adust 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

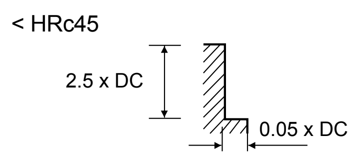
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

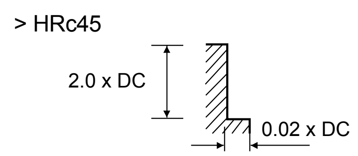
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

124365 (4 Flute Long Length)

VDI MATERIAL GROUP		HRc		Size (mm)							
				1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0
P	1-11	< 35	v_c (m/min)	54	59	60	64	63	75	72	83
			n	17280	12420	9530	8090	6660	6000	4610	4420
			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
K	15-20		v_c (m/min)	54	59	60	64	63	75	72	83
			n	17280	12420	9530	8090	6660	6000	4610	4420
			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	38	35-45	v_c (m/min)	31	33	34	37	36	43	41	48
			n	9850	7080	5440	4650	3860	3410	2610	2520
			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
	38	45-55	v_c (m/min)	19	20	21	23	22	27	27	31
			n	6050	4350	3400	2890	2380	2150	1710	1640
			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





▶ The data shown is based on medial length tools. Please adust 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

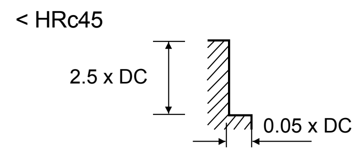
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

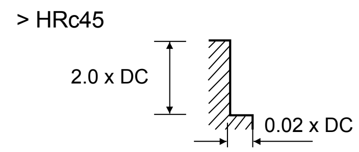
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

124365 (4 Flute Long Length)

VDI MATERIAL GROUP		HRc		Size (mm)						
				8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-11	< 35	v_c (m/min)	84	89	87	93	98	89	86
			n	3360	2820	2300	2120	1940	1420	1100
			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
K	15-20		v_c (m/min)	84	89	87	93	98	89	86
			n	3360	2820	2300	2120	1940	1420	1100
			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	38	35-45	v_c (m/min)	48	52	52	54	54	52	64
			n	1900	1640	1390	1230	1070	820	820
			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
	38	45-55	v_c (m/min)	32	32	32	33	34	31	39
			n	1260	1010	840	760	640	500	500
			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





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

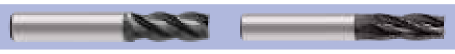
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

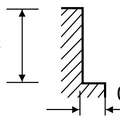
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

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



VDI MATERIAL GROUP		HRc		Size (mm)								
				1.0	1.2	1.5	2.0	2.5	3.0	3.5	4.0	4.5
P	1-11	< 35	v_c (m/min)	84	85	88	91	101	105	113	119	122
			n	26800	22500	18750	14450	12800	11150	10300	9450	8660
			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
M	12, 13		v_c (m/min)	42	42	44	50	54	54	58	61	62
			n	13400	11250	9380	7880	6830	5780	5310	4850	4400
			f_z	0.002	0.003	0.003	0.004	0.006	0.007	0.011	0.014	0.016
			f (mm/min)	120	125	130	140	155	170	225	280	290
K	15-20		v_c (m/min)	84	85	88	91	101	105	113	119	122
			n	26800	22500	18750	14450	12800	11150	10300	9450	8660
			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	38	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
			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
	38	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
			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



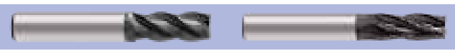
v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

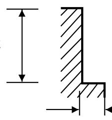
To calculate cutting speed from RPM: $v_c = \dfrac{n * \pi * ø}{1000}$

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.

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



VDI MATERIAL GROUP		HRc		Size (mm)								
				5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
P	1-11	< 35	v_c (m/min)	124	128	131	133	134	134	132	132	132
			n	7880	7410	6950	6530	6100	5680	5250	4960	4660
			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
M	12, 13		v_c (m/min)	62	65	67	68	68	68	66	66	67
			n	3950	37550	3550	3320	3090	2860	2630	2490	2360
			f_z	0.019	0.021	0.023	0.025	0.028	0.03	0.033	0.034	0.034
			f (mm/min)	300	315	330	335	340	345	350	340	325
K	15-20		v_c (m/min)	124	128	131	133	134	134	132	132	132
			n	7880	7410	6950	6530	6100	5680	5250	4960	4660
			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	38	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
			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
	38	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
			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



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

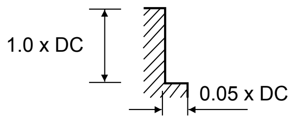
To calculate RPM from cutting speed: $n = \dfrac{v_c * 1000}{\pi * ø}$

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

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.

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

VDI MATERIAL GROUP		HRc		Size (mm) 9.5	10.0	11.0	12.0	14.0	16.0	18.0	20.0
P	1-11	< 35	v_c (m/min)	130	128	130	129	136	138	137	132
			n	4370	4080	3750	3430	3090	2750	2430	2100
			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
M	12, 13		v_c (m/min)	67	66	66	64	68	69	68	66
			n	2230	2100	1900	1700	1540	1380	1210	1050
			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
K	15-20		v_c (m/min)	130	128	130	129	136	138	137	132
			n	4370	4080	3750	3430	3090	2750	2430	2100
			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	38	35-45	v_c (m/min)	79	79	79	79	84	85	85	84
			n	2660	2500	2300	2100	1900	1700	1510	1330
			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
	38	45-55	v_c (m/min)	54	53	55	55	57	57	56	53
			n	1800	1700	1580	1450	1290	1130	990	850
			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



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: $v_c = \frac{n * \pi * ø}{1000}$

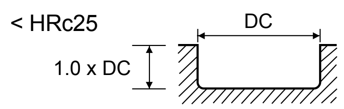
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

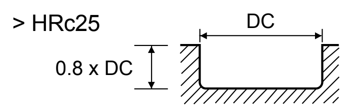
CUTTING DATA

167123, 167323, 168123, 168323, 169123, 169323 (4&5 Flute Multi Helix, Corner Radius)

SLOTTING

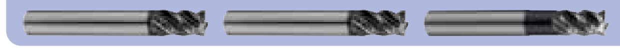
VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	< 25	v_c (m/min)	225	225	225	225	225	225
			n	12000	9000	7200	6000	4500	3600
			f_z	0.032	0.046	0.057	0.064	0.067	0.074
			f (mm/min)	1550	1650	1650	1540	1500	1330
	6-9	25-40	v_c (m/min)	200	205	200	205	205	200
			n	10600	8100	6400	5400	4100	3200
			f_z	0.026	0.036	0.046	0.053	0.051	0.056
			f (mm/min)	1100	1180	1180	1140	1050	900
K	15, 16		v_c (m/min)	225	225	225	225	225	225
			n	12000	9000	7200	6000	4500	3600
			f_z	0.032	0.046	0.057	0.064	0.067	0.074
			f (mm/min)	1550	1650	1650	1540	1500	1330
	17-20		v_c (m/min)	200	205	200	205	205	200
			n	10600	8100	6400	5400	4100	3200
			f_z	0.026	0.036	0.046	0.053	0.051	0.056
			f (mm/min)	1100	1180	1180	1140	1050	900





CUTTING DATA

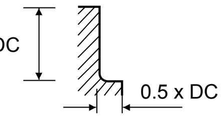
167123, 167323, 168123, 168323, 169123, 169323 (4&5 Flute Multi Helix, Corner Radius)



PROFILING

VDI MATERIAL GROUP		HRc		Size (mm)					
				6.0	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**
P	1-5	**< 25**	v_c (m/min)	300	300	300	300	300	300
			n	15800	11900	9500	8000	6000	4800
			f_z	0.041	0.057	0.071	0.08	0.082	0.089
			f (mm/min)	2570	2700	2700	2570	2450	2140
	6-9	**25-40**	v_c (m/min)	270	270	270	270	270	270
			n	14300	10700	8500	7100	5400	4300
			f_z	0.032	0.046	0.057	0.065	0.065	0.07
			f (mm/min)	1850	1950	1950	1850	1750	1500
K	15, 16		v_c (m/min)	300	300	300	300	300	300
			n	15800	11900	9500	8000	6000	4800
			f_z	0.041	0.057	0.071	0.08	0.082	0.089
			f (mm/min)	2570	2700	2700	2570	2450	2140
	17-20		v_c (m/min)	270	270	270	270	270	270
			n	14300	10700	8500	7100	5400	4300
			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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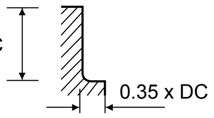

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

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

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.

MASTERMILL VX

High performance machining of Steel, Stainless Steel, Titanium and Nickel Alloys

APPLICATION GUIDE　　　　INDEX

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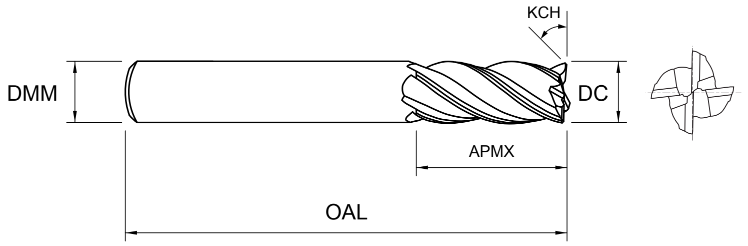
▸ For material group examples, refer to page 4

▸ For full material group tables, refer to pages 334-347

MG HM | ZEFP 4 | KCH 45° | FHA 35/37° | DIN 6535HA | VX COATED

Series No. 176323

▶cutting conditions: p.216-217



MASTERMILL VX

Chamfered for corner protection.
Minimized tool deflection.
Reduced tool vibration.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	CHAMFER WIDTH **CHW**
1763230300	**3.0**	6	6	50	0.10
1763239001	**3.0**	4	6	50	0.10
1763230400	**4.0**	6	8	50	0.15
1763239002	**4.0**	4	8	50	0.15
1763230500	**5.0**	6	10	50	0.15
1763230600	**6.0**	6	10	50	0.20
1763230800	**8.0**	8	12	55	0.20
1763231000	**10.0**	10	14	60	0.30
1763231200	**12.0**	12	16	70	0.35
1763231600	**16.0**	16	22	80	0.40
1763232000	**20.0**	20	28	80	0.50

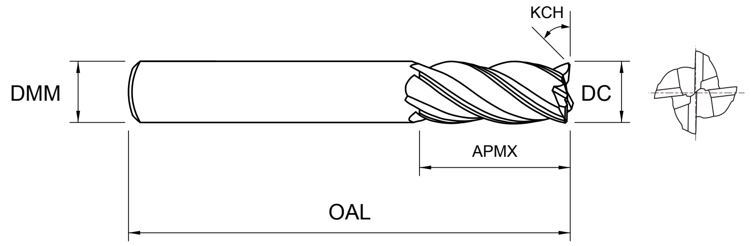
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

MG HM | ZEFP 4 | KCH 45° | FHA 35/37° | DIN 6535HA | VX COATED

Series No. 178323

▶cutting conditions: p.216-217



MASTERMILL VX

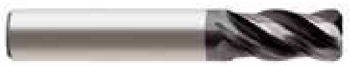
Chamfered for corner protection.
Minimized tool deflection.
Reduced tool vibration.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	CHAMFER WIDTH **CHW**
1783230300	**3.0**	6	8	55	0.10
1783239001	**3.0**	4	8	55	0.10
1783230400	**4.0**	6	10	55	0.15
1783239002	**4.0**	4	10	55	0.15
1783230500	**5.0**	6	12	55	0.15
1783230600	**6.0**	6	12	55	0.20
1783230800	**8.0**	8	16	60	0.20
1783231000	**10.0**	10	20	75	0.30
1783231200	**12.0**	12	24	75	0.35
1783231600	**16.0**	16	32	100	0.40
1783232000	**20.0**	20	40	100	0.50

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

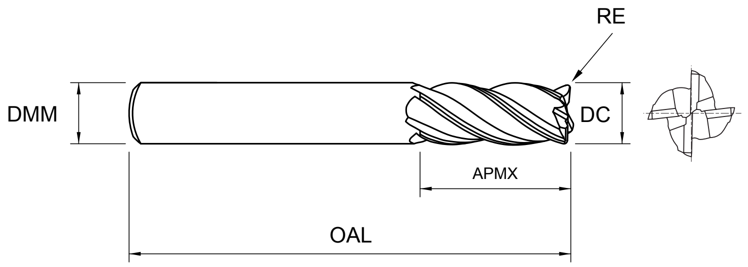
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

MG HM | ZEFP 4 | RE | FHA 35/37° | DIN 6535HA | VX COATED



Series No. 179323

▶cutting conditions: p.216-217



MASTERMILL VX
Corner radius.
Minimized tool deflection.
Reduced tool vibration.

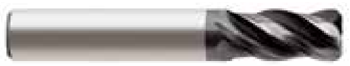
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1793230300	**3.0**	0.3	6	8	55
1793239001		0.5	6	8	55
1793230400	**4.0**	0.3	6	10	55
1793239002		0.5	6	10	55
1793230500*	**5.0**	0.3*	6	12	55
1793239003		0.5	6	12	55
1793239014*		1.0*	6	12	55
1793230600	**6.0**	0.3	6	12	55
1793239004		0.5	6	12	55
1793239005		1.0	6	12	55
1793239015		1.5	6	12	55
1793239016		2.0	6	12	55
1793239026	**8.0**	0.5	8	16	60
1793230800		1.0	8	16	60
1793239017		1.5	8	16	60
1793239018		2.0	8	16	60
1793231000	**10.0**	0.5	10	20	75
1793239006		1.0	10	20	75
1793239019		1.5	10	20	75
1793239020		2.0	10	20	75

* Available to order

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

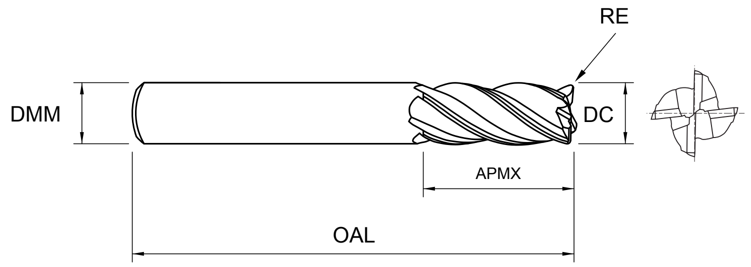
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

MG HM | ZEFP 4 | RE | FHA 35/37° | DIN 6535HA | VX COATED



Series No. 179323

▶cutting conditions: p.216-217



MASTERMILL VX
Corner radius.
Minimized tool deflection.
Reduced tool vibration.

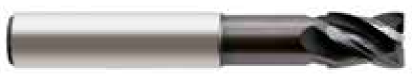
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1793231200	**12.0**	0.5	12	24	75
1793239008		1.0	12	24	75
1793239021		1.5	12	24	75
1793239009		2.0	12	24	75
1793231600	**16.0**	1.0	16	32	100
1793239022		1.5	16	32	100
1793239010		2.0	16	32	100
1793239023		2.5	16	32	100
1793239011		3.0	16	32	100
1793232000	**20.0**	1.0	20	40	100
1793239024		1.5	20	40	100
1793239012		2.0	20	40	100
1793239025		2.5	20	40	100
1793239013		3.0	20	40	100

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

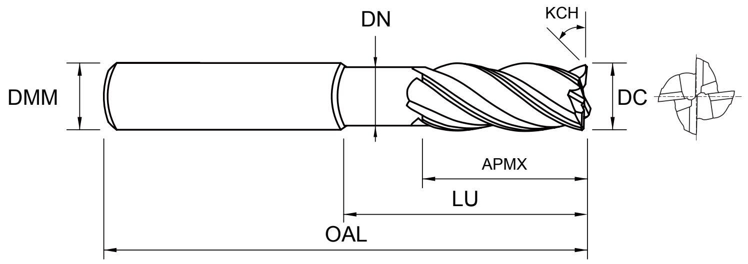
LONG LENGTH NECKED

MG HM | ZEFP 4 | KCH 45° | FHA 35/37° | DIN 6535HA | NECK | VX COATED



Series No. 177323

▶cutting conditions: p.216-217



MASTERMILL VX

Chamfered for corner protection.
Minimized tool deflection.
Reduced tool vibration.

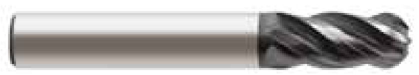
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**	CHAMFER WIDTH **CHW**
1773230300	**3.0**	6	6	17	57	2.7	0.10
1773230400	**4.0**	6	8	22	62	3.7	0.15
1773230500	**5.0**	6	10	27	65	4.7	0.15
1773230600	**6.0**	6	10	32	68	5.5	0.20
1773230800	**8.0**	8	12	46	82	7.5	0.20
1773231000	**10.0**	10	14	32	72	9.2	0.30
1773239001		10	14	55	100	9.2	0.30
1773231200	**12.0**	12	16	38	83	11.0	0.35
1773239002		12	16	64	108	11.0	0.35
1773231600	**16.0**	16	22	44	92	15.0	0.40
1773239003		16	22	60	108	15.0	0.40
1773239004		16	22	87	135	15.0	0.40
1773232000	**20.0**	20	28	54	104	19.0	0.50
1773239005		20	28	75	125	19.0	0.50
1773239006		20	28	110	160	19.0	0.50

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

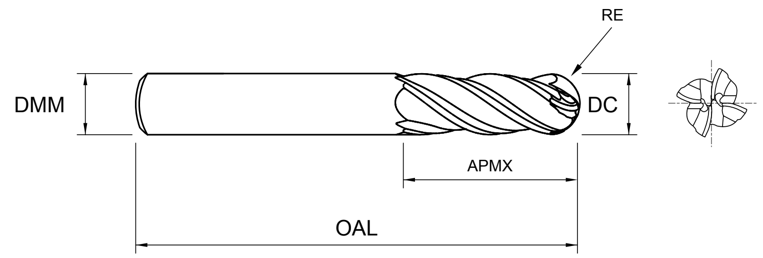
BALL NOSE

MG HM | ZEFP 4 | FHA 35/37° | DIN 6535HA | VX COATED



Series No. 170329

▶cutting conditions: p.224



MASTERMILL VX

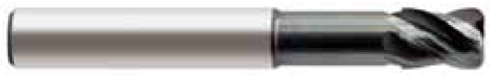
Minimized tool deflection.
Reduced tool vibration.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1703290300	**3.0**	1.5	6	8	57
1703290400	**4.0**	2.0	6	11	57
1703290500	**5.0**	2.5	6	13	57
1703290600	**6.0**	3.0	6	13	57
1703290800	**8.0**	4.0	8	19	63
1703291000	**10.0**	5.0	10	22	72
1703291200	**12.0**	6.0	12	26	83
1703291600	**16.0**	8.0	16	32	92
1703292000	**20.0**	10.0	20	38	104
1703292500	**25.0**	12.5	25	38	104

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.01	+0.01	h6

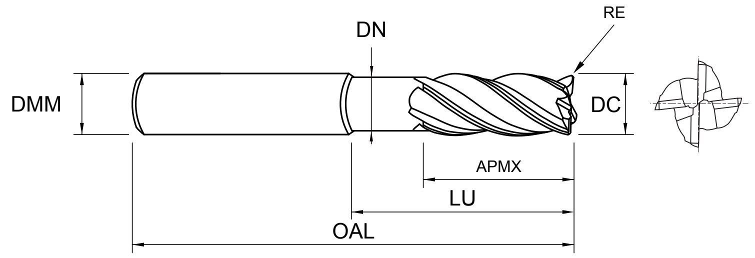
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

MG HM | ZEFP 4 | RE | FHA 35/37° | DIN 6535HA | NECK | VX COATED



Series No. 171329

▶cutting conditions: p.216-217



MASTERMILL VX

Corner radius.
Minimized tool deflection.
Reduced tool vibration.

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1713290300	**3.0**	0.3	6	7	12	54	2.7
1713299001		0.3	6	7	17	57	2.7
1713299002		0.5	6	7	12	54	2.7
1713299003		0.5	6	7	17	57	2.7
1713290400	**4.0**	0.3	6	8	15	57	3.7
1713299004		0.3	6	8	22	63	3.7
1713299005		0.5	6	8	15	57	3.7
1713299006		0.5	6	8	22	63	3.7
1713290500	**5.0**	0.3	6	10	17	57	4.7
1713299007		0.3	6	10	27	67	4.7
1713299008		0.5	6	10	17	57	4.7
1713299009		0.5	6	10	27	67	4.7
1713290600	**6.0**	0.3	6	10	15	57	5.5
1713299010		0.3	6	10	20	62	5.5
1713299011		0.3	6	10	32	74	5.5
1713299012		0.5	6	10	15	57	5.5
1713299013		0.5	6	10	20	62	5.5
1713299014		0.5	6	10	32	74	5.5
1713299015		1.0	6	10	15	57	5.5
1713299016		1.0	6	10	20	62	5.5
1713299017		1.0	6	10	32	74	5.5
1713290800	**8.0**	0.5	8	12	20	63	7.5
1713299018		0.5	8	12	30	73	7.5
1713299019		0.5	8	12	46	90	7.5
1713299020		1.0	8	12	20	63	7.5
1713299021		1.0	8	12	30	73	7.5
1713299022		1.0	8	12	46	90	7.5

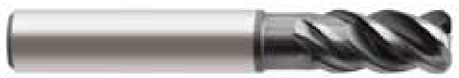
Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.03	-0.03	+0.03	h6

LONG LENGTH NECKED, RADIUS

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1713291000	**10.0**	0.5	10	14	25	72	9.2
1713299023		0.5	10	14	35	82	9.2
1713299024		0.5	10	14	55	102	9.2
1713299025		1.0	10	14	25	82	9.2
1713299026		1.0	10	14	35	82	9.2
1713299027		1.0	10	14	55	102	9.2
1713291200	**12.0**	0.5	12	16	30	83	11.0
1713299028		0.5	12	16	40	93	11.0
1713299029		0.5	12	16	64	117	11.0
1713299030		1.0	12	16	30	83	11.0
1713299031		1.0	12	16	40	93	11.0
1713299032		1.0	12	16	64	117	11.0
1713299033		2.0	12	16	30	83	11.0
1713299034		2.0	12	16	40	93	11.0
1713299035		2.0	12	16	64	117	11.0
1713291600	**16.0**	1.0	16	22	38	92	15.0
1713299036		1.0	16	22	55	109	15.0
1713299037		1.0	16	22	87	141	15.0
1713299038		2.0	16	22	38	92	15.0
1713299039		2.0	16	22	55	109	15.0
1713299040		2.0	16	22	87	141	15.0
1713299041		3.0	16	22	38	92	15.0
1713299042		3.0	16	22	55	109	15.0
1713299043		3.0	16	22	87	141	15.0
1713292000	**20.0**	1.0	20	26	50	104	19.0
1713299044		1.0	20	26	70	124	19.0
1713299045		1.0	20	26	110	164	19.0
1713299046		2.0	20	26	50	104	19.0
1713299047		2.0	20	26	70	124	19.0
1713299048		2.0	20	26	110	164	19.0
1713299049		3.0	20	26	50	104	19.0
1713299050		3.0	20	26	70	124	19.0
1713299051		3.0	20	26	110	164	19.0

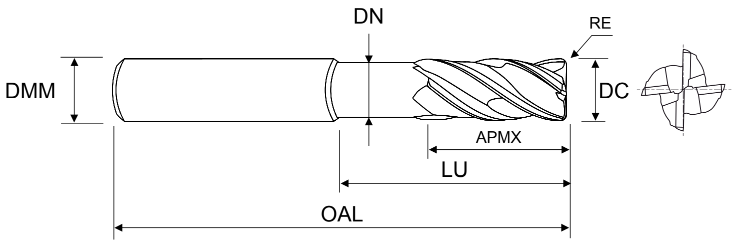
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	●	●						●	○	

MG HM | ZEFP 4 | RE | FHA 35/37° | DIN 6535HA | NECK | VX COATED



Series No. 170323

▶cutting conditions: p.218-219



MASTERMILL VXD

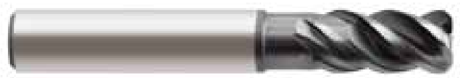
Double core geometry reduces tool deflection and improves dimensional stability.
Optimized edge preparation protects against chipping problems in high speed machining.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1703230600	**6.0**	0.5	6	13	20	57	5.5
1703239001		1.0	6	13	20	57	5.5
1703230800	**8.0**	0.5	8	19	25	63	7.5
1703239002		1.0	8	19	25	63	7.5
1703239003		1.5	8	19	25	63	7.5
1703239004		2.0	8	19	25	63	7.5
1703231000	**10.0**	0.5	10	22	30	72	9.2
1703239005		1.0	10	22	30	72	9.2
1703239006		1.5	10	22	30	72	9.2
1703239007		2.0	10	22	30	72	9.2
1703231200	**12.0**	0.5	12	26	35	83	11.0
1703239008		1.0	12	26	35	83	11.0
1703239009		1.5	12	26	35	83	11.0
1703239010		2.0	12	26	35	83	11.0
1703239011		3.0	12	26	35	83	11.0
1703231400	**14.0**	1.0	14	26	35	83	13.0
1703239012		2.0	14	26	35	83	13.0
1703231600	**16.0**	1.0	16	35	43	92	15.0
1703239013		1.5	16	35	43	92	15.0
1703239014		2.0	16	35	43	92	15.0
1703239015		3.0	16	35	43	92	15.0
1703239016		4.0	16	35	43	92	15.0

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●		●	●	○	○						○	●	

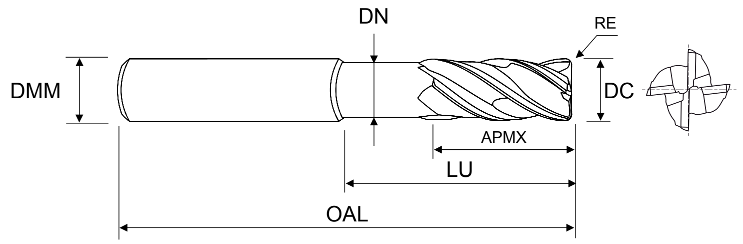
DOUBLE CORE



MG HM | ZEFP 4 | RE | FHA 35/37° | DIN 6535HA | NECK | VX COATED

Series No. 170323

▶cutting conditions: p.218-219



MASTERMILL VXD

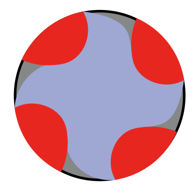
Double core geometry reduces tool deflection and improves dimensional stability.
Optimized edge preparation protects against chipping problems in high speed machining.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1703232000	**20.0**	1.0	20	44	56	110	19.0
1703239017		1.5	20	44	56	110	19.0
1703239018		2.0	20	44	56	110	19.0
1703239019		3.0	20	44	56	110	19.0
1703239020		3.5	20	44	56	110	19.0
1703239021		4.0	20	44	56	110	19.0
1703232500	**25.0**	1.0	25	55	70	130	24.0
1703239022		1.5	25	55	70	130	24.0
1703239023		2.0	25	55	70	130	24.0
1703239024		3.0	25	55	70	130	24.0
1703239025		4.0	25	55	70	130	24.0

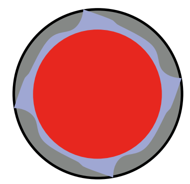
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

DOUBLE CORE

1. **4 Flute Double Core with unique flute design for excellent chip evacuation and high rigidity.**
2. **Increased stability and chip flow reduces tool defelection, improving dimensional stability and workpiece accuracy.**
3. **Chip clogging minimized when used for slotting.**



SECTION X-X
Excellent chip evacuation



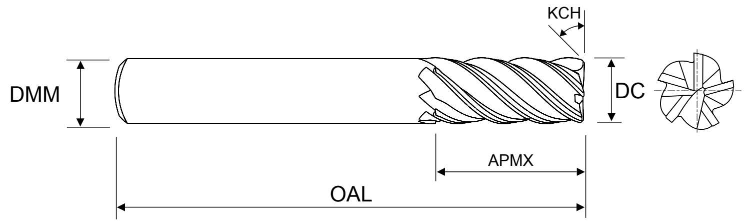
SECTION Y-Y
Higher rigidity

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●		●	●	○	○						○	●	

MG HM | ZEFP 5 | KCH 45° | FHA 35/37° | DIN 6535HA | VX COATED

Series No. 171323

▶cutting conditions: p.220

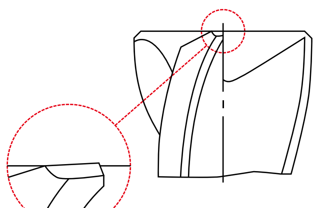


MASTERMILL VX5

Chamfered for corner protection.
High rigidity of flute for heavy profiling and high speed machining.
Reinforced cutting edge.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	CHAMFER WIDTH **CHW**
1713230600	**6.0**	6	10	54	0.20
1713230800	**8.0**	8	12	58	0.20
1713231000	**10.0**	10	14	66	0.30
1713231200	**12.0**	12	16	73	0.35
1713231600	**16.0**	16	22	82	0.40
1713232000	**20.0**	20	26	92	0.50
1713232500	**25.0**	25	29	100	0.50

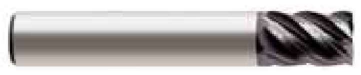
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6



Reinforced cutting edge

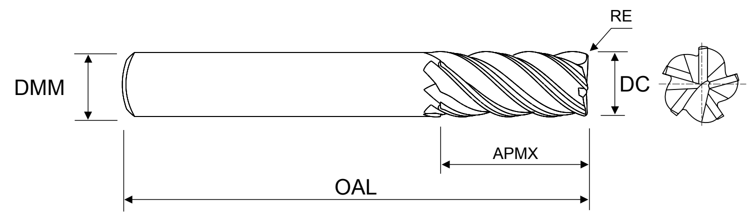
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	○	○						○	●	

MG HM | ZEFP 5 | RE | FHA 35/37° | DIN 6535HA | VX COATED



Series No. 173323

▶cutting conditions: p.220



MASTERMILL VX5

Corner radius.
High rigidity of flute for heavy profiling and high speed machining.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1733230600	**6.0**	0.5	6	10	54
1733230800	**8.0**	0.5	8	12	58
1733231000	**10.0**	0.5	10	14	66
1733231200	**12.0**	0.5	12	16	73
1733231600	**16.0**	1.0	16	22	82
1733232000	**20.0**	1.0	20	26	92
1733232500	**25.0**	1.0	25	29	100

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

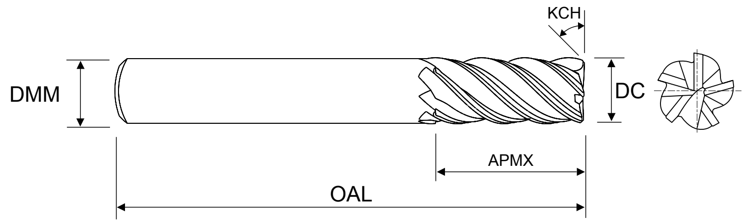
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	○	○						○	●	

STANDARD LENGTH

MG HM | ZEFP 5 | KCH 45° | FHA 35/37° | DIN 6535HA | VX COATED

Series No. 172323

▶cutting conditions: p.220

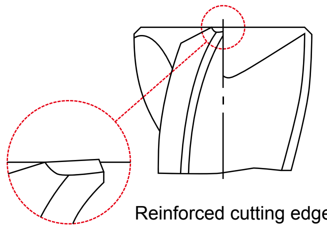


MASTERMILL VX5

Chamfered for corner protection.
High rigidity of flute for heavy profiling and high speed machining.
Reinforced cutting edge.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	CHAMFER WIDTH **CHW**
1723230600	**6.0**	6	13	57	0.20
1723230800	**8.0**	8	19	63	0.20
1723231000	**10.0**	10	22	72	0.30
1723231200	**12.0**	12	26	83	0.35
1723231600	**16.0**	16	36	92	0.40
1723232000	**20.0**	20	44	104	0.50
1723232500	**25.0**	25	54	121	0.50

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

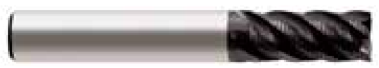


Reinforced cutting edge

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	●	●	●	○	○						●	○	

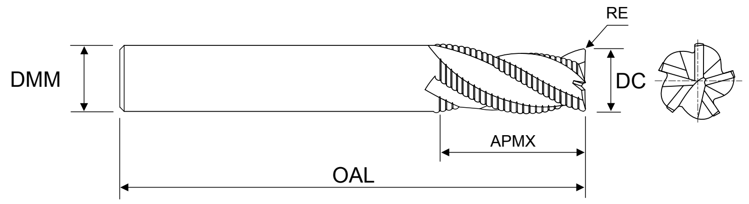
STANDARD LENGTH ROUGHING

MG HM | ZEFP 5 | RE | FHA 40° | FINE | DIN 6535HA | TiAlN COATED



Series No. 175323

▶cutting conditions: p.221



MASTERMILL VX5 ROUGHING

Corner radius.
High rigidity of flute and excellent chip evacuation in difficult to machine materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1753230600	**6.0**	0.2	6	16	57
1753230800	**8.0**	0.2	8	16	63
1753231000	**10.0**	0.3	10	22	72
1753231200	**12.0**	0.3	12	26	83
1753231400	**14.0**	0.3	14	26	83
1753231600	**16.0**	0.3	16	32	92
1753232000	**20.0**	0.3	20	38	104
1753232500	**25.0**	0.3	25	45	121

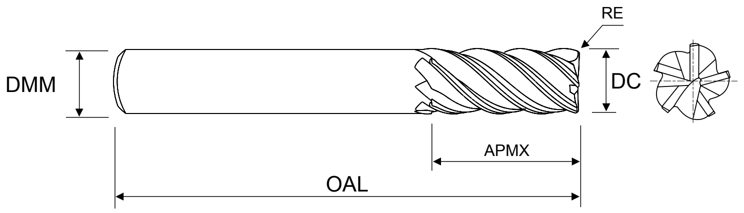
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
6.0, 8.0, 10.0	0.00 / -0.058	-0.03	+0.03	h6
12.0, 14.0, 16.0	0.00 / -0.070			
20.0, 25.0	0.00 / -0.084			

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good				●	○								○	●	

MG HM | ZEFP 5 | RE | FHA 35/37° | DIN 6535HA | VX COATED

Series No. 174323

▶cutting conditions: p.220



MASTERMILL VX5

Corner radius.
High rigidity of flute for heavy profiling and high speed machining.

EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1743230600	6.0	0.3	6	13	57
1743239001		0.5	6	13	57
1743239002		1.0	6	13	57
1743230800	8.0	0.5	8	19	63
1743239003		1.0	8	19	63
1743239004		1.5	8	19	63
1743239005		2.0	8	19	63
1743231000	10.0	0.5	10	22	72
1743239006		1.0	10	22	72
1743239007		1.5	10	22	72
1743239008		2.0	10	22	72
1743231200	12.0	0.5	12	26	83
1743239009		1.0	12	26	83
1743239010		1.5	12	26	83
1743239011		2.0	12	26	83
1743239012		2.5	12	26	83
1743239013		3.0	12	26	83
1743231600	16.0	1.0	16	36	92
1743239014		1.5	16	36	92
1743239015		2.0	16	36	92
1743239016		2.5	16	36	92
1743239017		3.0	16	36	92
1743239018		4.0	16	36	92

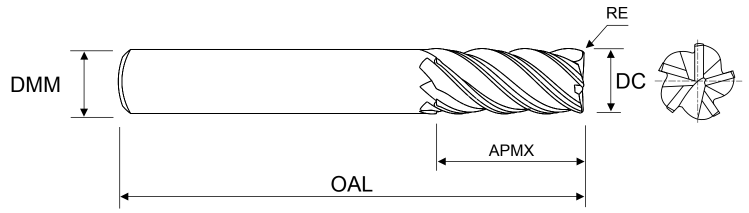
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●		●	●	○	○						○	●	

STANDARD LENGTH CORNER RADIUS EUROPA TOOL

MG HM | ZEFP 5 | RE | FHA 35/37° | DIN 6535HA | VX COATED

Series No. 174323

▶cutting conditions: p.220



MASTERMILL VX5

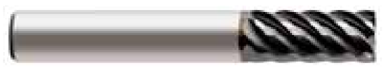
Corner radius.
High rigidity of flute for heavy profiling and high speed machining.

EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1743232000	20.0	1.0	20	44	104
1743239019		1.5	20	44	104
1743239020		2.0	20	44	104
1743239021		2.5	20	44	104
1743239022		3.0	20	44	104
1743239023		4.0	20	44	104
1743239024		5.0	20	44	104
1743232500	25.0	1.0	25	54	121
1743239025		1.5	25	54	121
1743239026		2.0	25	54	121
1743239027		2.5	25	54	121
1743239028		3.0	25	54	121
1743239029		4.0	25	54	121
1743239030		5.0	25	54	121

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.03	+0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●		●	●	○	○						○	●	

MG HM | ZEFP 6 | FHA 45° | DIN 6535HA | VX COATED

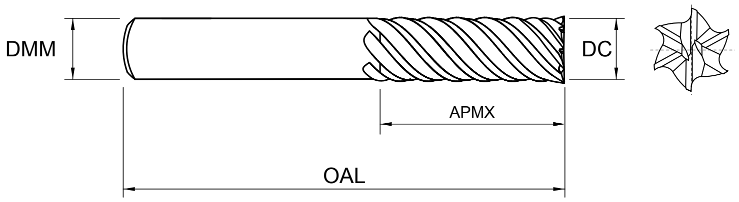


Series No. 174329

▶cutting conditions: p.222-223

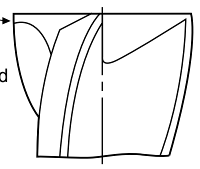
MASTERMILL VX6

Unequal index and unique geometry optimised for high speed and trochoidal milling.
90° corner with edge preparation for corner protection.



EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1743290600	**6.0**	6	13	57
1743290800	**8.0**	8	19	63
1743291000	**10.0**	10	22	72
1743291200	**12.0**	12	26	83
1743291600	**16.0**	16	32	92
1743292000	**20.0**	20	38	104
1743292500	**25.0**	25	44	104

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

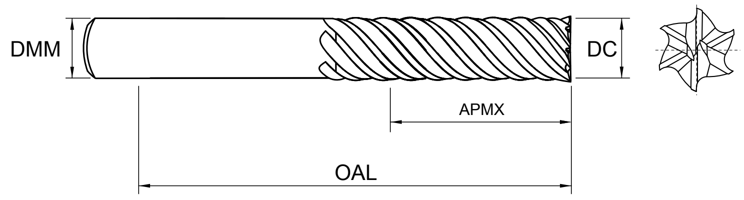


ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	○	●	●								●	●	

MG HM | ZEFP 6 | FHA 45° | DIN 6535HA | VX COATED

Series No. 175329

▶cutting conditions: p.222-223

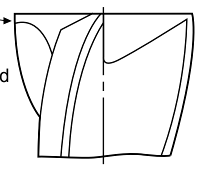


MASTERMILL VX6

Unequal index and unique geometry optimised for high speed and trochoidal milling.
90° corner with edge preparation for corner protection.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1753290600	**6.0**	6	24	75
1753290800	**8.0**	8	32	75
1753291000	**10.0**	10	40	100
1753291200	**12.0**	12	48	120
1753291600	**16.0**	16	64	140
1753292000	**20.0**	20	80	150
1753292500	**25.0**	25	100	170

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

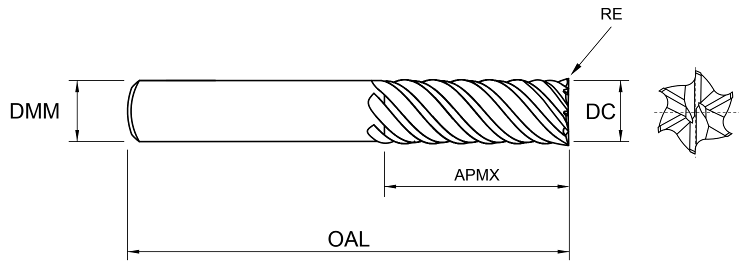


ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	○	●	●								●	●	

MG HM | ZEFP 6 | RE | FHA 45º | DIN 6535HA | VX COATED

Series No. 176329

▶cutting conditions: p.222-223



MASTERMILL VX6
Corner radius.
Unequal index and unique geometry optimised for high speed and trochoidal milling.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1763290600	**6.0**	0.5	6	13	57
1763299001		1.0	6	13	57
1763290800	**8.0**	0.5	8	19	63
1763299002		1.0	8	19	63
1763291000	**10.0**	0.5	10	22	72
1763299003		1.0	10	22	72
1763299004		1.5	10	22	72
1763299005		2.0	10	22	72
1763291200	**12.0**	0.5	12	26	83
1763299006		1.0	12	26	83
1763299007		1.5	12	26	83
1763299008		2.0	12	26	83
1763299009		3.0	12	26	83
1763291600	**16.0**	1.0	16	32	92
1763299010		1.5	16	32	92
1763299011		2.0	16	32	92
1763299012		3.0	16	32	92

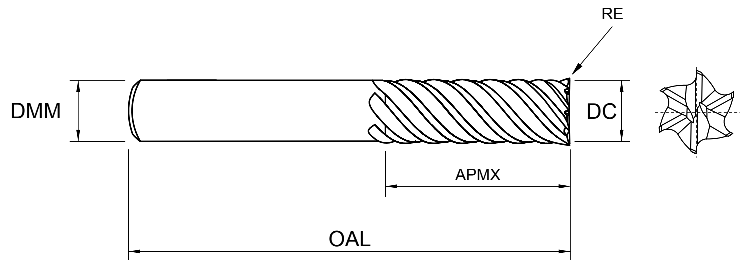
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●								●	●	

MG HM | ZEFP 6 | RE | FHA 45º | DIN 6535HA | VX COATED

Series No. 176329

▶cutting conditions: p.222-223



MASTERMILL VX6
Corner radius.
Unequal index and unique geometry optimised for high speed and trochoidal milling.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1763292000	**20.0**	1.0	20	38	104
1763299013		1.5	20	38	104
1763299014		2.0	20	38	104
1763299015		3.0	20	38	104
1763292500	**25.0**	1.0	25	44	104
1763299016		1.5	25	44	104
1763299017		2.0	25	44	104
1763299018		3.0	25	44	104

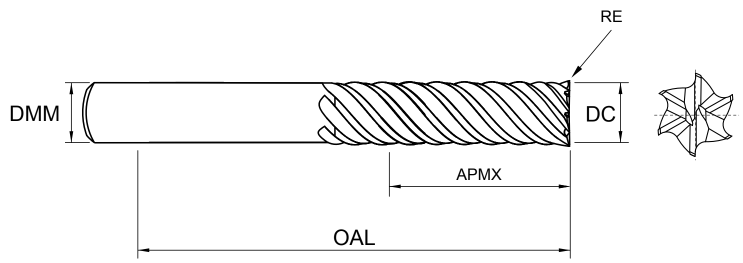
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●								●	●	

MG HM | ZEFP 6 | RE | FHA 45° | DIN 6535HA | VX COATED

Series No. 173329

▶cutting conditions: p.222-223



MASTERMILL VX6

Corner radius.
Unequal index and unique geometry optimised for high speed and trochoidal milling.

EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1733290600	6.0	0.5	6	24	75
1733299001		1.0	6	24	75
1733290800	8.0	0.5	8	32	75
1733299002		1.0	8	32	75
1733299003		2.0	8	32	75
1733291000	10.0	0.5	10	40	100
1733299004		1.0	10	40	100
1733299005		1.5	10	40	100
1733299006		2.0	10	40	100
1733291200	12.0	0.5	12	48	120
1733299007		1.0	12	48	120
1733299008		1.5	12	48	120
1733299009		2.0	12	48	120
1733299010		3.0	12	48	120
1733291600	16.0	1.0	16	64	140
1733299011		1.5	16	64	140
1733299012		2.0	16	64	140
1733299013		3.0	16	64	140

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.03	+0.03	h6

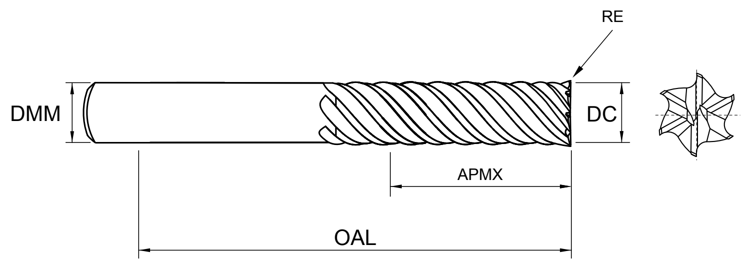
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●								●	●	

LONG LENGTH CORNER RADIUS

MG HM | ZEFP 6 | RE | FHA 45° | DIN 6535HA | VX COATED

Series No. 173329

▶cutting conditions: p.222-223



MASTERMILL VX6

Corner radius.
Unequal index and unique geometry optimised for high speed and trochoidal milling.

EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1733292000	20.0	1.0	20	80	150
1733299014		1.5	20	80	150
1733299015		2.0	20	80	150
1733299016		3.0	20	80	150
1733299017		4.0	20	80	150
1733299018		5.0	25	80	150
1733292500	25.0	1.0	25	100	170
1733299019		1.5	25	100	170
1733299020		2.0	25	100	170
1733299021		3.0	25	100	170
1733299022		4.0	25	100	170
1733299023		5.0	25	100	170

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.03	-0.03	+0.03	h6

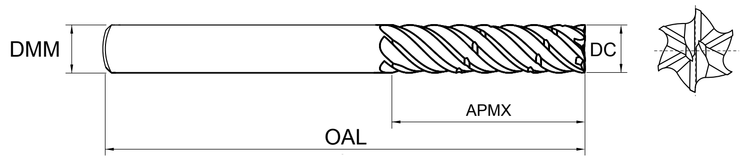
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●								●	●	

LONG LENGTH CHIPSPLITTER

MG HM | ZEFP 6 | FHA 45° | DIN 6535HA | VX COATED

Series No. 675329

▶cutting conditions: p.222-223



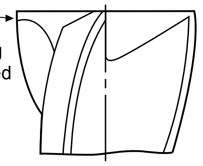
MASTERMILL VX6C

Sharp corner
Unequal index and unique geometry optimised for high speed and trochoidal milling.
Chip splitter geometry for better swarf control.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
6753290600	**6.0**	6	24	75
6753290800	**8.0**	8	32	75
6753291000	**10.0**	10	40	100
6753291200	**12.0**	12	48	120
6753291600	**16.0**	16	64	140
6753292000	**20.0**	20	80	150
6753292500	**25.0**	25	100	170

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

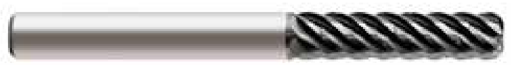
Sharp cutting edge removed



ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	○	●	●								●	●	

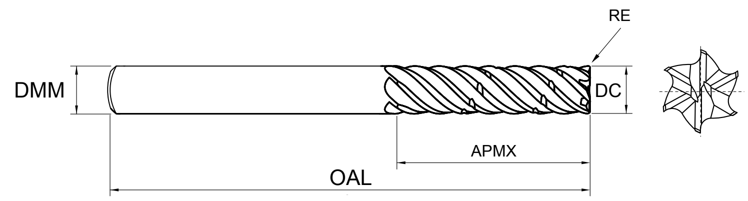
LONG LENGTH CHIPSPLITTER CORNER RADIUS

MG HM | ZEFP 6 | RE | FHA 45° | DIN 6535HA | VX COATED



Series No. 673329

▶cutting conditions: p.222-223



MASTERMILL VX6C

Corner radius.
Unequal index and unique geometry optimised for high speed and trochoidal milling.
Chip splitter geometry for better swarf control.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
6733290600	**6.0**	0.5	6	24	75
6733299001		1.0	6	24	75
6733290800	**8.0**	0.5	8	32	75
6733299002		1.0	8	32	75
6733299003		2.0	8	32	75
6733291000	**10.0**	0.5	10	40	100
6733299004		1.0	10	40	100
6733299005		1.5	10	40	100
6733299006		2.0	10	40	100
6733291200	**12.0**	0.5	12	48	120
6733299007		1.0	12	48	120
6733299008		1.5	12	48	120
6733299009		2.0	12	48	120
6733299010		3.0	12	48	120
6733291600	**16.0**	1.0	16	64	140
6733299011		1.5	16	64	140
6733299012		2.0	16	64	140
6733299013		3.0	16	64	140
6733292000	**20.0**	1.0	20	80	150
6733299014		1.5	20	80	150
6733299015		2.0	20	80	150

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

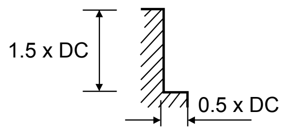
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	●	●	○	●	●								●	●	

MASTERMILL VX
CUTTING DATA

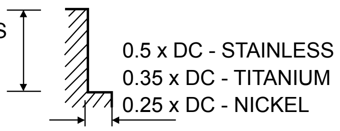
Cutting Conditions 171329, 176323, 177323, 178323, 179323 (4 Flute VX) **SIDE CUTTING**

VDI MATERIAL GROUP		HRc		Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	< 25	v_c (m/min)	152	152	152	152	152	168	168	168	168
			n	16128	12096	9677	8064	6048	5348	4456	3342	2674
			f_z	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.053	0.065
			f (mm/min)	323	387	513	516	653	813	838	709	695
	6-9	25-35	v_c (m/min)	107	107	107	107	107	117	117	117	117
			n	11353	8515	6812	5677	4257	3724	3104	2328	1862
			f_z	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.053	0.065
			f (mm/min)	227	272	300	363	460	566	583	493	484
	10-11	35-45	v_c (m/min)	64	64	64	64	64	70	70	70	70
			n	6791	5093	4074	3395	2546	2228	1857	1393	1114
			f_z	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.037	0.045
			f (mm/min)	81	122	130	149	194	241	238	206	201
M	12		v_c (m/min)	161	161	161	161	161	161	161	161	161
			n	17083	12812	10250	8541	6406	5125	4270	3203	2562
			f_z	0.004	0.006	0.009	0.013	0.022	0.034	0.040	0.045	0.055
			f (mm/min)	273	307	369	444	564	697	683	577	564
	13		v_c (m/min)	115	115	115	115	115	115	115	115	115
			n	12202	9151	7321	6104	4576	3661	3050	2288	1830
			f_z	0.005	0.008	0.013	0.018	0.028	0.048	0.056	0.063	0.077
			f (mm/min)	244	293	381	439	512	703	683	577	564
	14		v_c (m/min)	104	104	104	104	104	104	104	104	104
			n	11035	8276	6621	5517	4138	3310	2759	2069	1655
			f_z	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.062	0.077
			f (mm/min)	221	265	344	397	463	636	607	513	510
K	15-20		v_c (m/min)	112	112	112	112	112	123	123	123	123
			n	11884	8913	7130	5942	4456	3915	3263	2447	1958
			f_z	0.006	0.010	0.014	0.020	0.034	0.048	0.058	0.065	0.081
			f (mm/min)	285	357	399	475	606	752	757	636	634
S	31-35		v_c (m/min)	31	31	31	31	31	31	31	31	31
			n	3289	2467	1974	1645	1233	987	822	617	493
			f_z	0.005	0.007	0.012	0.018	0.031	0.047	0.055	0.064	0.077
			f (mm/min)	66	69	95	118	153	186	181	158	152
	36-37		v_c (m/min)	81	81	81	81	81	81	81	81	81
			n	8594	6446	5157	4297	3223	2578	2149	1611	1289
			f_z	0.004	0.007	0.011	0.016	0.025	0.043	0.050	0.056	0.069
			f (mm/min)	138	180	227	275	322	445	430	361	356

SIDE CUTTING
STEEL &
CAST IRON



SIDE CUTTING
1.5 x DC - STAINLESS
1.0 x DC - TITANIUM
1.0 x DC - NICKEL

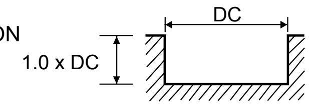


CUTTING DATA

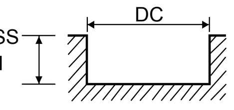
Cutting Conditions 171329, 176323, 177323, 178323, 179323 (4 Flute VX) **SLOTTING**

VDI MATERIAL GROUP		HRc		Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	< 25	v_c (m/min)	152	152	152	152	152	168	168	168	168
			n	16128	12096	9677	8064	6048	5348	4456	3342	2674
			f_z	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.053	0.065
			f (mm/min)	323	387	513	516	653	813	838	709	695
	6-9	25-35	v_c (m/min)	107	107	107	107	107	117	117	117	117
			n	11353	8515	6812	5677	4257	3724	3104	2328	1862
			f_z	0.005	0.008	0.011	0.016	0.027	0.038	0.047	0.053	0.065
			f (mm/min)	227	272	300	363	460	566	583	493	484
	10-11	35-45	v_c (m/min)	64	64	64	64	64	70	70	70	70
			n	6791	5093	4074	3395	2546	2228	1857	1393	1114
			f_z	0.003	0.006	0.008	0.011	0.019	0.027	0.032	0.037	0.045
			f (mm/min)	81	122	130	149	194	241	238	206	201
M	12		v_c (m/min)	161	161	161	161	161	161	161	161	161
			n	17083	12812	10250	8541	6406	5125	4270	3203	2562
			f_z	0.004	0.006	0.009	0.013	0.022	0.034	0.040	0.045	0.055
			f (mm/min)	273	307	369	444	564	697	683	577	564
	13		v_c (m/min)	115	115	115	115	115	115	115	115	115
			n	12202	9151	7321	6104	4576	3661	3050	2288	1830
			f_z	0.005	0.008	0.013	0.018	0.028	0.048	0.056	0.063	0.077
			f (mm/min)	244	293	381	439	512	703	683	577	564
	14		v_c (m/min)	104	104	104	104	104	104	104	104	104
			n	11035	8276	6621	5517	4138	3310	2759	2069	1655
			f_z	0.005	0.008	0.013	0.018	0.028	0.048	0.055	0.062	0.077
			f (mm/min)	221	265	344	397	463	636	607	513	510
K	15-20		v_c (m/min)	112	112	112	112	112	123	123	123	123
			n	11884	8913	7130	5942	4456	3915	3263	2447	1958
			f_z	0.006	0.010	0.014	0.020	0.034	0.048	0.058	0.065	0.081
			f (mm/min)	285	357	399	475	606	752	757	636	634
S	31-35		v_c (m/min)	31	31	31	31	31	31	31	31	31
			n	3289	2467	1974	1645	1233	987	822	617	493
			f_z	0.005	0.007	0.012	0.018	0.031	0.047	0.055	0.064	0.077
			f (mm/min)	66	69	95	118	153	186	181	158	152
	36-37		v_c (m/min)	81	81	81	81	81	81	81	81	81
			n	8594	6446	5157	4297	3223	2578	2149	1611	1289
			f_z	0.004	0.007	0.011	0.016	0.025	0.043	0.050	0.056	0.069
			f (mm/min)	138	180	227	275	322	445	430	361	356

SLOTTING
STEEL &
CAST IRON



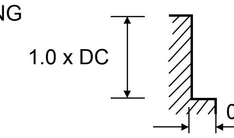
SLOTTING
1.0 x DC - STAINLESS
0.5 x DC - TITANIUM
0.5 x DC - NICKEL



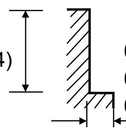
Cutting Conditions 170323 (4 Flute VXD) **SIDE CUTTING**

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-5	< 25	v_c (m/min)	160	160	160	160	160	160	160	160
			n	8488	6366	5093	4244	3638	3183	2546	2037
			f_z	0.027	0.035	0.042	0.053	0.058	0.063	0.077	0.084
			f (mm/min)	917	891	856	900	844	802	784	684
	6-9	25-35	v_c (m/min)	150	150	150	150	150	150	150	150
			n	7958	5968	4775	3979	3410	2984	2387	1910
			f_z	0.025	0.035	0.042	0.049	0.056	0.063	0.070	0.084
			f (mm/min)	796	836	802	780	764	752	668	642
	10-11	35-45	v_c (m/min)	150	150	150	150	150	150	150	150
			n	7958	5968	4775	3979	3410	2984	2387	1910
			f_z	0.027	0.035	0.046	0.053	0.060	0.067	0.077	0.084
			f (mm/min)	859	836	879	844	819	800	736	642
M	12		v_c (m/min)	155	155	155	155	155	155	155	155
			n	8223	6167	4934	4112	3524	3084	2467	1974
			f_z	0.034	0.046	0.057	0.067	0.076	0.086	0.095	0.114
			f (mm/min)	1125	1125	1125	1094	1071	1055	937	900
	13		v_c (m/min)	105	105	105	105	105	105	105	105
			n	5570	4187	3342	2785	2387	2089	1671	1337
			f_z	0.025	0.034	0.042	0.048	0.055	0.062	0.071	0.081
			f (mm/min)	557	568	562	535	525	518	475	433
	14		v_c (m/min)	44	44	44	44	44	44	44	44
			n	2334	1751	1401	1168	1000	875	700	560
			f_z	0.016	0.021	0.027	0.032	0.036	0.040	0.046	0.052
			f (mm/min)	151	146	149	151	144	140	128	117
K	15-20		v_c (m/min)	175	175	175	175	175	175	175	175
			n	9284	6963	5570	4642	3979	3482	2785	2228
			f_z	0.021	0.028	0.035	0.042	0.048	0.053	0.060	0.070
			f (mm/min)	780	780	780	780	764	738	668	624
S	31-35		v_c (m/min)	32	32	32	32	32	32	32	32
			n	1698	1273	1019	849	728	637	509	407
			f_z	0.020	0.026	0.032	0.038	0.044	0.048	0.055	0.065
			f (mm/min)	136	132	130	129	128	122	112	106
	36-37		v_c (m/min)	70	70	70	70	70	70	70	70
			n	3714	2785	2228	1857	1592	1393	1114	891
			f_z	0.034	0.048	0.057	0.067	0.076	0.086	0.095	0.114
			f (mm/min)	508	529	508	494	484	476	423	406

SIDE CUTTING
STEEL &
CAST IRON



SIDE CUTTING
1.0 x DC - STAINLESS
0.6 x DC - STAINLESS (14)
1.0 x DC - TITANIUM
0.6 x DC - NICKEL



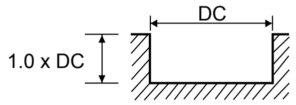
0.4 x DC - STAINLESS
0.4 x DC - TITANIUM
0.3 x DC - NICKEL

CUTTING DATA

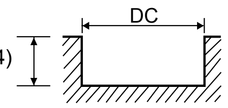
Cutting Conditions 170323 (4 Flute VXD) **SLOTTING**

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
P	1-5	< 25	v_c (m/min)	125	125	125	125	125	125	125	125
			n	6631	4974	3979	3316	2842	2487	1989	1592
			f_z	0.025	0.034	0.042	0.049	0.056	0.063	0.070	0.084
			f (mm/min)	663	676	668	650	637	627	557	535
	6-9	25-35	v_c (m/min)	120	120	120	120	120	120	120	120
			n	6366	4775	3820	3183	2728	2387	1910	1528
			f_z	0.025	0.034	0.042	0.049	0.056	0.063	0.070	0.077
			f (mm/min)	637	649	642	624	611	602	535	471
	10-11	35-45	v_c (m/min)	120	120	120	120	120	120	120	120
			n	6366	4775	3820	3183	2728	238	1910	1528
			f_z	0.027	0.035	0.042	0.053	0.058	0.063	0.077	0.084
			f (mm/min)	688	668	642	675	633	602	588	513
M	12		v_c (m/min)	125	125	125	125	125	125	125	125
			n	6631	4974	3979	3316	2842	2487	1989	1592
			f_z	0.034	0.046	0.057	0.067	0.074	0.081	0.095	0.105
			f (mm/min)	907	907	907	882	841	803	756	665
	13		v_c (m/min)	85	85	85	85	85	85	85	85
			n	4509	3382	2706	2255	1933	1691	1353	1082
			f_z	0.025	0.034	0.042	0.048	0.055	0.062	0.071	0.081
			f (mm/min)	446	463	452	428	425	418	386	350
	14		v_c (m/min)	36	36	36	36	36	36	36	36
			n	1910	1432	1146	955	819	716	573	458
			f_z	0.016	0.021	0.027	0.032	0.036	0.040	0.046	0.052
			f (mm/min)	123	120	122	123	118	114	105	96
K	15-20		v_c (m/min)	140	140	140	140	140	140	140	140
			n	7427	5570	4456	3714	3183	2785	2228	1783
			f_z	0.021	0.028	0.035	0.042	0.048	0.053	0.060	0.067
			f (mm/min)	624	624	624	624	611	590	535	478
S	31-35		v_c (m/min)	25	25	25	25	25	25	25	25
			n	1326	995	796	663	568	497	397	318
			f_z	0.018	0.024	0.030	0.036	0.040	0.044	0.050	0.055
			f (mm/min)	95	95	95	95	91	88	80	70
	36-37		v_c (m/min)	55	55	55	55	55	55	55	55
			n	2918	2188	1751	1459	1251	1094	875	700
			f_z	0.034	0.046	0.057	0.067	0.076	0.086	0.095	0.105
			f (mm/min)	399	399	399	388	380	374	333	293

SLOTTING
STEEL &
CAST IRON



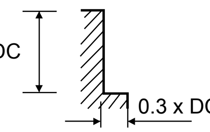
SLOTTING
1.0 x DC - STAINLESS
0.5 x DC - STAINLESS (14)
1.0 x DC - TITANIUM
0.4 x DC - NICKEL



Cutting Conditions 171323, 172323, 173323, 174323 (5 Flute VX5)

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-5	< 25	v_c (m/min)	144	144	144	144	144	144	144
			n	7639	5730	4584	3820	2865	2292	1833
			f_z	0.034	0.038	0.050	0.063	0.076	0.089	0.101
			f (mm/min)	1299	1089	1146	1203	1089	1020	926
	6-9	25-35	v_c (m/min)	101	101	101	101	101	101	101
			n	5358	4019	3215	2679	2009	1607	1286
			f_z	0.034	0.038	0.050	0.063	0.076	0.089	0.101
			f (mm/min)	911	764	804	844	764	715	649
	10-11	35-45	v_c (m/min)	60	60	60	60	60	60	60
			n	3183	2387	1910	1592	1194	955	764
			f_z	0.024	0.027	0.035	0.044	0.054	0.062	0.071
			f (mm/min)	382	322	334	350	322	296	271
M	12		v_c (m/min)	117	117	117	117	117	117	117
			n	6207	4655	3724	3104	2328	1862	1490
			f_z	0.024	0.025	0.030	0.046	0.054	0.061	0.071
			f (mm/min)	745	582	559	714	628	568	529
	13		v_c (m/min)	82	82	82	82	82	82	82
			n	4350	3263	2610	2175	1631	1305	1044
			f_z	0.030	0.032	0.038	0.063	0.069	0.076	0.088
			f (mm/min)	653	522	496	685	563	496	459
	14		v_c (m/min)	59	59	59	59	59	59	59
			n	3130	2348	1878	1565	1174	939	751
			f_z	0.030	0.032	0.038	0.063	0.069	0.076	0.088
			f (mm/min)	470	376	354	493	405	357	331
K	15-20		v_c (m/min)	106	106	106	106	106	106	106
			n	5623	4218	3374	2812	2109	1687	1350
			f_z	0.043	0.048	0.063	0.079	0.096	0.111	0.126
			f (mm/min)	1209	1012	1063	1111	1012	936	850
S	31-35		v_c (m/min)	31	31	31	31	31	31	31
			n	1645	1233	987	822	617	493	395
			f_z	0.021	0.022	0.027	0.044	0.048	0.053	0.062
			f (mm/min)	173	136	133	181	148	131	122
	36-37		v_c (m/min)	69	69	69	69	69	69	69
			n	3661	2745	2196	1830	1373	1098	879
			f_z	0.027	0.029	0.034	0.057	0.062	0.069	0.079
			f (mm/min)	494	398	373	522	426	379	347

SIDE CUTTING

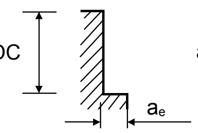


CUTTING DATA

Cutting Conditions 175323 (5 Flute VX5 Roughing)

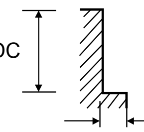
VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	20.0	25.0
M	12-14		v_c (m/min)	80	80	80	80	80	80	80	80
			n	4244	3183	2546	2122	1819	1592	1273	1019
			f_z	0.025	0.034	0.041	0.051	0.057	0.063	0.081	0.091
			f (mm/min)	531	541	522	541	518	501	516	463
S	31-35		v_c (m/min)	40	40	40	40	40	40	40	40
			n	2122	1592	1273	1061	909	796	637	509
			f_z	0.020	0.025	0.037	0.040	0.046	0.052	0.061	0.068
			f (mm/min)	212	199	236	212	209	207	197	173
	36-37		v_c (m/min)	65	65	65	65	65	65	65	65
			n	3448	2586	2069	1724	1478	1293	1035	828
			f_z	0.022	0.031	0.038	0.046	0.052	0.058	0.074	0.084
			f (mm/min)	379	401	393	397	384	375	383	348

SIDE CUTTING - STAINLESS & TITANIUM



a_e: ø6.0 - ø10.0 : 0.15 x DC
ø12.0 - ø16.0 : 0.1 x DC
ø20.0 - ø 25.0 : 0.05 x DC

SIDE CUTTING - NICKEL



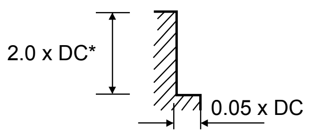
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
Finishing cuts typically require reduced feed rates and/or higher spindle speed, with a_e of 2% x DC; please adjust parameters accordingly.

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed per tooth (mm)
f - feed rate (mm/min)
a_p - axial depth of cut
a_e - radial depth of cut

Cutting Conditions 173329, 673329, 174329, 175329, 675329, 176329 (6 Flute VX6) TROCHOIDAL

VDI MATERIAL GROUP		HRc		Size (mm)						
				6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-5	< 25	v_c (m/min)	300	300	300	300	300	300	300
			n	15915	11937	9549	7958	5968	4775	3820
			f_z	0.068	0.116	0.144	0.173	0.202	0.225	0.232
			f (mm/min)	6494	8308	8251	8260	7234	6446	5317
	6-9	25-35	v_c (m/min)	203	203	203	203	203	203	203
			n	10769	8077	6462	5385	4039	3231	2585
			f_z	0.050	0.085	0.106	0.128	0.149	0.167	0.174
			f (mm/min)	3231	4119	4110	4135	3610	3237	2698
	10-11	35-45	v_c (m/min)	100	100	100	100	100	100	100
			n	5305	3979	3183	2653	1989	1592	1273
			f_z	0.041	0.071	0.088	0.105	0.123	0.137	0.144
			f (mm/min)	1305	1695	1681	1681	1468	1308	1100
M	12		v_c (m/min)	213	213	213	213	213	213	213
			n	11300	8475	6780	5650	4238	3390	2712
			f_z	0.049	0.084	0.104	0.125	0.146	0.162	0.168
			f (mm/min)	3322	4271	4231	4238	3712	3294	2734
	13		v_c (m/min)	147	147	147	147	147	147	147
			n	7799	5849	4679	3899	2924	2340	1872
			f_z	0.041	0.071	0.088	0.105	0.123	0.137	0.143
			f (mm/min)	1918	2492	2471	2457	2158	1923	1606
	14		v_c (m/min)	134	134	134	134	134	134	134
			n	7109	5332	4265	3554	2666	2133	1706
			f_z	0.041	0.071	0.088	0.105	0.123	0.137	0.142
			f (mm/min)	1749	2271	2252	2239	1967	1753	1454
S	31-35		v_c (m/min)	60	60	60	60	60	60	60
			n	11300	8475	6780	5650	4238	3390	2712
			f_z	0.033	0.055	0.070	0.083	0.097	0.113	0.117
			f (mm/min)	2239	2798	2849	2815	2467	2300	1905
	36-37		v_c (m/min)	213	213	213	213	213	213	213
			n	11300	8475	6780	5650	4238	3390	2712
			f_z	0.033	0.055	0.070	0.083	0.097	0.113	0.117
			f (mm/min)	2239	2798	2849	2815	2467	2300	1905

TROCHOIDAL MILLING



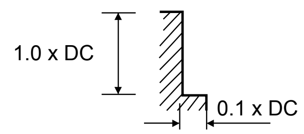
***If tool's length of cut is below 2xD use 90% of the length.**
***Long length tools can be used up to 4xD if rigidity is 100%**
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed per tooth (mm)
f - feed rate (mm/min)
a_p - axial depth of cut
a_e - radial depth of cut

Cutting Conditions 173329, 673329, 174329, 175329, 675329, 176329 (6 Flute VX6) CONVENTIONAL

VDI MATERIAL GROUP		HRc		Size (mm)						
				6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-5	< 25	v_c (m/min)	151	151	151	151	151	151	151
			n	7998	5998	4799	3999	2999	2399	1919
			f_z	0.022	0.035	0.043	0.053	0.061	0.069	0.075
			f (mm/min)	1056	1224	1238	1272	1098	993	864
	6-9	25-35	v_c (m/min)	126	126	126	126	126	126	126
			n	6705	5029	4023	3353	2514	2012	1609
			f_z	0.017	0.028	0.035	0.041	0.049	0.053	0.058
			f (mm/min)	684	845	845	825	739	640	560
	10-11	35-45	v_c (m/min)	70	70	70	70	70	70	70
			n	3716	2787	2230	1858	1394	1115	892
			f_z	0.012	0.019	0.024	0.029	0.033	0.037	0.040
			f (mm/min)	268	318	321	323	276	247	214
M	12		v_c (m/min)	131	131	131	131	131	131	131
			n	6947	5211	4168	3474	2605	2084	1667
			f_z	0.017	0.028	0.035	0.041	0.049	0.053	0.058
			f (mm/min)	709	875	875	855	766	663	580
	13		v_c (m/min)	9.3	93	93	93	93	93	93
			n	4928	3696	2957	2464	1848	1478	1183
			f_z	0.012	0.021	0.027	0.031	0.038	0.043	0.048
			f (mm/min)	326	466	479	458	421	381	341
	14		v_c (m/min)	85	85	85	85	85	85	85
			n	4524	3393	2714	2262	1696	1354	1086
			f_z	0.012	0.021	0.027	0.031	0.038	0.043	0.048
			f (mm/min)	326	428	440	421	387	350	313
S	31-35		v_c (m/min)	26	26	26	26	26	26	26
			n	4928	3696	2957	2464	1848	1478	1183
			f_z	0.014	0.023	0.029	0.036	0.044	0.048	0.053
			f (mm/min)	426	510	514	532	488	426	376
	36-37		v_c (m/min)	93	93	93	93	93	93	93
			n	1373	1030	824	687	515	412	330
			f_z	0.012	0.021	0.027	0.031	0.038	0.043	0.048
			f (mm/min)	99	130	104	128	117	106	95

SIDE CUTTING

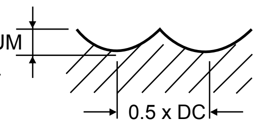


For long length tools reduce feed by up to 50%.
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed per tooth (mm)
f - feed rate (mm/min)
a_p - axial depth of cut
a_e - radial depth of cut

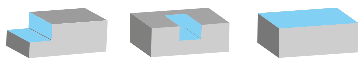
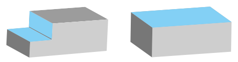
Cutting Conditions 170329, (4 Flute VX Ball Nose)

VDI 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	1-5	< 25	v_c (m/min)	162	162	162	162	162	162	162	162	162	162
			n	17189	12892	10313	8594	6446	5157	4297	3223	2578	2063
			f_z	0.025	0.027	0.030	0.040	0.060	0.065	0.070	0.075	0.090	0.099
			f (mm/min)	1719	1392	1238	1375	1547	1341	1203	967	928	817
	6-9	25-35	v_c (m/min)	113	113	113	113	113	113	113	113	113	113
			n	11990	8992	7194	5995	4496	3597	2997	2248	1798	1439
			f_z	0.025	0.027	0.030	0.040	0.060	0.065	0.070	0.074	0.090	0.099
			f (mm/min)	1199	921	863	959	1079	935	839	665	647	570
	10-11	35-45	v_c (m/min)	68	68	68	68	68	68	68	68	68	68
			n	7215	5411	4329	3608	2706	2165	1804	1353	1082	866
			f_z	0.017	0.019	0.021	0.028	0.042	0.045	0.049	0.052	0.063	0.070
			f (mm/min)	491	411	364	404	455	390	354	281	273	242
M	12		v_c (m/min)	85	85	85	85	85	85	85	85	85	85
			n	9019	6764	5411	4509	3382	2706	2255	1691	1353	1082
			f_z	0.020	0.020	0.025	0.041	0.045	0.050	0.055	0.060	0.065	0.068
			f (mm/min)	722	541	541	740	609	541	496	406	352	294
	13		v_c (m/min)	77	77	77	77	77	77	77	77	77	77
			n	8170	6127	4902	4085	3064	2451	2042	1532	1225	980
			f_z	0.015	0.015	0.025	0.030	0.040	0.045	0.050	0.054	0.058	0.059
			f (mm/min)	490	368	490	490	490	441	408	332	284	231
	14		v_c (m/min)	77	77	77	77	77	77	77	77	77	77
			n	8170	6127	4902	4085	3064	2451	2042	1532	1225	980
			f_z	0.020	0.020	0.025	0.041	0.045	0.050	0.055	0.060	0.065	0.068
			f (mm/min)	654	490	490	670	551	490	449	368	319	267
K	15-20		v_c (m/min)	119	119	119	119	119	119	119	119	119	119
			n	12626	9470	7576	6313	4735	3788	3157	2367	1894	1515
			f_z	0.031	0.033	0.037	0.050	0.074	0.081	0.087	0.093	0.112	0.124
			f (mm/min)	1566	1250	1121	1263	1402	1227	1098	881	848	752
S	31-35		v_c (m/min)	21	21	21	21	21	21	21	21	21	21
			n	2228	1671	1337	1114	836	668	557	418	334	267
			f_z	0.014	0.014	0.017	0.028	0.031	0.035	0.038	0.042	0.045	0.048
			f (mm/min)	125	94	91	125	104	94	85	70	60	51
	36-37		v_c (m/min)	47	47	47	47	47	47	47	47	47	47
			n	4987	3740	2992	2493	1870	1496	1247	935	748	598
			f_z	0.018	0.018	0.022	0.037	0.040	0.045	0.049	0.054	0.058	0.064
			f (mm/min)	359	269	263	369	299	269	244	202	174	146



ET1

Designed for difficult conditions in Stainless Steel

P			M		K		N					S		H	MACHINING GUIDE
1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	
○	○	○	●	●								○	○		
○	○	○	●	●								○	○		
○	○	○	●	●								○	○		
○	○	○	●	●								○	○		
○	○	○	●	●								○	○		

ET1 END MILLS

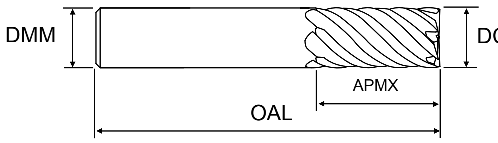
▶ For material group examples, refer to page 4
▶ For full material group tables, refer to pages 334-347

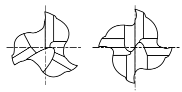
LONG LENGTH 50º HELIX

MG HM | ZEFP 3 | ZEFP 4 | FHA 50º | DIN 6535HA | DIN 6535HB

Series No. 132123, 132323

▶ cutting conditions : p.236-237





For difficult conditions in stainless steel.

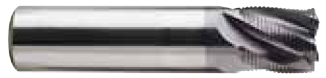
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1321230600	**1323230600**	**6.0**	6	13.0	50	3
1321230800	**1323230800**	**8.0**	8	19.0	60	
1321231000	**1323231000**	**10.0**	10	22.0	70	
1321231200	**1323231200**	**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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	○		●	●								○	○	

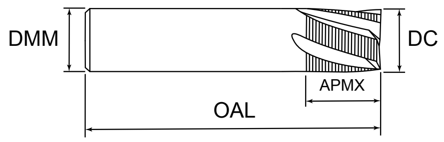
SHORT LENGTH ROUGHING

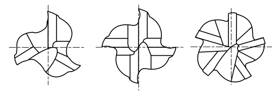
MG HM | ZEFP 3 | ZEFP 4 | ZEFP 5 | FHA 30º | FINE | DIN 6535HA | DIN 6535HB



Series No. 320123, 320323

▶ cutting conditions : p.234-235





For difficult conditions in stainless steel.

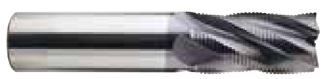
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
3201230600	**3203230600**	**6.0**	6	7.0	54	3
3201230700	**3203230700**	**7.0**	8	8.0	58	
3201230800	**3203230800**	**8.0**		9.0		
3201230900	**3203230900**	**9.0**	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

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0 - 10.0	0.00 / -0.058	h6
12.0 - 18.0	0.00 / -0.070	
20.0, 25.0	0.00 / -0.084	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	○	○		●	●								○	○	

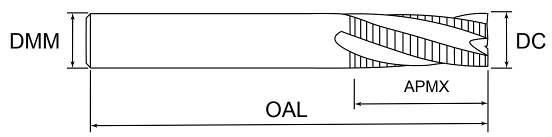
LONG LENGTH ROUGHING

MG HM | ZEFP 3 | ZEFP 4 | ZEFP 5 | FHA 30° | FINE | DIN 6535HA | DIN 6535HB

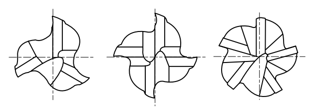


Series No. 118123, 118323

▶ cutting conditions : p.234-235



For difficult conditions in stainless steel.



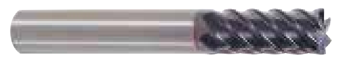
EUROPA CODE ORDCODE FLAT	EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1181230600	**1183230600**	**6.0**	6	16.0	57	3
1181230700	**1183230700**	**7.0**	8	16.0	63	
1181230800	**1183230800**	**8.0**		16.0		
1181230900	**1183230900**	**9.0**	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

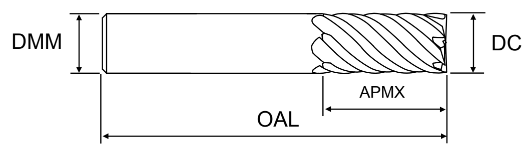
Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0 - 10.0	0.00 / -0.058	h6
12.0 - 18.0	0.00 / -0.070	
20.0, 25.0	0.00 / -0.084	

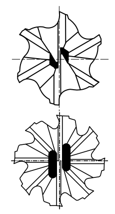
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	○		●	●								○	○	

LONG LENGTH 45º HELIX

MG HM | ZEFP 6 | ZEFP 8 | FHA 45° | DIN 6535HA







Series No. 117323

▶ cutting conditions : p.238-239

For difficult conditions in stainless steel.

EUROPA CODE ORDCODE PLAIN	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

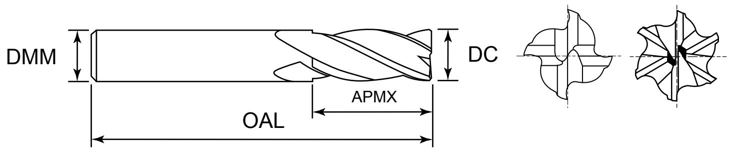
ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	○		●	●								○	○	

SHORT LENGTH ASP60

HSS PM | ZEFP 4 | ZEFP 6 | FHA 30° | DIN 6535HB

Series No. 107122

▶ cutting conditions : p.240



For difficult conditions in stainless steel.

EUROPA CODE ORDCODE FLAT	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
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 TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO		P			M		K		N					S		H
VDI		1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG		11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent	○ Good	○	○		●	●								○	○	

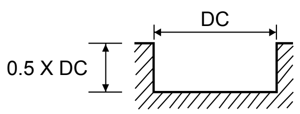
ET1

CUTTING DATA

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

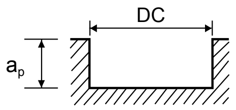
VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-5	< 30	v_c (m/min)	294	292	289	302	299	302	294	302	338
			n	15600	11600	9200	8000	6800	6000	5200	4800	4300
			f_z	0.03	0.04	0.038	0.045	0.053	0.06	0.067	0.068	0.06
			f (mm/min)	1390	1390	1390	1440	1440	1440	1390	1300	1290
	6-9	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
			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	12-14		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
			f_z	0.013	0.018	0.017	0.02	0.024	0.023	0.023	0.023	0.023
			f (mm/min)	340	340	340	340	340	310	250	220	250
S	31-35		v_c (m/min)	45	45	41	45	40	40	40	41	47
			n	2400	1800	1300	1200	900	800	700	660	600
			f_z	0.016	0.02	0.022	0.024	0.022	0.02	0.021	0.023	0.022
			f (mm/min)	115	110	115	115	80	65	60	60	65
	36-37		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
			f_z	0.013	0.018	0.017	0.02	0.024	0.023	0.023	0.023	0.023
			f (mm/min)	340	340	340	340	340	310	250	220	250

STEEL

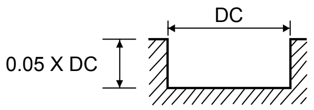


STAINLESS STEEL, TITANIUM

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



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: $n = \frac{v_c * 1000}{\pi * ø}$

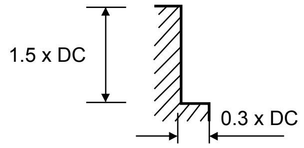
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

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

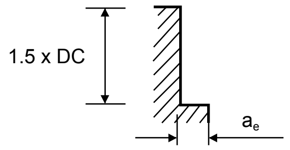
VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-5	< 30	v_c (m/min)	294	292	289	302	299	302	294	302	338
			n	15600	11600	9200	8000	6800	6000	5200	4800	4300
			f_z	0.05	0.067	0.063	0.075	0.088	0.1	0.112	0.113	0.1
			f (mm/min)	2320	2320	2320	2400	2400	2400	2320	2160	2150
	6-9	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
			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	12-14		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
			f_z	0.023	0.03	0.028	0.034	0.04	0.039	0.039	0.038	0.038
			f (mm/min)	570	570	570	570	570	510	420	360	410
S	31-35		v_c (m/min)	45	45	41	45	40	40	40	41	47
			n	2400	1800	1300	1200	900	800	700	660	600
			f_z	0.026	0.033	0.037	0.04	0.036	0.034	0.036	0.038	0.037
			f (mm/min)	190	180	190	190	130	110	100	100	110
	36-37		v_c (m/min)	158	158	160	158	158	166	153	151	170
			n	8400	6300	5100	4200	3600	3300	2700	2400	2160
			f_z	0.023	0.03	0.028	0.034	0.04	0.039	0.039	0.038	0.038
			f (mm/min)	570	570	570	570	570	510	420	360	410

STEEL

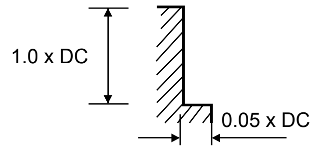


STAINLESS STEEL, TITANIUM

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



INCONEL



▶ 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: $n = \frac{v_c * 1000}{\pi * ø}$

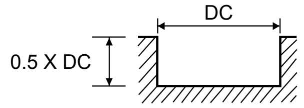
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

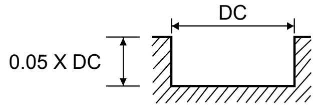
132123, 132323 (3&4 Flute 50º Helix) **SLOTTING**

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	18.0	20.0	25.0
P	1-5	< 30	v_c (m/min)	105	105	100	105	110	110	105	105
			n	5560	4200	3260	2740	2200	1940	1680	1360
			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
	6-9	30-45	v_c (m/min)	65	65	65	65	70	70	65	65
			n	3360	2520	2000	1680	1360	1210	1060	840
			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	12-14		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
			f_z	0.019	0.025	0.028	0.029	0.032	0.03	0.021	0.022
			f (mm/min)	160	160	140	120	100	85	70	60
S	31-35		v_c (m/min)	20	20	20	20	20	20	20	20
			n	1160	840	370	560	420	370	320	270
			f_z	0.011	0.016	0.02	0.018	0.02	0.018	0.016	0.014
			f (mm/min)	40	40	40	30	25	20	20	15
	36-37		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
			f_z	0.019	0.025	0.028	0.029	0.032	0.03	0.021	0.022
			f (mm/min)	160	160	140	120	100	85	70	60

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: $n = \frac{v_c * 1000}{\pi * ø}$

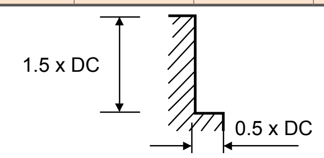
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

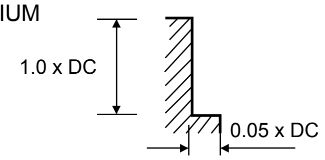
132123, 132323 (3&4 Flute 50º Helix) **PROFILING**

VDI MATERIAL GROUP		HRc		Size (mm) 6.0	8.0	10.0	12.0	16.0	18.0	20.0	25.0
P	1-5	< 30	v_c (m/min)	105	105	100	105	110	110	105	105
			n	5560	4200	3260	2740	2200	1940	1680	1360
			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
	6-9	30-45	v_c (m/min)	65	65	65	65	70	70	65	65
			n	3360	2520	2000	1680	1360	1210	1060	840
			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	12-14		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
			f_z	0.029	0.042	0.046	0.044	0.048	0.046	0.034	0.034
			f (mm/min)	250	265	230	180	150	130	115	90
S	31-35		v_c (m/min)	20	20	20	20	20	20	20	20
			n	1160	840	370	560	420	370	320	270
			f_z	0.017	0.02	0.025	0.027	0.028	0.027	0.022	0.023
			f (mm/min)	55	50	50	45	35	30	30	25
	36-37		v_c (m/min)	55	55	55	50	55	55	55	55
			n	2840	2100	1680	1370	1050	950	840	670
			f_z	0.029	0.042	0.046	0.044	0.048	0.046	0.034	0.034
			f (mm/min)	250	265	230	180	150	130	115	90

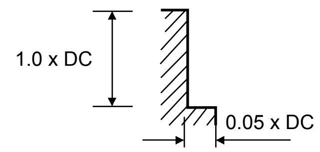
STEEL



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: $n = \frac{v_c * 1000}{\pi * ø}$

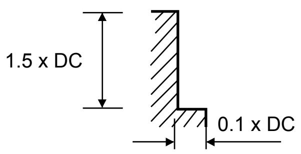
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

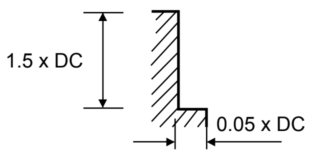
117323 (6&8 Flute 45º Helix)

VDI MATERIAL GROUP		HRc	NORMAL SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-5	< 30	v_c (m/min)	105	105	105	105	105	105	120
			n	5560	4200	3360	2840	2100	1680	1500
			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
	6-9	30-45	v_c (m/min)	75	75	75	75	75	75	85
			n	3880	2940	2320	2000	1480	1160	1100
			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	12-14		v_c (m/min)	65	65	60	60	60	55	65
			n	3370	2490	1920	1610	1160	900	850
			f_z	0.054	0.074	0.095	0.104	0.111	0.086	0.079
			f (mm/min)	1100	1100	1100	1000	770	620	540
S	31-35		v_c (m/min)	25	25	15	15	15	15	15
			n	1350	1000	440	400	310	250	220
			f_z	0.035	0.047	0.106	0.104	0.102	0.078	0.077
			f (mm/min)	280	280	280	250	190	155	135
	36-37		v_c (m/min)	65	65	60	60	60	55	65
			n	3370	2490	1920	1610	1160	900	850
			f_z	0.054	0.074	0.095	0.104	0.111	0.086	0.079
			f (mm/min)	1100	1100	1100	1000	770	620	540

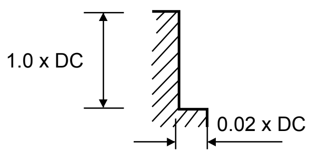
STEEL < HRc30



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: $n = \frac{v_c * 1000}{\pi * ø}$

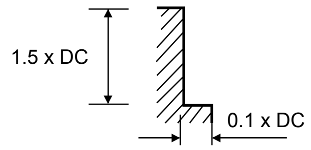
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

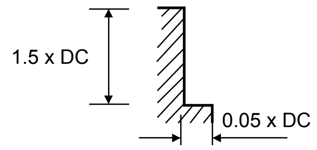
117323 (6&8 Flute 45º Helix)

VDI MATERIAL GROUP		HRc	HIGH SPEED	Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-5	< 30	v_c (m/min)	420	420	420	430	420	420	470
			n	22200	16800	13400	11350	8400	6700	6000
			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
	6-9	30-45	v_c (m/min)	315	315	315	315	315	315	355
			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	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: $n = \frac{v_c * 1000}{\pi * ø}$

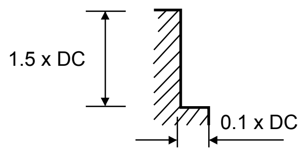
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

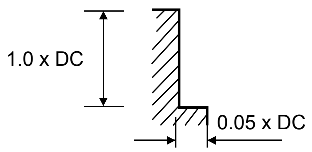
107122 (4&6 Flute ASP60) 

VDI 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	1-5	< 30	v_c (m/min)	40	45	45	50	50	50	50	50	50	50	50	50
			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
	6-9	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
			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	12-14		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
			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
			f (mm/min)	110	125	135	140	150	170	150	140	135	125	120	100
S	31-35		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
			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
			f (mm/min)	28	37	36	35	34	36	35	32	31	28	21	18
	36-37		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
			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
			f (mm/min)	110	125	135	140	150	170	150	140	135	125	120	100

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

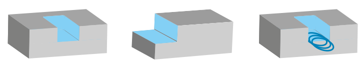
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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

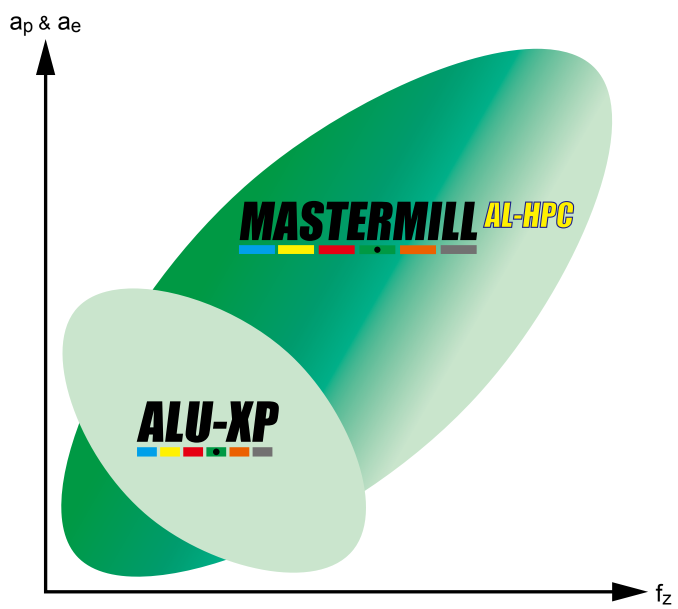
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

MASTERMILL AL-HPC

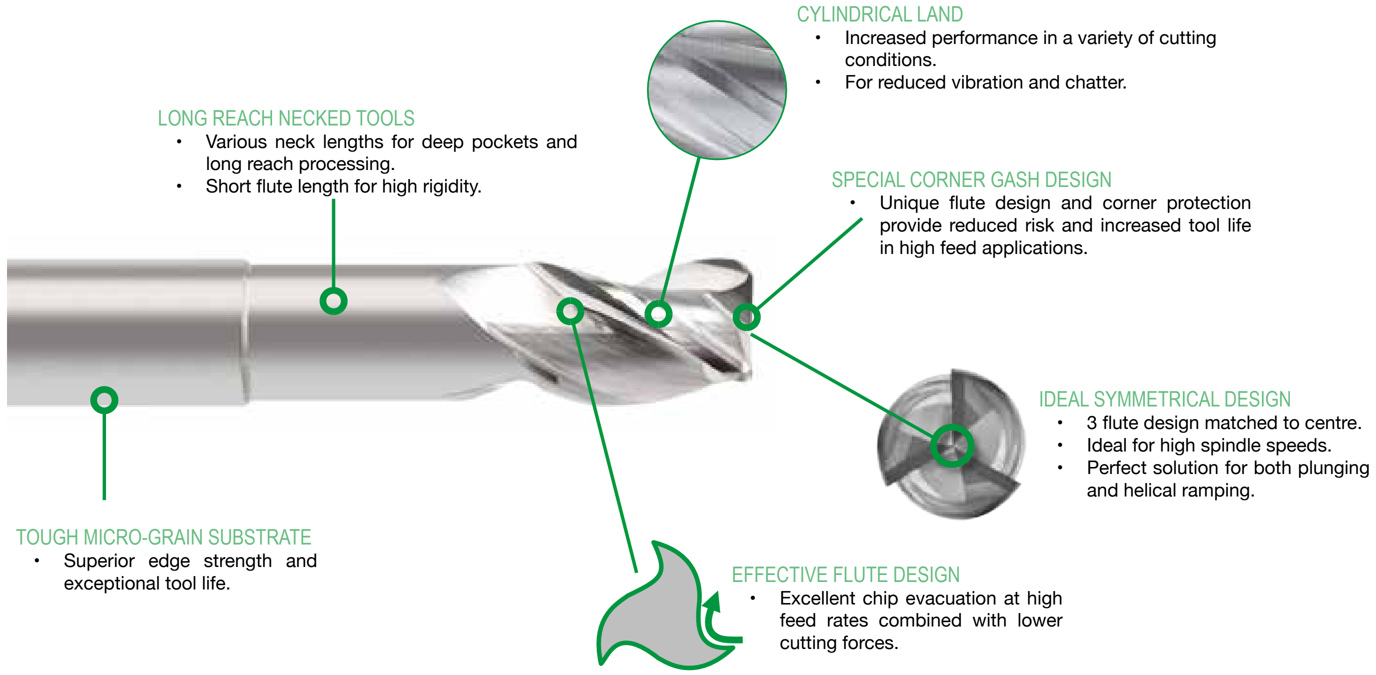
Designed for high speed and high feed machining of Aluminium with no built-up edge

P			M		K		N					S		H	MACHINING GUIDE
1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	
							●	●	●						
							●	●	●						
							●	●	●						
							●	●	●						
							●	●	●						
							●	●	●						

MASTERMILL AL-HPC



Mastermill AL-HPC tools operate with much higher cutting conditions than standard Alu-XP tools and are extremely suitable for high speed, high efficiency machining with heavy metal removal rates.
Manufactured with all three flutes centre matched, the tool itself is balanced, making toolholder balancing easier and less time consuming.
All tools can be run on the latest CNC machinery for maximum benefit, but they work equally well on older machines, operating at lower speeds with the same high efficiency. They are designed to take the heat away from the workpiece, meaning heavier cuts can be taken at whatever speed your machine dictates.



Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	 RETOLU	Shank Dia. Tolerance TCDCON
6.0 - 10.0	0.00 / -0.008	-0.02	+0.02	h6
12.0 - 16.0	0.00 / -0.009			
20.0	0.00 / -0.011			
25.0	0.00 / -0.013			

▶ For material group examples, refer to page 4
▶ For full material group tables, refer to pages 334-347

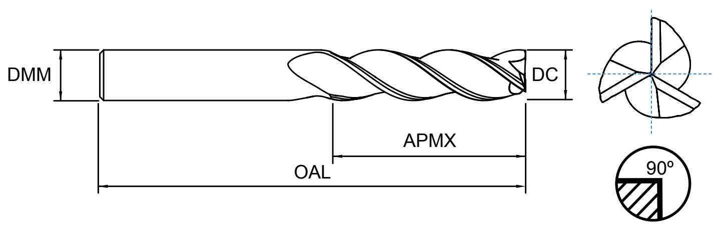
MG HM | ZEFP 3 | FHA 37° | DIN 6535HA

Series No. 143345

▶ cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254

▶ cutting conditions: Aluminium - p.252 / Copper Alloys - p.253 / Plastics - p.254

Special geometry to control balance at high RPM, for stable machining and high surface finish.
Exceptional performance in both high speed machining and heavy cutting conditions.
Polished flutes for improved chip flow.



EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1433450600	**6.0**	6	13.0	57
1433450800	**8.0**	8	19.2	63
1433451000	**10.0**	10	22.0	72
1433451200	**12.0**	12	26.0	83
1433451600	**16.0**	16	32.0	92
1433452000	**20.0**	20	38.0	104
1433452500	**25.0**	25	50.0	125

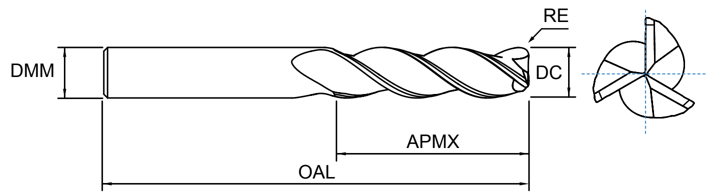
▶ To order NX coated use code 143346, followed by diameter code.

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					

MG HM | ZEFP 3 | RE | FHA 37° | DIN 6535HA

Series No. 142345

▶ cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254



Special geometry to control balance at high RPM, for stable machining and high surface finish.
Exceptional performance in both high speed machining and heavy cutting conditions.
Polished flutes for improved chip flow.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1423450600	**6.0**	0.5	6	13.0	57
1423450901		1.0	6	13.0	57
1423450902		1.5	6	13.0	57
1423450800	**8.0**	0.3	8	19.2	63
1423450907		0.5	8	19.2	63
1423450908		1.0	8	19.2	63
1423450904		1.5	8	19.2	63
1423451000	**10.0**	0.5	10	22.0	72
1423450915		1.0	10	22.0	72
1423450916		1.5	10	22.0	72
1423451200	**12.0**	1.5	12	26.0	83
1423450909		2.0	12	26.0	83
1423450922		2.5	12	26.0	83
1423450923		3.0	12	26.0	83
1423451600	**16.0**	1.5	16	32.0	92
1423450932		2.0	16	32.0	92
1423450933		2.5	16	32.0	92
1423450934		3.0	16	32.0	92
1423452000	**20.0**	2.0	20	38.0	104
1423450943		2.5	20	38.0	104
1423450944		3.0	20	38.0	104
1423450945		4.0	20	38.0	104

▶ To order NX coated use code 142346, followed by diameter code.

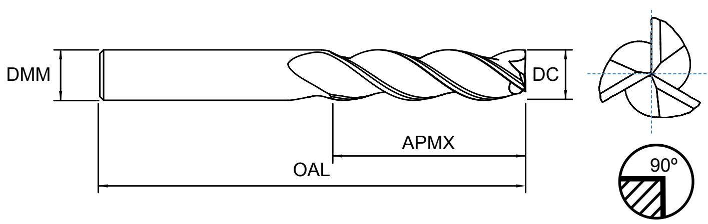
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					

MG HM | ZEFP 3 | FHA 37° | DIN 6535HA

Series No. 144345

▶cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254

Special geometry to control balance at high RPM, for stable machining and high surface finish.
Exceptional performance in both high speed machining and heavy cutting conditions.
Polished flutes for improved chip flow.



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1443450600	**6.0**	6	24.0	75
1443450800	**8.0**	8	32.0	75
1443451000	**10.0**	10	40.0	100
1443451200	**12.0**	12	48.0	100
1443451600	**16.0**	16	64.0	125
1443452000	**20.0**	20	80.0	150

▶To order NX coated use code 144346, followed by diameter code.

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					

MG HM | ZEFP 3 | RE | FHA 37° | DIN 6535HA

Series No. 145345

▶cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254

Special geometry to control balance at high RPM, for stable machining and high surface finish.
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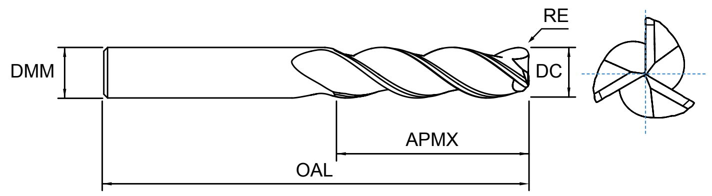
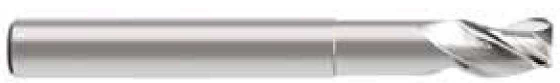


EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1453450600	**6.0**	0.5	6	24.0	75
1453450906		1.0	6	24.0	75
1453450910	**8.0**	0.5	8	32.0	75
1453450911		1.0	8	32.0	75
1453450912		1.5	8	32.0	75
1453450913		2.0	8	32.0	75
1453451000	**10.0**	0.5	10	40.0	100
1453450918		1.0	10	40.0	100
1453450919		1.5	10	40.0	100
1453450920		2.0	10	40.0	100
1453451200	**12.0**	0.5	12	48.0	100
1453450925		1.0	12	48.0	100
1453450926		1.5	12	48.0	100
1453450927		2.0	12	48.0	100
1453450928		2.5	12	48.0	100
1453450929		3.0	12	48.0	100
1453451600	**16.0**	0.5	16	64.0	125
1453450937		1.0	16	64.0	125
1453450938		1.5	16	64.0	125
1453450939		2.0	16	64.0	125
1453450940		2.5	16	64.0	125
1453450941		3.0	16	64.0	125
1453452000	**20.0**	0.5	20	80.0	150
1453450947		1.0	20	80.0	150
1453450948		1.5	20	80.0	150
1453450949		2.0	20	80.0	150
1453450950		2.5	20	80.0	150
1453450951		3.0	20	80.0	150

▶To order NX coated use code 145346, followed by diameter code.

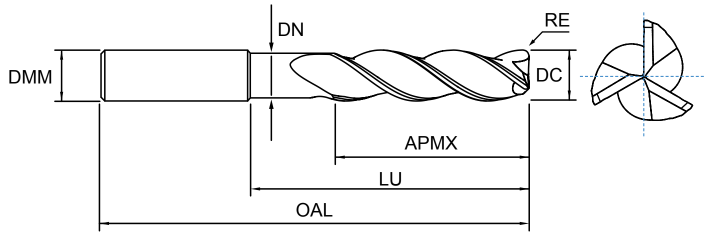
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					

MG HM | ZEFP 3 | FHA 37° | DIN 6535HA | NECK



Series No. 156345

▶ cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254



Special geometry to control balance at high RPM, for stable machining and high surface finish.
Exceptional performance in both high speed machining and heavy cutting conditions.
Polished flutes for improved chip flow.

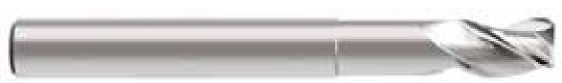
EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1563450600	**6.0**	0.5	6	10.0	20.0	63	5.7
1563450901		1.0	6	10.0	20.0	63	5.7
1563450902		0.5	6	13.0	30.0	72	5.7
1563450903		1.0	6	13.0	30.0	72	5.7
1563450800	**8.0**	0.5	8	12.0	25.0	75	7.4
1563450905		0.8	8	12.0	25.0	75	7.4
1563450906		1.0	8	12.0	25.0	75	7.4
1563450907		1.2	8	12.0	25.0	75	7.4
1563450908		1.5	8	12.0	25.0	75	7.4
1563450909		1.6	8	12.0	25.0	75	7.4
1563451000	**10.0**	0.5	10	14.0	35.0	100	9.2
1563450911		0.8	10	14.0	35.0	100	9.2
1563450912		1.0	10	14.0	35.0	100	9.2
1563450913		1.2	10	14.0	35.0	100	9.2
1563450914		1.5	10	14.0	35.0	100	9.2
1563450915		1.6	10	14.0	35.0	100	9.2
1563450916		2.4	10	14.0	35.0	100	9.2
1563451200	**12.0**	0.5	12	16.0	40.0	100	11.0
1563450917		0.8	12	16.0	40.0	100	11.0
1563450918		1.0	12	16.0	40.0	100	11.0
1563450919		1.2	12	16.0	40.0	100	11.0
1563450920		1.5	12	16.0	40.0	100	11.0
1563450921		1.6	12	16.0	40.0	100	11.0
1563450922		2.0	12	16.0	40.0	100	11.0
1563450923		2.4	12	16.0	40.0	100	11.0
1563450924		2.5	12	16.0	40.0	100	11.0
1563450925		3.0	12	16.0	40.0	100	11.0
1563450926		4.0	12	16.0	40.0	100	11.0

▶ To order NX coated use code 156346, followed by diameter code.

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					

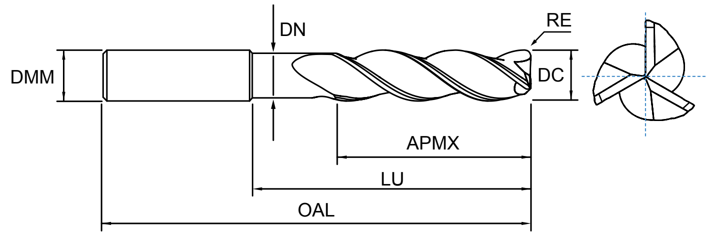
EXTENDED NECK CORNER RADIUS

MG HM | ZEFP 3 | RE | FHA 37° | DIN 6535HA | NECK



Series No. 156345

▶ cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254

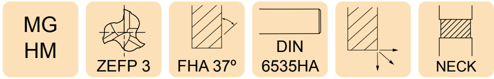


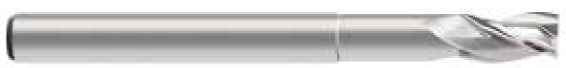
Special geometry to control balance at high RPM, for stable machining and high surface finish.
Exceptional performance in both high speed machining and heavy cutting conditions.
Polished flutes for improved chip flow.

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1563451600	**16.0**	0.8	16	20.0	50.0	125	15.0
1563450930		1.2	16	20.0	50.0	125	15.0
1563450931		1.6	16	20.0	50.0	125	15.0
1563450932		2.0	16	20.0	50.0	125	15.0
1563450933		2.4	16	20.0	50.0	125	15.0
1563450934		2.5	16	20.0	50.0	125	15.0
1563450935		3.0	16	20.0	50.0	125	15.0
1563450936		3.2	16	20.0	50.0	125	15.0
1563450937		4.0	16	20.0	50.0	125	15.0
1563452000	**20.0**	0.8	20	25.0	65.0	150	19.0
1563450938		1.2	20	25.0	65.0	150	19.0
1563450939		1.6	20	25.0	65.0	150	19.0
1563450940		2.0	20	25.0	65.0	150	19.0
1563450941		2.4	20	25.0	65.0	150	19.0
1563450942		2.5	20	25.0	65.0	150	19.0
1563450943		3.0	20	25.0	65.0	150	19.0
1563450944		3.2	20	25.0	65.0	150	19.0
1563450945		4.0	20	25.0	65.0	150	19.0

▶ To order NX coated use code 156346, followed by diameter code.

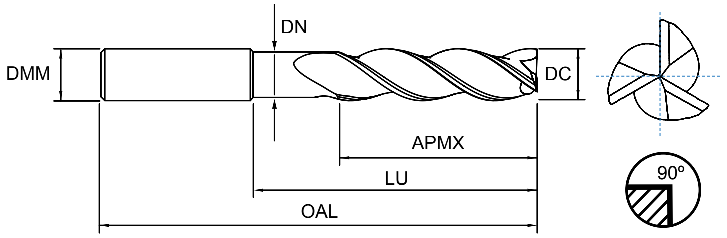
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					





Series No. 153345

▶ cutting conditions: Aluminium - p.252
Copper Alloys - p.253
Plastics - p.254



Special geometry to control balance at high RPM, for stable machining and high surface finish.
Exceptional performance in both high speed machining and heavy cutting conditions.
Polished flutes for improved chip flow.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1533450300	**3.0**	6	6.0	16.0	60	2.8
1533450400	**4.0**	6	8.0	20.0	60	3.8
1533450600	**6.0**	6	10.0	20.0	75	5.7
1533450800	**8.0**	8	12.0	25.0	75	7.4
1533451000	**10.0**	10	14.0	35.0	100	9.2
1533451200	**12.0**	12	16.0	40.0	100	11.0
1533451600	**16.0**	16	20.0	50.0	125	15.0
1533452000	**20.0**	20	25.0	65.0	150	19.0

▶ To order NX coated use code 153346, followed by diameter code.

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	●	●					

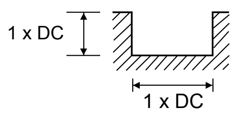
MASTERMILL AL-HPC

CUTTING DATA

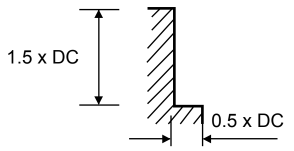
All Mastermill AL-HPC end mills

VDI MATERIAL GROUP		Type of cut		Size (mm) 3.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
N	21-24	SLOTTING	v_c (m/min)	488	488	488	488	488	488	488	488
			n	51778	25889	19427	15533	12945	9708	7767	6213
			f_z	0.025	0.076	0.095	0.114	0.152	0.168	0.191	0.254
			f (mm/min)	3946	5918	5537	5326	5918	4883	4439	4735
	25		v_c (m/min)	183	183	183	183	183	183	183	183
			n	19417	9708	7285	5825	4854	3641	2913	2330
			f_z	0.025	0.076	0.095	0.114	0.152	0.168	0.191	0.254
			f (mm/min)	1480	2219	2076	1997	2219	1831	1665	1775
	21-24	SIDE CUTTING	v_c (m/min)	610	610	610	610	610	610	610	610
			n	64756	32378	24283	19427	16189	12142	9713	7771
			f_z	0.025	0.076	0.171	0.267	0.356	0.381	0.419	0.495
			f (mm/min)	4857	7382	12457	15561	17290	13878	12210	11539
	25		v_c (m/min)	244	244	244	244	244	244	244	244
			n	25889	12945	9713	7767	6472	4854	3883	3107
			f_z	0.025	0.076	0.095	0.114	0.152	0.168	0.191	0.254
			f (mm/min)	1973	2959	2768	2663	2959	2441	2219	2367
	21-24	H.S.M.	v_c (m/min)	1006	1006	1006	1006	1006	1006	1006	1006
			n	106740	53370	40048	32022	26685	30014	16011	12809
			f_z	0.053	0.140	0.205	0.267	0.356	0.381	0.419	0.495
			f (mm/min)	17080	22367	24629	25621	28467	22876	20131	19033
	25		v_c (m/min)	366	366	366	366	366	366	366	366
			n	38834	19417	14570	11650	9708	7281	5825	4660
			f_z	0.053	0.140	0.205	0.267	0.356	0.381	0.419	0.495
			f (mm/min)	6214	8138	8961	9321	10357	8323	7324	6924

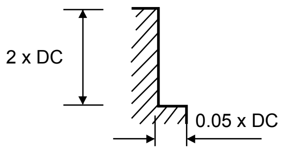
SLOTTING



SIDE CUTTING



H.S.M. (HIGH SPEED MACHINING)

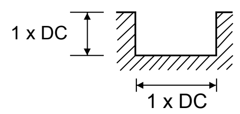


- Recommended cutting depths are **maximum** depths, and **speeds and feeds are target values** based on these depths.
- Finishing cuts should be taken with radial depth of cut of 0.2 x DC or less.
- **For long series and long necked tools,** reduce feed rate and depth of cut by up to 50%.
- All recommendations are based on ideal machining conditions.
- Adjustments may need to be made according to your set-up.

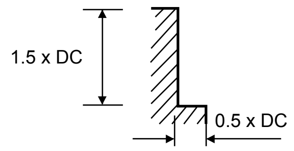
All Mastermill AL-HPC end mills

VDI MATERIAL GROUP		Type of cut		Size (mm) 3.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
N	26-27	SLOTTING	v_c (m/min)	268	268	268	268	268	268	268	268
			n	28436	14218	11465	8531	7109	5332	4265	3412
			f_z	0.020	0.051	0.076	0.102	0.127	0.140	0.152	0.178
			f (mm/min)	1733	2167	2614	2600	2708	9311	6983	5586
	28		v_c (m/min)	91	91	91	91	91	91	91	91
			n	9655	4828	3623	2897	2414	1810	1448	1159
			f_z	0.020	0.051	0.076	0.102	0.127	0.140	0.152	0.178
			f (mm/min)	589	736	826	883	920	759	662	618
	26-27	SIDE CUTTING	v_c (m/min)	351	351	351	351	351	351	351	351
			n	37242	18621	13973	11173	9311	6983	5586	4469
			f_z	0.020	0.051	0.076	0.102	0.127	0.140	0.152	0.178
			f (mm/min)	2270	2838	3186	3405	3547	2927	2554	2384
	28		v_c (m/min)	137	137	137	137	137	137	137	137
			n	14536	7268	5454	4361	33634	2726	2180	1744
			f_z	0.020	0.051	0.076	0.102	0.127	0.140	0.152	0.178
			f (mm/min)	886	1108	1243	1329	1385	1142	997	930
	26-27	H.S.M.	v_c (m/min)	564	564	564	564	564	564	564	564
			n	59842	29921	22452	17953	14961	11220	8976	7181
			f_z	0.043	0.114	0.165	0.216	0.292	0.330	0.356	0.406
			f (mm/min)	7752	10260	11114	11628	16110	11115	9576	8755
	28		v_c (m/min)	229	229	229	229	229	229	229	229
			n	24298	12149	9116	7289	6074	4556	3645	2916
			f_z	0.043	0.114	0.165	0.216	0.292	0.330	0.356	0.406
			f (mm/min)	3148	4166	4513	4721	5323	4513	3888	3555

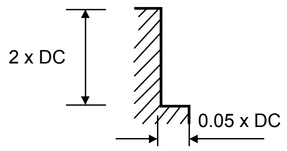
SLOTTING



SIDE CUTTING



H.S.M. (HIGH SPEED MACHINING)

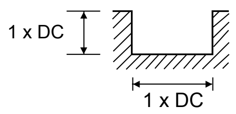


- Recommended cutting depths are **maximum** depths, and **speeds and feeds are target values** based on these depths.
- Finishing cuts should be taken with radial depth of cut of 0.2 x DC or less.
- **For long series and long necked tools,** reduce feed rate and depth of cut by up to 50%.
- All recommendations are based on ideal machining conditions.
- Adjustments may need to be made according to your set-up.

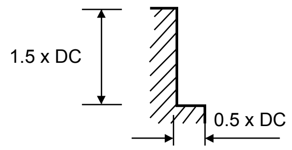
All Mastermill AL-HPC end mills

VDI MATERIAL GROUP		Type of cut		Size (mm)							
				3.0	**6.0**	**8.0**	**10.0**	**12.0**	**16.0**	**20.0**	**25.0**
N	29.1	SLOTTING	v_c (m/min)	503	503	503	503	503	503	503	503
			n	53370	26685	20024	16011	13342	10007	8005	6404
			f_z	0.038	0.102	0.146	0.191	0.254	0.249	0.305	0.356
			f (mm/min)	6100	8134	8770	9150	10167	8388	320	6832
		SIDE CUTTING	v_c (m/min)	625	625	625	625	625	625	625	625
			n	66314	33157	24881	19894	16579	12434	9947	7958
			f_z	0.038	0.102	0.146	0.191	0.254	0.249	0.305	0.356
			f (mm/min)	7580	10106	10898	11370	12633	10422	9096	8489
		H.S.M.	v_c (m/min)	1021	1021	1021	1021	1021	1021	1021	1021
			n	10831	54166	40645	32499	27083	20312	16250	13000
			f_z	0.086	0.229	0.330	0.432	0.584	0.635	0.699	0.813
			f (mm/min)	28066	37147	40238	42100	47465	38695	34051	31699

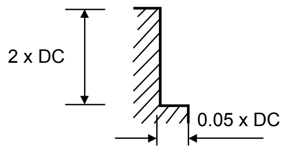
SLOTTING



SIDE CUTTING



H.S.M. (HIGH SPEED MACHINING)



- Recommended cutting depths are **maximum** depths, and **speeds and feeds are target values** based on these depths.
- Finishing cuts should be taken with radial depth of cut of 0.2 x DC or less.
- **For long series and long necked tools,** reduce feed rate and depth of cut by up to 50%.
- All recommendations are based on ideal machining conditions.
- Adjustments may need to be made according to your set-up.

ALU-XP

Designed for general machining of Aluminium

APPLICATION GUIDE

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																2 FLUTE			
							●									152303		Short Length 45º Helix ø3.0mm - 20.0mm	P.259
							●									151303		Long Length 45º Helix ø1.0mm - 20.0mm	P.260
							●									154303		Long Series 45º Helix ø1.0mm - 20.0mm	P.261
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▶For material group examples, refer to page 4
▶For full material group tables, refer to pages 334-347

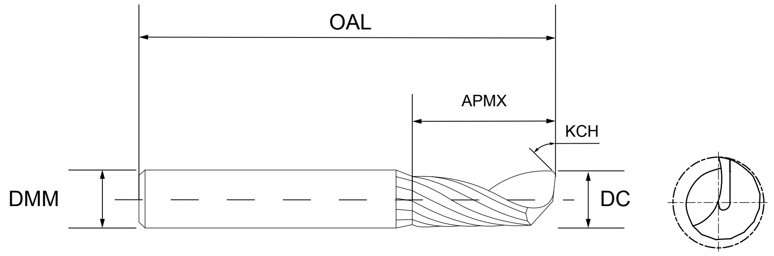
SINGLE FLUTE ROUTER

MG HM | ZEFP 1 | KCH 45° | FHA 30° | DIN 6535HA

Series No. 135303

▶cutting conditions: p.278

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



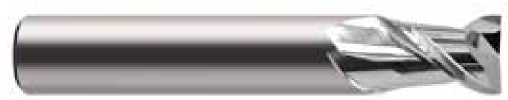
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	CHAMFER WIDTH CHW
1353030200	**2.0**	3	8.0	50	0.04
1353030300	**3.0**	3	12.0	50	0.05
1353030400	**4.0**	4	15.0	60	0.07
1353030500	**5.0**	5	17.0	60	0.09
1353030600	**6.0**	6	20.0	65	0.10
1353030800	**8.0**	8	22.0	65	0.14
1353031000	**10.0**	10	25.0	75	0.14
1353031200	**12.0**	12	30.0	80	0.14

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●		●					

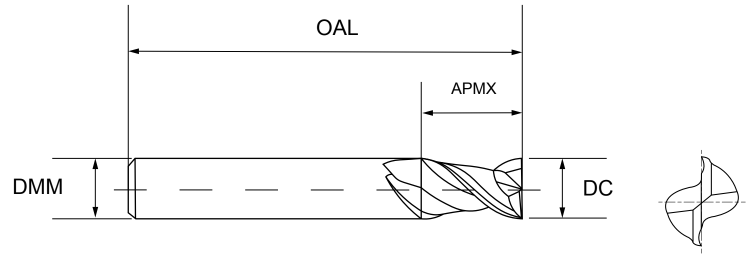
SHORT LENGTH

MG HM | ZEFP 2 | FHA 45° | DIN 6535HA



Series No. 152303

▶cutting conditions: p.280

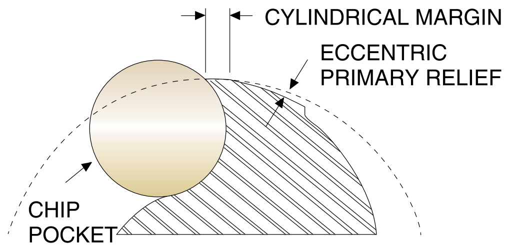


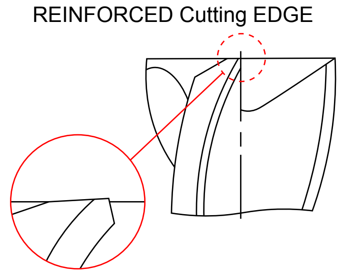
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner protected.
Mirror polished flutes.

EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
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

▶To order NX coated use code 152325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.015	h6

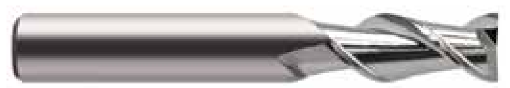




ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

STANDARD LENGTH

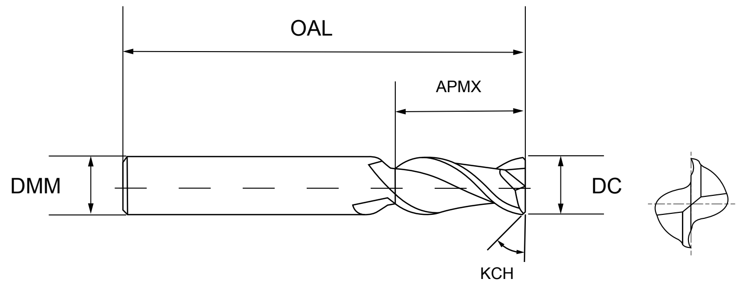
MG HM | ZEFP 2 | KCH 45° | FHA 45° | DIN 6535HA



Series No. 151303

▶cutting conditions: p.280

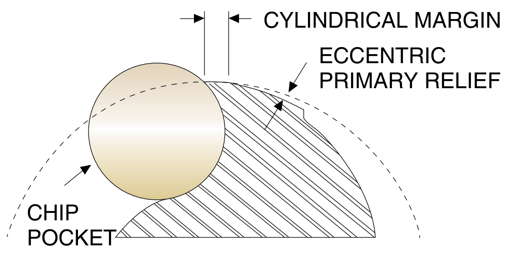
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner protected.
Mirror polished flutes.

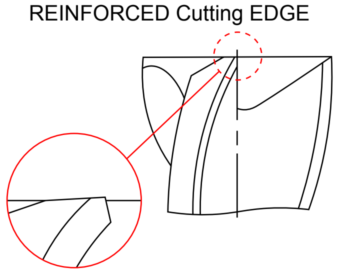


EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	CHAMFER WIDTH CHW
1513030100	**1.0**	6	3.0	50	0.04
1513030150	**1.5**	6	5.0	50	0.04
1513030200	**2.0**	6	6.0	50	0.04
1513030250	**2.5**	6	8.0	55	0.04
1513030300	**3.0**	6	8.0	57	0.05
1513030400	**4.0**	6	11.0	57	0.05
1513030500	**5.0**	6	13.0	57	0.05
1513030600	**6.0**	6	13.0	57	0.05
1513030800	**8.0**	8	19.0	63	0.05
1513031000	**10.0**	10	22.0	72	0.10
1513031200	**12.0**	12	26.0	83	0.10
1513031400	**14.0**	14	26.0	83	0.10
1513031600	**16.0**	16	32.0	92	0.10
1513031800	**18.0**	18	32.0	92	0.10
1513032000	**20.0**	20	38.0	104	0.10

▶To order NX coated use code 151325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.015	h6





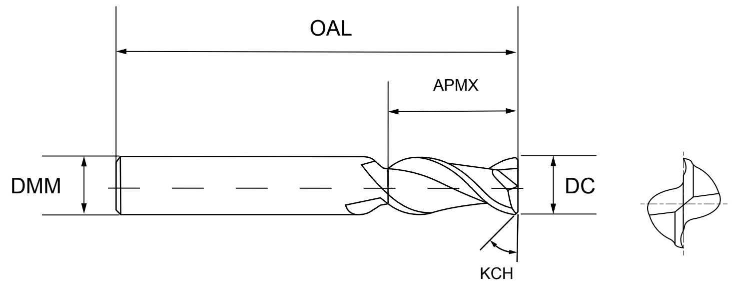
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

LONG SERIES

MG HM | ZEFP 2 | KCH 45° | FHA 45° | DIN 6535HA

Series No. 154303

▶cutting conditions: p.280

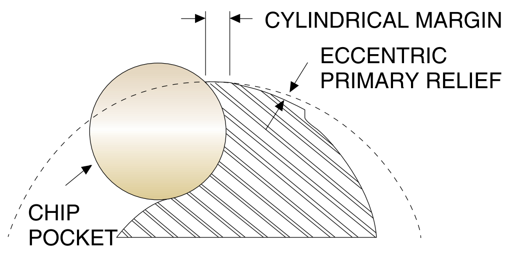


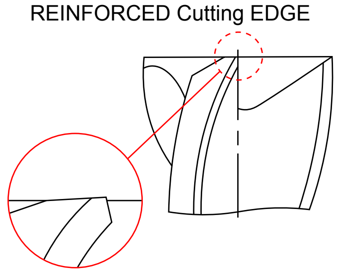
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Long series. Corner protected.
Mirror polished flutes.

EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	CHAMFER WIDTH CHW
1543030100	**1.0**	6	6.0	60	0.04
1543030150	**1.5**	6	8.0	60	0.04
1543030200	**2.0**	6	10.0	60	0.04
1543030300	**3.0**	6	15.0	75	0.05
1543030400	**4.0**	6	20.0	75	0.05
1543030500	**5.0**	6	25.0	75	0.05
1543030600	**6.0**	6	25.0	75	0.05
1543030800	**8.0**	8	30.0	80	0.05
1543031000	**10.0**	10	40.0	100	0.10
1543031200	**12.0**	12	50.0	100	0.10
1543031400	**14.0**	14	50.0	100	0.10
1543031600	**16.0**	16	70.0	125	0.10
1543031800	**18.0**	18	70.0	125	0.10
1543032000	**20.0**	20	75.0	150	0.10

▶To order NX coated use code 154325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.015	h6





ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

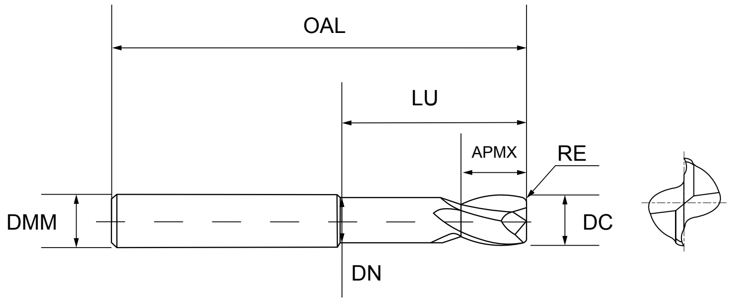
EXTENDED NECK

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK

Series No. 155303

▶cutting conditions: p.281

Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner radius. Neck relief.
Mirror polished flutes.



EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

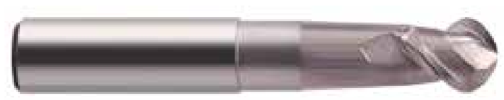
▶To order NX coated use code 155325, followed by diameter code.

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.03	+0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

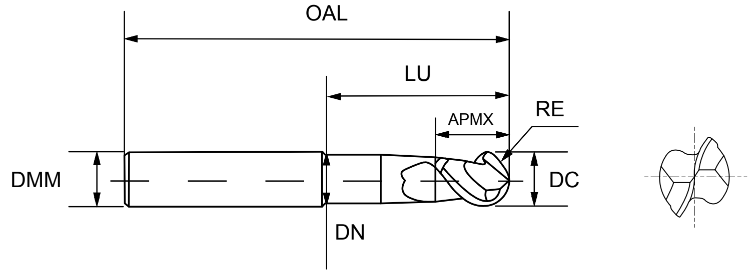
EXTENDED NECK BALL NOSE

MG HM | ZEFP 2 | FHA 50° | DIN 6535HA | NECK



Series No. 112303

▶cutting conditions: p.278



Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Neck relief.
Mirror polished flutes.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

▶To order NX coated use code 112325, followed by diameter code.

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
±0.02	-0.01	+0.01	h6

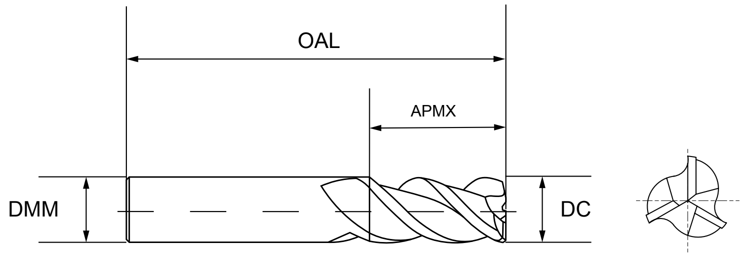
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	○						

MG HM | ZEFP 3 | FHA 45° | DIN 6535HA

Series No. 143303

▶cutting conditions: p.279

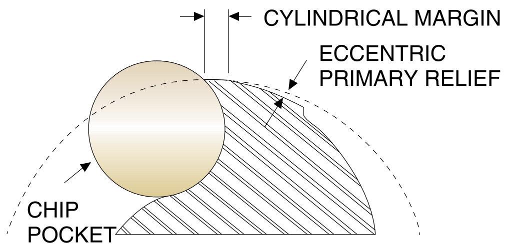
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner protected.
Mirror polished flutes.

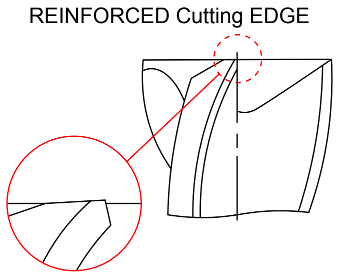


EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1433030300	**3.0**	6	12.0	57
1433030400	**4.0**	6	15.0	57
1433030500	**5.0**	6	20.0	57
1433030600	**6.0**	6	20.0	65
1433030800	**8.0**	8	22.0	65
1433031000	**10.0**	10	25.0	70
1433031200	**12.0**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

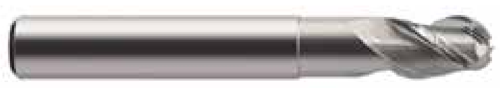
▶To order NX coated use code 143325, followed by diameter code.

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	h6





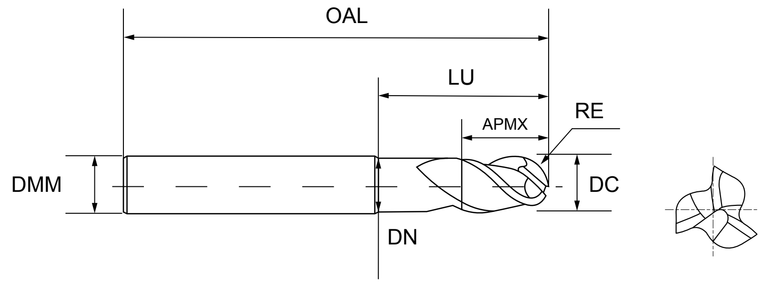
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							



MG HM | ZEFP 3 | FHA 40° | DIN 6535HA | NECK

Series No. 116303

▶cutting conditions: p.281



Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Neck relief.
Mirror polished flutes.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
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

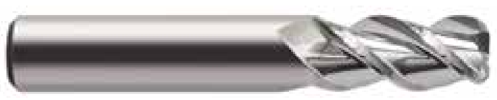
▶To order NX coated use code 116325, followed by diameter code.

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.01	+0.01	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●	○						

STANDARD LENGTH CORNER RADIUS

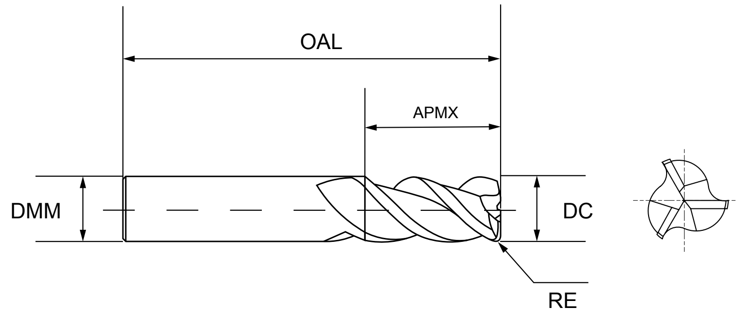
MG HM | ZEFP 3 | RE | FHA 45º | DIN 6535HA



Series No. 142303

▶cutting conditions: p.279

Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner protected.
Mirror polished flutes.



EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1423030300	3.0	0.5	6	12.0	57
1423030901		1.0	6	12.0	57
1423030400	4.0	0.5	6	15.0	57
1423030902		1.0	6	15.0	57
1423030500	5.0	0.5	6	20.0	57
1423030903		1.0	6	20.0	57
1423030600	6.0	0.5	6	20.0	65
1423030904		1.0	6	20.0	65
1423030800	8.0	0.5	8	22.0	65
1423030905		1.0	8	22.0	65
1423030914		2.0	8	22.0	65
1423030915		3.0	8	22.0	65
1423031000	10.0	0.5	10	25.0	70
1423030906		1.0	10	25.0	70
1423030907		2.0	10	25.0	70
1423030916		3.0	10	25.0	70
1423031200	12.0	0.5	12	25.0	75
1423030908		1.0	12	25.0	75
1423030909		2.0	12	25.0	75
1423030917		3.0	12	25.0	75
1423030918		4.0	12	25.0	75

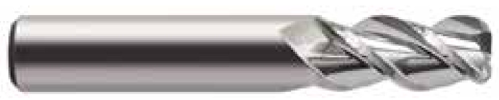
▶To order NX coated use code 142325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.015	-0.03	+0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

STANDARD LENGTH CORNER RADIUS

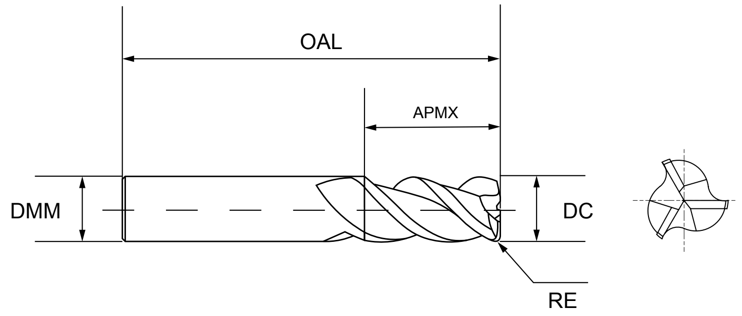
MG HM | ZEFP 3 | RE | FHA 45º | DIN 6535HA



Series No. 142303

▶cutting conditions: p.279

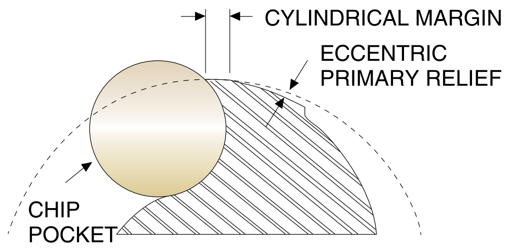
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Mirror polished flutes.



EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1423031600	16.0	0.5	16	35.0	90
1423030910		1.0	16	35.0	90
1423030911		2.0	16	35.0	90
1423030919		3.0	16	35.0	90
1423030920		4.0	16	35.0	90
1423030921		5.0	16	35.0	90
1423032000	20.0	0.5	20	40.0	100
1423039012		1.0	20	40.0	100
1423039013		2.0	20	40.0	100
1423030922		3.0	20	40.0	100
1423030923		4.0	20	40.0	100
1423030924		5.0	20	40.0	100

▶To order NX coated use code 142325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.015	-0.03	+0.03	h6



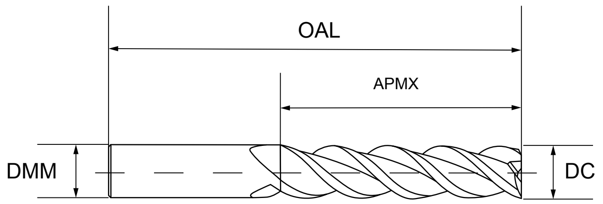
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

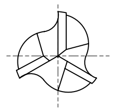
MG HM | ZEFP 3 | FHA 45° | DIN 6535HA

Series No. 144303

▶cutting conditions: p.279

Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Long series. Corner protected.
Mirror polished flutes.

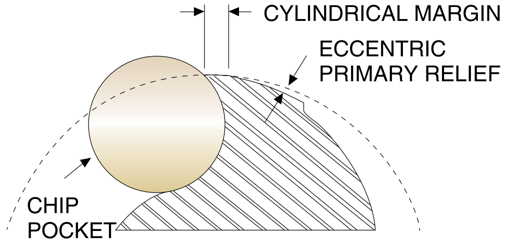


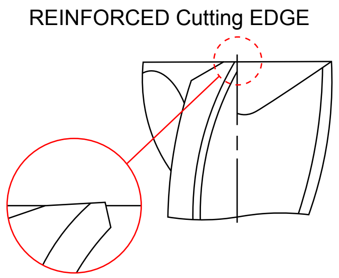


EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1443030300	**3.0**	6	15.0	75
1443030301		6	30.0	80
1443030400	**4.0**	6	20.0	75
1443030401		6	30.0	80
1443030500	**5.0**	6	25.0	75
1443030501		6	45.0	90
1443030600	**6.0**	6	25.0	75
1443030601		6	50.0	100
1443030800	**8.0**	8	30.0	80
1443030801		8	45.0	95
1443030802		8	65.0	110
1443031000	**10.0**	10	40.0	100
1443031001		10	55.0	110
1443031002		10	65.0	120

▶To order NX coated use code 144325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.015	h6

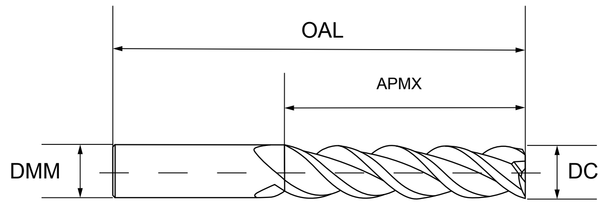


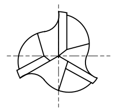


ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

MG HM | ZEFP 3 | FHA 45° | DIN 6535HA

Series No. 144303





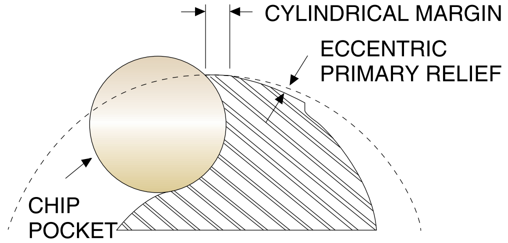
▶cutting conditions: p.279

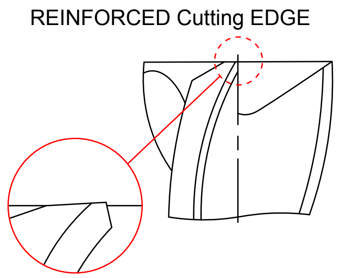
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Long series. Corner protected.
Mirror polished flutes.

EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1443031200	**12.0**	12	50.0	100
1443031201		12	65.0	125
1443031202		12	75.0	135
1443031600	**16.0**	16	70.0	125
1443031601		16	75.0	150
1443031602		16	95.0	180
1443031603		16	115.0	200
1443032000	**20.0**	20	75.0	150
1443032001		20	95.0	180
1443032002		20	115.0	200
1443032003		20	125.0	220

▶To order NX coated use code 144325, followed by diameter code.

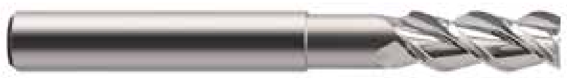
Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.015	h6





ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

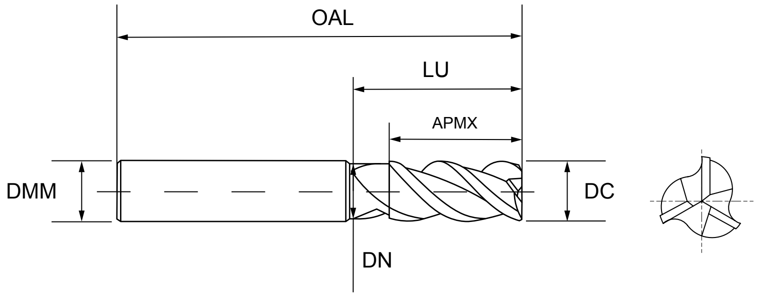
MG HM | ZEFP 3 | FHA 45° | DIN 6535HA | NECK



Series No. 153303

▶ cutting conditions: p.279

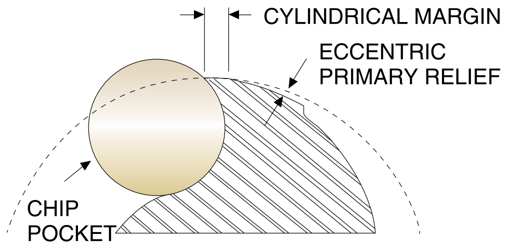
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Long series. Corner protected.
Mirror polished flutes.

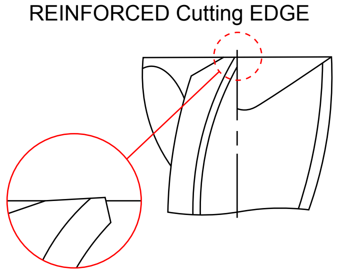


EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1533030300	**3.0**	6	8.0	12.0	57	2.7
1533030301		6	8.0	20.0	60	2.7
1533030302		6	8.0	30.0	80	2.7
1533030400	**4.0**	6	11.0	18.0	57	3.7
1533030401		6	10.0	26.0	70	3.7
1533030402		6	10.0	30.0	80	3.7
1533030500	**5.0**	6	13.0	18.0	57	4.7
1533030600	**6.0**	6	13.0	18.0	57	5.7
1533030601		6	15.0	35.0	90	5.7
1533030602		6	15.0	45.0	90	5.7
1533030800	**8.0**	8	21.0	25.0	63	7.4
1533030801		8	20.0	40.0	100	7.4
1533030802		8	20.0	50.0	100	7.4

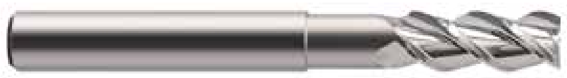
▶ To order NX coated use code 153325, followed by diameter code.

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	h6





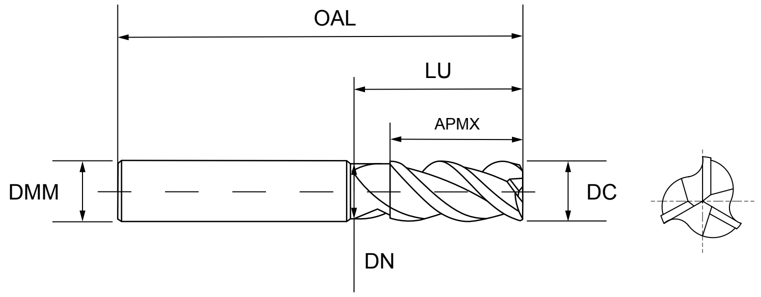
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							



MG HM | ZEFP 3 | FHA 45° | DIN 6535HA | NECK

Series No. 153303

▶ cutting conditions: p.279

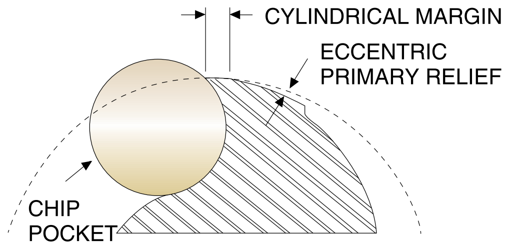


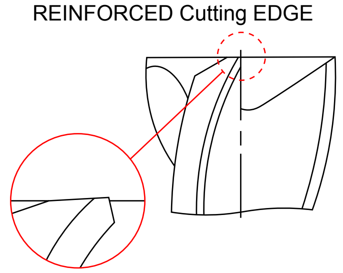
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Long series. Corner protected.
Mirror polished flutes.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1533031000	**10.0**	10	22.0	30.0	72	9.2
1533031001		10	25.0	45.0	100	9.2
1533031002		10	25.0	55.0	100	9.0
1533031200	**12.0**	12	26.0	36.0	83	11.0
1533031201		12	30.0	50.0	110	11.0
1533031202		12	30.0	60.0	110	11.0
1533031600	**16.0**	16	36.0	42.0	92	15.0
1533031601		16	25.0	50.0	130	15.0
1533032000	**20.0**	20	41.0	52.0	104	19.0
1533032001		20	30.0	60.0	150	19.0

▶ To order NX coated use code 153325, followed by diameter code.

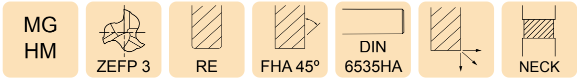
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.015	h6





ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

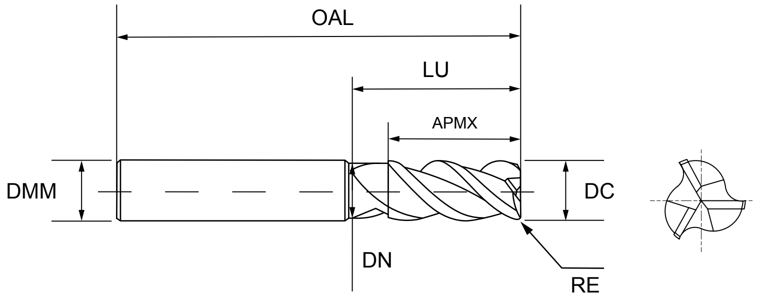
EXTENDED NECK CORNER RADIUS



Series No. 156303

▶cutting conditions: p.279

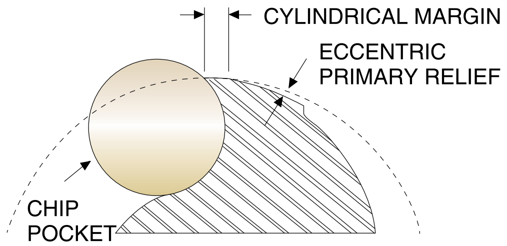
Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner radius. Neck relief.
Mirror polished flutes.



EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1563030600	**6.0**	0.5	6	10.0	20.0	70	5.7
1563030601		1.0	6	10.0	20.0	70	5.7
1563030800	**8.0**	0.5	8	12.0	25.0	80	7.4
1563030801		1.0	8	12.0	25.0	80	7.4
1563030802		2.0	8	12.0	25.0	80	7.4
1563030803		3.0	8	12.0	25.0	80	7.4
1563031000	**10.0**	0.5	10	15.0	30.0	100	9.2
1563031001		1.0	10	15.0	30.0	100	9.2
1563031002		2.0	10	15.0	30.0	100	9.2
1563031003		3.0	10	15.0	30.0	100	9.2
1563031200	**12.0**	0.5	12	20.0	35.0	110	11.0
1563031201		1.0	12	20.0	35.0	110	11.0
1563031202		2.0	12	20.0	35.0	110	11.0
1563031203		3.0	12	20.0	35.0	110	11.0
1563031204		4.0	12	20.0	35.0	110	11.0

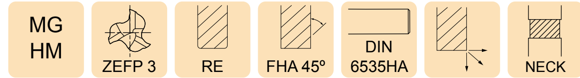
▶To order NX coated use code 156325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.015	-0.03	+0.03	h6



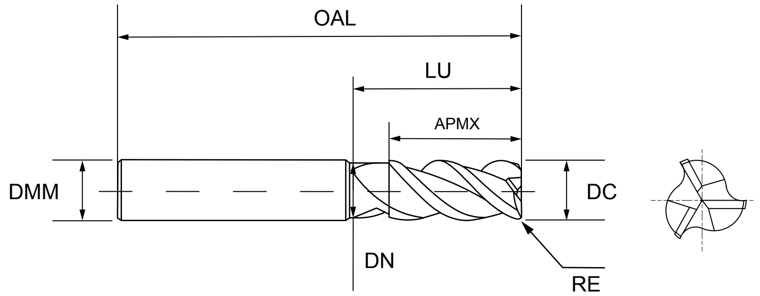
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

EXTENDED NECK CORNER RADIUS



Series No. 156303

▶cutting conditions: p.279

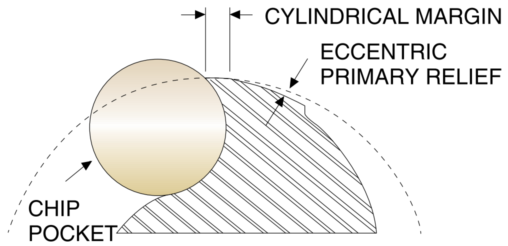


Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner radius. Neck relief.
Mirror polished flutes.

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1563031600	**16.0**	1.0	16	25.0	50.0	130	15.0
1563031601		2.0	16	25.0	50.0	130	15.0
1563031602		3.0	16	25.0	50.0	130	15.0
1563031603		4.0	16	25.0	50.0	130	15.0
1563031604		5.0	16	25.0	50.0	130	15.0
1563032000	**20.0**	1.0	20	30.0	60.0	150	19.0
1563032001		2.0	20	30.0	60.0	150	19.0
1563032002		3.0	20	30.0	60.0	150	19.0
1563032003		4.0	20	30.0	60.0	150	19.0
1563032004		5.0	20	30.0	60.0	150	19.0

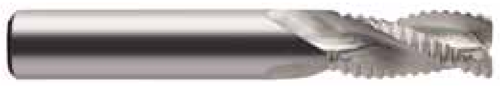
▶To order NX coated use code 156325, followed by diameter code.

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	Radius Tolerance (mm) RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.015	-0.03	+0.03	h6



ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

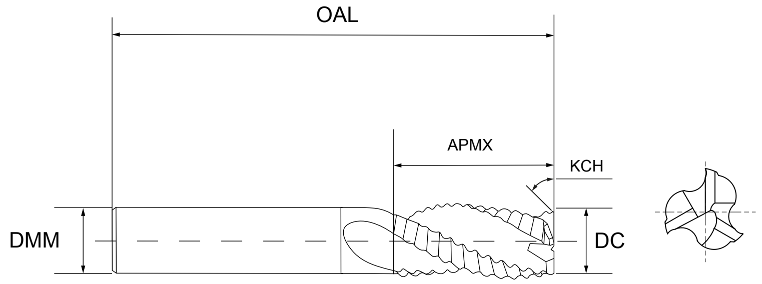
MG HM | ZEFP 3 | KCH 45° | FHA 30° | DIN 6535HA | DIN 6535HB | ALU



Series No. 125103, 125303

▶cutting conditions: p.280

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



DIN 6535HB ORDCODE	DIN 6535HA ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	CHAMFER WIDTH CHW
1251030600	**1253030600**	**6.0**	6	16.0	57	0.60
1251030800	**1253030800**	**8.0**	8	16.0	63	0.60
1251031000	**1253031000**	**10.0**	10	22.0	72	0.60
1251031200	**1253031200**	**12.0**	12	26.0	83	0.60
1251031400	**1253031400**	**14.0**	14	26.0	83	0.91
1251031600	**1253031600**	**16.0**	16	32.0	92	0.91
1251032000	**1253032000**	**20.0**	20	38.0	104	0.91

▶To order NX coated use code 125125 or 125325, followed by diameter code.

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0, 8.0, 10.0	0.00 / -0.058	h6
12.0, 14.0, 16.0	0.00 / -0.070	
20.0	0.00 / -0.084	

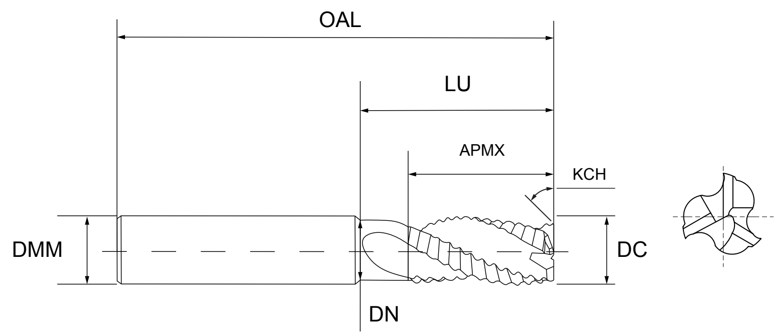
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

MG HM | ZEFP 3 | KCH 45° | FHA 30° | DIN 6535HA | DIN 6535HB | NECK | ALU

Series No.126103, 126303

▶cutting conditions: p.280

Suitable for machining of aluminium and other non-ferrous materials.
Excellent surface finishes, superior chip removal.
Corner protected. Neck relief.



DIN 6535HB ORDCODE	DIN 6535HA ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN	CHAMFER WIDTH CHW
1261030600	**1263030600**	**6.0**	6	16.0	20.0	57	5.0	0.60
1261030800	**1263030800**	**8.0**	8	16.0	25.0	63	7.0	0.60
1261031000	**1263031000**	**10.0**	10	22.0	30.0	72	9.0	0.60
1261031200	**1263031200**	**12.0**	12	26.0	36.0	83	10.5	0.60
1261031600	**1263031600**	**16.0**	16	32.0	42.0	92	14.5	0.91
1261032000	**1263032000**	**20.0**	20	38.0	52.0	104	18.5	0.91

▶To order NX coated use code 126125 or 126325, followed by diameter code.

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0, 8.0, 10.0	0.00 / -0.058	h6
12.0, 16.0	0.00 / -0.070	
20.0	0.00 / -0.084	

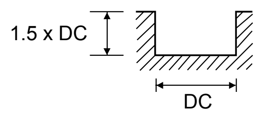
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								●							

ALU-XP

CUTTING DATA

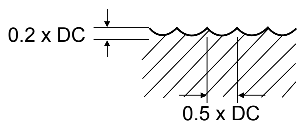
135303 (1 Flute Router)

VDI MATERIAL GROUP		Type of cut		Size (mm) 2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	21-25	SLOTTING	v_c (m/min)	145	170	190	190	190	195	190	190
			n	23000	18000	15000	12000	10000	8000	6000	5000
			f_z	0.065	0.094	0.12	0.15	0.18	0.244	0.333	0.44
			f (mm/min)	1500	1700	1800	1800	1800	1900	2000	2200
	29.1		v_c (m/min)	200	235	250	235	255	250	250	255
			n	32000	25000	20000	15000	13500	10000	8000	6700
			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)

VDI MATERIAL GROUP		Type of cut		Size (mm) 6.0	8.0	10.0	12.0	16.0	20.0
N	21-25	SLOTTING	v_c (m/min)	270	280	350	420	440	350
			n	14400	11200	11200	11200	8800	5600
			f_z	0.049	0.071	0..084	0.07	0.123	0.157
			f (mm/min)	1400	1600	1880	2400	2160	1760
	26-28		v_c (m/min)	85	85	105	125	135	105
			n	4400	3360	3360	3360	2640	1680
			f_z	0.04	0.06	0.069	0.089	0.101	0.131
			f (mm/min)	350	400	465	600	535	440



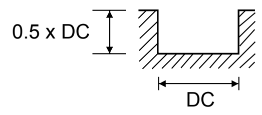
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long series and long necked tools it may be necessary to reduce feed rate by up to 50%.

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed per tooth (mm)
f - feed rate (mm/min)
a_p - axial depth of cut
a_e - radial depth of cut

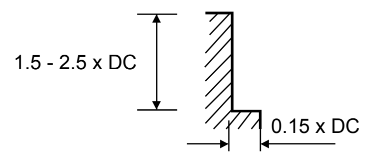
143303, 144303, 153303 (3 Flute 45º Helix, Long, Necked & Long Series)

VDI MATERIAL GROUP		Type of cut		Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-25	SLOTTING	v_c (m/min)	65	90	110	130	140	175	210	210	175
			n	7000	7000	7000	7000	5600	5600	5600	4200	2800
			f_z	0.035	0.045	0.05	0.06	0.088	0.106	0.131	0.158	0.2
			f (mm/min)	730	940	1050	1250	1470	1780	2200	1990	1680
		SIDE CUTTING	v_c (m/min)	65	90	110	130	140	175	210	210	175
			n	7000	7000	7000	7000	5600	5600	5600	4200	2800
			f_z	0.045	0.055	0.065	0.075	0.113	0.131	0.163	0.2	0.238
			f (mm/min)	940	1150	1360	1580	1900	2200	2740	2520	2000

SLOTTING



SIDE CUTTING

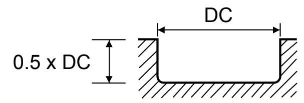


▶ The feed rate for long series and long necked tools should be reduced by up to 50%

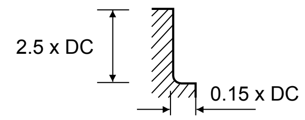
142303, 156303 (3 Flute 45º Helix, Corner Radius & Necked Corner Radius)

VDI MATERIAL GROUP		Type of cut		Size (mm) 3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-25	SLOTTING	v_c (m/min)	95	125	155	190	200	250	300	300	250
			n	10000	10000	10000	10000	8000	8000	8000	6000	4000
			f_z	0.039	0.05	0.055	0.066	0.096	0.117	0.145	0.174	0.22
			f (mm/min)	1160	1490	1650	1980	2310	2810	3470	3140	2640
		SIDE CUTTING	v_c (m/min)	95	125	155	190	200	250	300	300	250
			n	10000	10000	10000	10000	8000	8000	8000	6000	4000
			f_z	0.05	0.061	0.072	0.083	0.125	0.145	0.179	0.22	0.262
			f (mm/min)	1490	1820	2150	2480	3000	3470	4290	3960	3140

SLOTTING



SIDE CUTTING

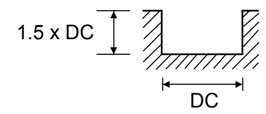


▶ The feed rate for long series and long necked tools should be reduced by up to 50%

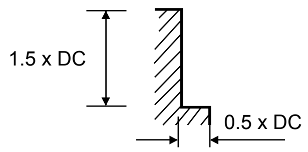
125103, 125303, 126103, 126303 (3 Flute Roughing)

VDI MATERIAL GROUP		Type of cut		Size (mm)					
				6.0	8.0	10.0	12.0	16.0	20.0
N	21-25	SLOTTING	v_c (m/min)	200	200	205	320	322	320
			n	13500	10500	8500	8500	6400	5100
			f_z	0.168	0.168	0.169	0.165	00.167	0.163
			f (mm/min)	6800	5300	4300	4200	3200	2500
		SIDE CUTTING	v_c (m/min)	200	200	205	320	322	320
			n	13500	10500	8500	8500	6400	5100
			f_z	0.168	0.167	0.169	0.167	0.167	0.165
			f (mm/min)	5300	4000	3500	3200	2400	1900

SLOTTING



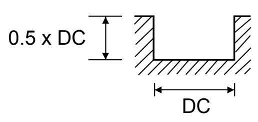
SIDE CUTTING



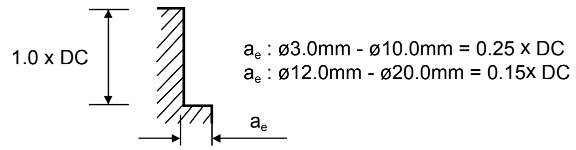
151303, 152303, 154303 (2 Flute 45º Helix, Short, Long & Long Series)

VDI MATERIAL GROUP		Type of cut		Size (mm)								
				3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-25	SLOTTING	v_c (m/min)	95	125	155	190	200	250	300	300	250
			n	10000	10000	10000	10000	8000	8000	8000	6000	4000
			f_z	0.035	0.045	0.05	0.06	0.088	0.106	0.131	0.158	0.2
			f (mm/min)	700	900	1000	1200	1400	1700	2100	1900	1600
		SIDE CUTTING	v_c (m/min)	95	125	155	190	200	250	300	300	250
			n	10000	10000	10000	10000	8000	8000	8000	6000	4000
			f_z	0.035	0.045	0.05	0.06	0.088	0.106	0.131	0.158	0.2
			f (mm/min)	700	900	1000	1200	1400	1700	2100	1900	1600

SLOTTING



SIDE CUTTING

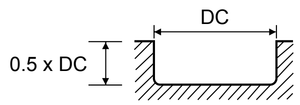


▶ The feed rate for long & long series tools should be reduced by up to 50%

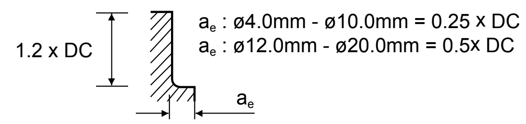
155303 (2 Flute Corner Radius)

VDI MATERIAL GROUP		Type of cut		Size (mm)						
				4.0	6.0	8.0	10.0	12.0	16.0	20.0
N	21-25	SLOTTING	v_c (m/min)	130	195	200	250	300	320	250
			n	10400	10400	8000	8000	8000	6400	4000
			f_z	0.046	0.058	0.09	0.110	0.135	0.156	0.2
			f (mm/min)	960	1200	1440	1760	2160	2000	1600
		SIDE CUTTING	v_c (m/min)	130	195	200	250	300	320	250
			n	10400	10400	8000	8000	8000	6400	4000
			f_z	0.054	0.077	0.115	0.135	0.17	0.194	0.25
			f (mm/min)	1120	1600	1840	2160	2720	2480	2000

SLOTTING

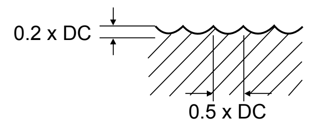


SIDE CUTTING



116303 (3 Flute 40º Helix, Ball Nose)

VDI MATERIAL GROUP		Type of cut		Size (mm)								
				2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
N	21-25	SLOTTING	v_c (m/min)	135	135	180	225	270	280	350	420	440
			n	21600	14400	14400	14400	14400	11200	11200	11200	8800
			f_z	0.018	0.026	0.035	0.038	0.049	0.071	0.084	0.107	0.123
			f (mm/min)	760	760	1000	1080	1400	1600	1880	2400	2160
	26-28		v_c (m/min)	40	40	55	70	85	85	105	125	135
			n	6400	4400	4400	4400	4400	3360	3360	3360	2640
			f_z	0.015	0.022	0.028	0.031	0.04	0.06	0.069	0.089	0.101
			f (mm/min)	190	190	250	270	350	400	465	600	535



EUROPA TOOL

GRAPHEX

Designed specifically
for machining
Graphite

APPLICATION GUIDE

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2-FLUTE END MILLS

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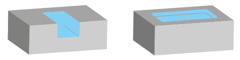
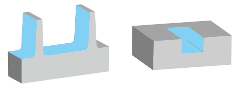
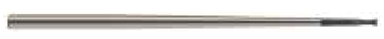
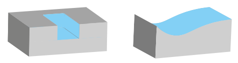
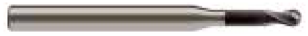
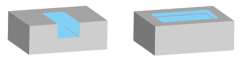
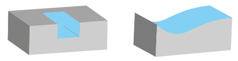
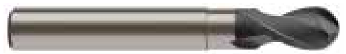
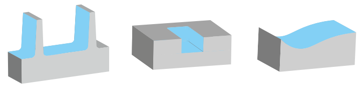
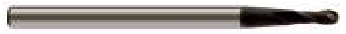
										○	●					109333		Miniature Extended Neck Corner Radius ø0.2mm - 6.0mm	P.286-287
										○	●					113333		Miniature Tapered Neck Corner Radius ø1.0mm - 2.0mm	P.288
										○	●					101333 102333		Miniature Extended Neck Ball Nose ø0.2mm - 6.0mm	P.290-291
										○	●					107333		Extended Neck Long Length ø0.5mm - 12.0mm	P.289
										○	●					103333		Extended Neck Short Length Ball Nose ø2.0mm - 12.0mm	P.292
										○	●					104333 105333		Extended Neck Long Length Ball Nose ø2.0mm - 12.0mm	P.293
										○	●					108333		Tapered Neck Ball Nose ø1.0mm - 2.0mm	P.294

3-FLUTE END MILLS

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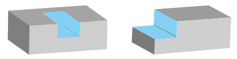
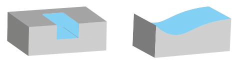
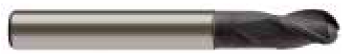
							○			○	●					111333		Short Length Corner Radius ø2.0mm - 12.0mm	P.295
							○			○	●					112333		Long Length Corner Radius ø2.0mm - 12.0mm	P.296
							○			○	●					106333		Extended Neck Short Length Ball Nose ø2.0mm - 12.0mm	P.297

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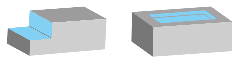
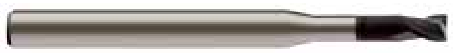
										○	●					110333		Extended Neck Corner Radius ø6.0mm - 12.0mm	P.298
																		Cutting Data	P.299

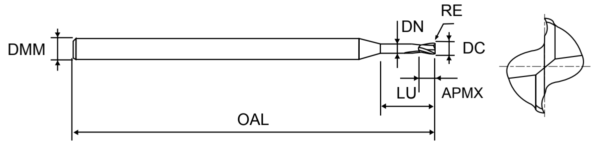
▶For material group examples, refer to page 4

▶For full material group tables, refer to pages 334-347

MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK



Series No. 109333



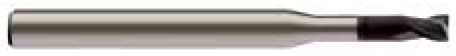
▶ cutting conditions : p.301

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1093330020	**0.2**	-	3	0.3	-	40	-
1093330030	**0.3**	-	3	0.5	-	40	-
1093330040	**0.4**	-	3	0.6	-	40	-
1093330050	**0.5**	0.05	3	0.7	2.5	40	0.45
1093339001	**0.5**	0.05	3	0.7	4.0	40	0.45
1093330060	**0.6**	0.05	3	0.9	3.0	40	0.55
1093339002	**0.6**	0.05	3	0.9	5.0	40	0.55
1093330080	**0.8**	0.05	3	1.2	4.0	40	0.75
1093339003	**0.8**	0.05	3	1.2	7.0	40	0.75
1093330100	**1.0**	0.10	3	1.5	5.0	40	0.95
1093339004	**1.0**	0.10	3	1.5	8.5	40	0.95
1093339005	**1.0**	0.10	3	1.5	12.0	40	0.95
1093330120	**1.2**	0.10	3	1.8	6.0	50	1.15
1093339006	**1.2**	0.10	3	1.8	10.0	50	1.15
1093330150	**1.5**	0.15	3	2.2	7.5	50	1.40
1093339007	**1.5**	0.15	3	2.2	12.0	50	1.40
1093339008	**1.5**	0.15	3	2.2	18.0	50	1.40
1093330200	**2.0**	0.15	3	2.2	10.0	60	1.90
1093339009	**2.0**	0.15	3	2.2	16.0	60	1.90
1093339010	**2.0**	0.15	3	2.2	25.0	60	1.90

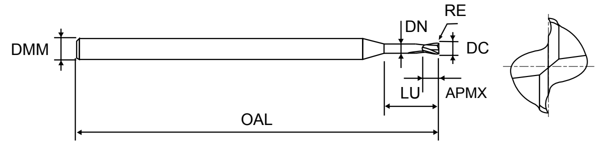
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			



MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK

Series No. 109333



▶ cutting conditions : p.301

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

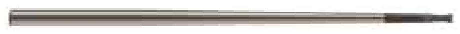
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1093330300	**3.0**	0.20	4	3.0	10.0	65	2.90
1093339011	**3.0**	0.20	4	3.0	15.0	65	2.90
1093339012	**3.0**	0.20	4	3.0	20.0	65	2.90
1093339013	**3.0**	0.20	4	3.0	25.0	75	2.90
1093339014	**3.0**	0.20	4	3.0	30.0	75	2.90
1093330400	**4.0**	0.20	6	4.0	20.0	65	3.90
1093339015	**4.0**	0.20	6	4.0	30.0	75	3.90
1093339016	**4.0**	0.20	6	4.0	40.0	90	3.90
1093330500	**5.0**	0.30	6	5.0	20.0	75	4.90
1093339017	**5.0**	0.30	6	5.0	30.0	75	4.90
1093339018	**5.0**	0.30	6	5.0	40.0	90	4.90
1093339019	**5.0**	0.30	6	5.0	50.0	90	4.90
1093330600	**6.0**	0.30	6	6.0	30.0	75	5.90
1093339020	**6.0**	0.30	6	6.0	40.0	90	5.90
1093339021	**6.0**	0.30	6	6.0	50.0	90	5.90
1093339022	**6.0**	0.0	6	6.0	60.0	100	5.90

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

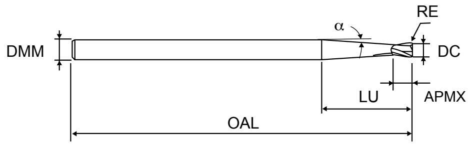
MINIATURE CORNER RADIUS TAPERED NECK

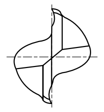
MG HM | ZEFP 2 | RE | FHA 30° | DIN 6535HA | NECK



Series No. 113333

▶ cutting conditions : p.301





Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK TAPER **α**
1133330100	**1.0**	0.10	3	2.0	30	60	2º
1133339001	**1.0**	0.10	3	2.0	70	100	1º
1133330150	**1.5**	0.15	3	3.0	30	60	1º30'
1133339002	**1.5**	0.15	3	3.0	50	100	1º
1133330200	**2.0**	0.15	3	4.0	30	60	1º
1133339003	**2.0**	0.15	4	4.0	70	100	1º

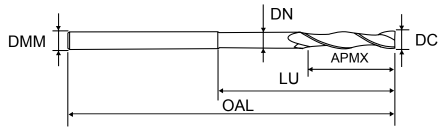
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	h6

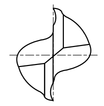
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

LONG LENGTH

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK

Series No.107333





▶ cutting conditions : p.301

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1073330050	**0.5**	3	1.0	2	40	0.45
1073330060	**0.6**	3	2.0	3	40	0.55
1073330070	**0.7**	3	2.0	4	40	0.65
1073330080	**0.8**	3	2.0	5	40	0.75
1073330090	**0.9**	3	2.0	6	40	0.85
1073330100	**1.0**	4	3.0	8	75	0.95
1073330150	**1.5**	4	4.0	10	75	1.45
1073330200	**2.0**	4	6.0	16	100	1.90
1073330250	**2.5**	4	8.0	20	100	2.40
1073330300	**3.0**	6	8.0	30	100	2.80
1073330350	**3.5**	6	10.0	35	100	3.20
1073330400	**4.0**	6	20.0	40	100	3.70
1073330500	**5.0**	6	25.0	50	125	4.60
1073330600	**6.0**	6	30.0	60	140	5.60
1073330700	**7.0**	6	35.0	-	140	-
1073330800	**8.0**	8	40.0	80	150	7.40
1073330900	**9.0**	8	45.0	-	150	-
1073331000	**10.0**	10	50.0	80	150	9.40
1073331100	**11.0**	10	50.0	-	150	-
1073331200	**12.0**	12	55.0	80	150	11.40

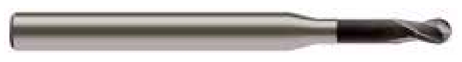
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

MINIATURE BALL NOSE EXTENDED NECK

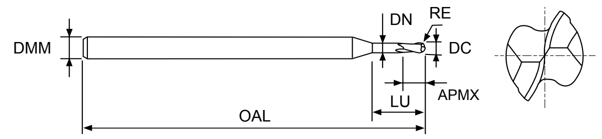
EUROPA TOOL

MG HM | ZEFP 2 | FHA 30º | DIN 6535HA | NECK



Series No. 101333, 102333

▶ cutting conditions : p.300



Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1013330020	**0.2**	0.10	3	0.2	-	40	-
1013330030	**0.3**	0.15	3	0.3	-	40	-
1013330040	**0.4**	0.20	3	0.4	-	40	-
1023330040	**0.4**	0.20	4	0.6	4.0	45	0.35
1023339001	**0.4**	0.20	4	0.6	6.0	45	0.35
1013330050	**0.5**	0.25	3	0.5	2.5	40	0.45
1013330060	**0.6**	0.30	3	0.6	3.0	40	0.55
1023330060	**0.6**	0.30	4	1.0	4.0	45	0.55
1013339001	**0.6**	0.30	3	0.6	5.0	40	0.55
1023339002	**0.6**	0.30	4	1.0	6.0	45	0.55
1023339003	**0.6**	0.30	4	1.0	8.0	45	0.55
1013330080	**0.8**	0.40	3	0.8	4.0	40	0.75
1013339002	**0.8**	0.40	3	0.8	7.0	40	0.75
1013330100	**1.0**	0.50	3	1.0	5.0	40	0.95
1023330100	**1.0**	0.50	4	1.5	6.0	45	0.95
1023339004	**1.0**	0.50	4	1.5	8.0	45	0.95
1013339003	**1.0**	0.50	3	1.0	8.5	40	0.95
1013339004	**1.0**	0.50	3	1.0	12.0	40	0.95
1023339005	**1.0**	0.50	4	1.5	12.0	45	0.95
1013330120	**1.2**	0.60	3	1.2	6.0	50	1.15
1013339005	**1.2**	0.60	3	1.2	10.0	50	1.15
1013330150	**1.5**	0.75	3	1.5	7.5	50	1.40
1013339006	**1.5**	0.75	3	1.5	12.0	50	1.40
1023330150	**1.5**	0.75	4	1.75	12.0	45	1.40
1013339007	**1.5**	0.75	3	1.5	18.0	50	1.40

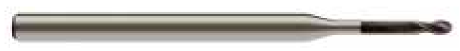
Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.02	-0.010	+0.010	h6

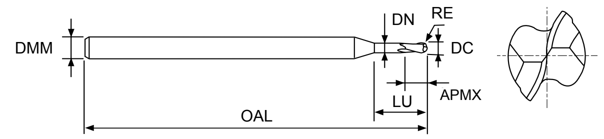
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

MINIATURE BALL NOSE EXTENDED NECK

EUROPA TOOL

MG HM | ZEFP 2 | FHA 30º | DIN 6535HA | NECK





Series No. 101333, 102333

▶ cutting conditions : p.300

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

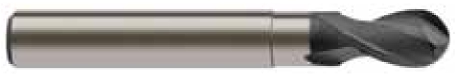
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1023330200	**2.0**	1.0	4	3.0	8.0	60	1.90
1013330200	**2.0**	1.0	3	2.2	10.0	60	1.90
1023339006	**2.0**	1.0	4	3.0	12.0	60	1.90
1013339008	**2.0**	1.0	3	2.2	16.0	60	1.90
1023339007	**2.0**	1.0	4	3.0	16.0	60	1.90
1013339009	**2.0**	1.0	3	2.2	25.0	60	1.90
1013330300	**3.0**	1.5	4	3.0	10.0	65	2.90
1013339010	**3.0**	1.5	4	3.0	15.0	65	2.90
1013339011	**3.0**	1.5	4	3.0	20.0	65	2.90
1013339012	**3.0**	1.5	4	3.0	25.0	75	2.90
1013339013	**3.0**	1.5	4	3.0	30.0	75	2.90
1023330400	**4.0**	2.0	4	6.0	16.0	60	3.90
1013330400	**4.0**	2.0	6	4.0	20.0	65	3.90
1013339014	**4.0**	2.0	6	4.0	30.0	75	3.90
1013339015	**4.0**	2.0	6	4.0	40.0	90	3.90
1013330500	**5.0**	2.5	6	5.0	20.0	65	4.90
1013339016	**5.0**	2.5	6	5.0	30.0	75	4.90
1013339017	**5.0**	2.5	6	5.0	40.0	90	4.90
1013339018	**5.0**	2.5	6	5.0	50.0	90	4.90
1013330600	**6.0**	3.0	6	6.0	30.0	75	5.90
1013339019	**6.0**	3.0	6	6.0	40.0	90	5.90
1013339020	**6.0**	3.0	6	6.0	50.0	90	5.90
1013339021	**6.0**	3.0	6	6.0	60.0	100	5.90

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm) RETOLL	RETOLU	Shank Dia. Tolerance TCDMM
0.00 / -0.02	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

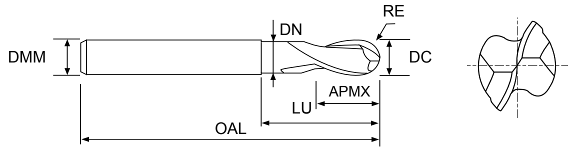
SHORT LENGTH BALL NOSE EXTENDED NECK

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 103333

▶ cutting conditions : p.300



Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

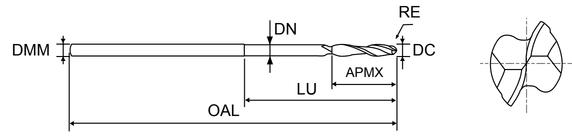
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1033330200	**2.0**	1.0	6	3.0	5.0	60	1.9
1033330250	**2.5**	1.25	6	4.0	6.0	60	2.4
1033330300	**3.0**	1.5	6	4.5	6.5	60	2.8
1033330350	**3.5**	1.75	6	5.0	7.0	65	3.2
1033330400	**4.0**	2.0	6	6.0	8.0	65	3.7
1033330500	**5.0**	2.5	6	7.5	10.0	65	4.6
1033330600	**6.0**	3.0	6	9.0	12.0	75	5.6
1033330800	**8.0**	4.0	8	12.0	25.0	75	7.4
1033331000	**10.0**	5.0	10	15.0	30.0	80	9.4
1033331200	**12.0**	6.0	12	18.0	36.0	90	11.4

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.03	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

LONG LENGTH BALL NOSE EXTENDED NECK

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No.104333, 105333

▶ cutting conditions : p.300

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

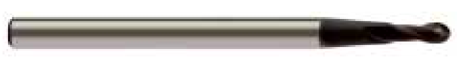
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1043330200	**2.0**	1.0	4	10.0	20.0	80	1.95
1053330200	**2.0**	1.0	4	10.0	20.0	100	1.95
1043330300	**3.0**	1.5	4	15.0	25.0	80	2.90
1053330300	**3.0**	1.5	4	15.0	25.0	100	2.90
1043330400	**4.0**	2.0	4	20.0	30.0	80	3.90
1053330400	**4.0**	2.0	4	20.0	30.0	100	3.90
1043330500	**5.0**	2.5	6	30.0	50.0	100	4.90
1053330500	**5.0**	2.5	6	30.0	50.0	120	4.90
1043330600	**6.0**	3.0	6	30.0	50.0	100	5.50
1053330600	**6.0**	3.0	6	30.0	50.0	150	5.50
1043330700	**7.0**	3.5	6	30.0	-	100	-
1053330700	**7.0**	3.5	6	30.0	-	150	-
1043330800	**8.0**	4.0	8	40.0	60.0	110	7.50
1053330800	**8.0**	4.0	8	40.0	60.0	150	7.50
1043330900	**9.0**	4.5	8	40.0	-	110	-
1053330900	**9.0**	4.5	8	40.0	-	150	-
1043331000	**10.0**	5.0	10	50.0	70.0	120	9.50
1053331000	**10.0**	5.0	10	50.0	70.0	180	9.50
1043331200	**12.0**	6.0	12	55.0	75.0	130	11.50
1053331200	**12.0**	6.0	12	55.0	75.0	200	11.50

Mill Dia. Tolerance TCDC(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.03	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

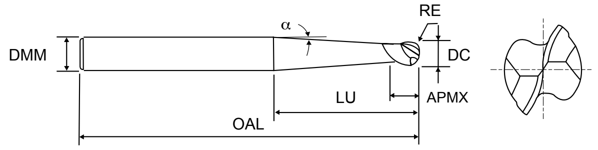
BALL NOSE TAPERED NECK

MG HM | ZEFP 2 | FHA 30° | DIN 6535HA | NECK



Series No. 108333

▶ cutting conditions : p.300



Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK TAPER **α**
1083330100	**1.0**	0.5	3	2.0	-	40	8°30'
1083339001	**1.0**	0.5	3	2.0	30.0	60	2°
1083339002	**1.0**	0.5	3	2.0	70.0	100	1°
1083330150	**1.5**	0.75	3	3.0	-	40	6°15'
1083339003	**1.5**	0.75	3	3.0	30.0	60	1°30'
1083339004	**1.5**	0.75	3	3.0	58.0	100	0°45'
1083330200	**2.0**	1.0	3	4.0	-	40	4°15'
1083339005	**2.0**	1.0	3	4.0	30.0	60	1°
1083339006	**2.0**	1.0	4	4.0	70.0	100	1°

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.02	-0.010	+0.010	h6

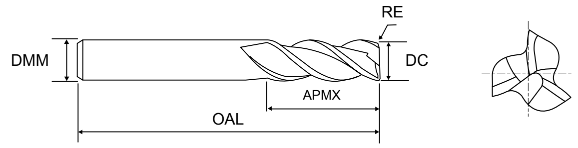
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

SHORT LENGTH CORNER RADIUS

MG HM | ZEFP 3 | RE | FHA 40° | DIN 6535HA

Series No.111333

▶ cutting conditions : p.302



Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

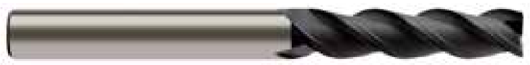
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1113330200	**2.0**	0.15	3	6.0	40
1113330300	**3.0**	0.15	3	12.0	40
1113330400	**4.0**	0.20	4	14.0	50
1113330500	**5.0**	0.30	5	16.0	50
1113330600	**6.0**	0.30	6	20.0	65
1113330800	**8.0**	0.50	8	20.0	65
1113331000	**10.0**	0.50	10	25.0	75
1113331200	**12.0**	0.50	12	25.0	75

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

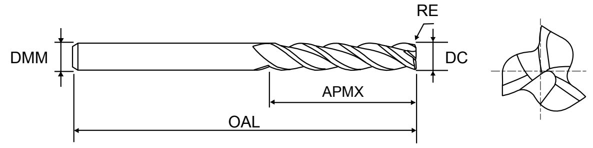
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								○			○	●			

LONG LENGTH CORNER RADIUS

MG HM | ZEFP 3 | RE | FHA 40º | DIN 6535HA



Series No. 112333



▶ cutting conditions : p.302

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

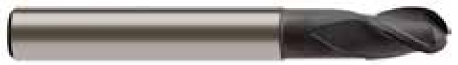
EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1123330200	**2.0**	0.15	3	9.0	60
1123330300	**3.0**	0.15	3	30.0	60
1123330400	**4.0**	0.20	4	30.0	60
1123330500	**5.0**	0.30	5	35.0	70
1123330600	**6.0**	0.30	6	40.0	100
1123330800	**8.0**	0.50	8	40.0	100
1123331000	**10.0**	0.50	10	40.0	100
1123331200	**12.0**	0.50	12	45.0	100

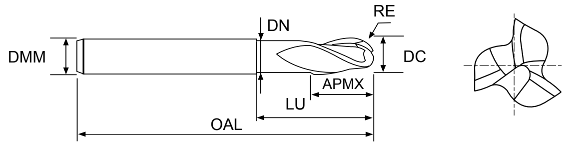
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								○			○	●			

SHORT LENGTH BALL NOSE EXTENDED NECK

MG HM | ZEFP 2 | FHA 30º | DIN 6535HA | NECK





Series No.106333

▶ cutting conditions : p.302

Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1063330200	**2.0**	1.0	6	3.0	5.0	60	1.9
1063330250	**2.5**	1.25	6	4.0	6.0	60	2.4
1063330300	**3.0**	1.5	6	4.5	6.5	60	2.8
1063330350	**3.5**	1.75	6	5.0	7.0	65	3.2
1063330400	**4.0**	2.0	6	6.0	8.0	65	3.7
1063330500	**5.0**	2.5	6	7.5	10.0	65	4.6
1063330600	**6.0**	3.0	6	9.0	12.0	75	5.6
1063330800	**8.0**	4.0	8	12.0	25.0	75	7.4
1063331000	**10.0**	5.0	10	15.0	30.0	80	9.4
1063331200	**12.0**	6.0	12	18.0	36.0	90	11.4

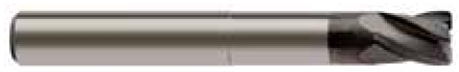
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm) **RETOLL**	**RETOLU**	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	-0.010	+0.010	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good								○			○	●			

CORNER RADIUS EXTENDED NECK

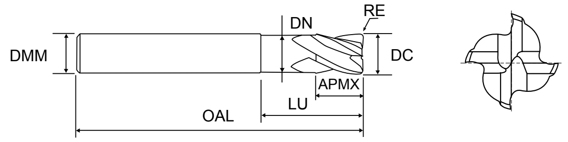
EUROPA TOOL

MG HM | ZEFP 4 | RE | FHA 30º | DIN 6535HA | NECK



Series No. 110333

▶ cutting conditions : p.302



Unique ultra fine diamond coating for high quality surface finish.
High hardness coating for increased wear resistance.
High performance on graphite and non-metals.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	EFFECTIVE LENGTH **LU**	OVERALL LENGTH **OAL**	NECK DIAMETER **DN**
1103330600	**6.0**	0.5	6	10.0	40.0	80	5.9
1103330800	**8.0**	0.5	8	10.0	40.0	80	7.8
1103339004	**8.0**	1.0	8	10.0	60.0	100	7.8
1103331000	**10.0**	0.5	10	25.0	-	75	-
1103339005	**10.0**	0.5	10	12.0	40.0	80	9.8
1103339006	**10.0**	1.0	10	12.0	40.0	80	9.8
1103339007	**10.0**	0.5	10	12.0	80.0	125	9.8
1103331200	**12.0**	0.5	12	25.0	-	80	-
1103339008	**12.0**	0.5	12	15.0	40.0	80	11.8
1103339009	**12.0**	1.0	12	15.0	40.0	80	11.8
1103339100	**12.0**	1.0	12	15.0	80.0	125	11.8

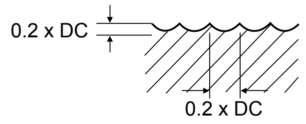
Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good											○	●			

GRAPHEX
CUTTING DATA

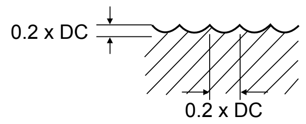
101333, 102333, 108333 (2 Flute Miniature Ball Nose)

VDI MATERIAL GROUP		Type of cut		Size (mm)										
				0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	30	SLOTTING	v_c (m/min)	50	75	100	125	150	190	250	255	250	250	265
			n	40000	40000	40000	40000	40000	40000	40000	27000	20000	16000	14000
			f_z	0.008	0.01	0.012	0.015	0.018	0.02	0.025	0.041	0.073	0.091	0.104
			f (mm/min)	600	800	960	1200	1440	1600	2000	2200	2900	2900	2900



103333, 104333, 105333 (2 Flute Ball Nose)

VDI MATERIAL GROUP		Type of cut		Size (mm)									
				2.0	2.5	3.0	3.5	4.0	5.0	6.0	8.0	10.0	12.0
N	30	SLOTTING	v_c (m/min)	100	125	150	175	200	245	285	325	360	395
			n	16000	16000	16000	16000	16000	15500	15000	13000	11500	10500
			f_z	0.025	0.035	0.045	0.055	0.066	0.082	0.098	0.115	0.133	0.150
			f (mm/min)	800	1120	1450	1750	2100	2550	2950	3000	3050	3150



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

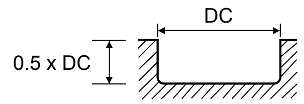
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

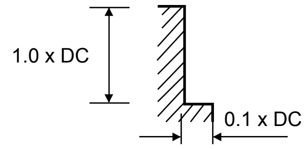
109333, 113333 (2 Flute Miniature Corner Radius)

VDI MATERIAL GROUP		Type of cut		Size (mm)										
				0.4	0.6	0.8	1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0
N	30	SLOTTING	v_c (m/min)	50	75	100	125	150	190	250	255	250	250	265
			n	40000	40000	40000	40000	40000	40000	40000	27000	20000	16000	14000
			f_z	0.008	0.008	0.01	0.012	0.015	0.018	0.02	0.035	0.058	0.072	0.082
			f (mm/min)	640	640	800	960	1200	1440	1600	1900	2300	2300	2300



107333 (2 Flute Long Length)

VDI MATERIAL GROUP		Type of cut		Size (mm)												
				0.4	0.6	0.8	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
N	30	SIDE CUTTING	v_c (m/min)	50	75	100	125	190	155	190	225	220	205	200	205	205
			n	40000	40000	40000	40000	40000	25000	20000	18000	14000	11000	8000	6500	5500
			f_z	0.003	0.004	0.007	0.009	0.010	0.016	0.020	0.026	0.043	0.064	0.081	0.092	0.109
			f (mm/min)	200	350	550	700	800	800	800	950	1200	1400	1300	1200	1200



▶ The feed rate for long series and long necked 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: $n = \frac{v_c * 1000}{\pi * ø}$

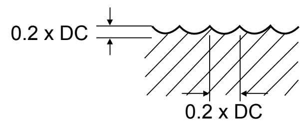
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

SABRE Powder metallurgy tools for Steel and Stainless Steel

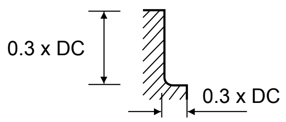
106333 (3 Flute Ball Nose)

VDI MATERIAL GROUP		Type of cut		Size (mm)									
				2.0	**2.5**	**3.0**	**3.5**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**
N	30	SLOTTING	v_c (m/min)	100	125	150	175	200	245	285	325	360	395
			n	16000	16000	16000	16000	16000	15500	15000	13000	11500	10500
			f_z	0.025	0.035	0.045	0.055	0.065	0.082	0.099	0.115	0.133	0.151
			f (mm/min)	1200	1700	2150	2650	3100	3800	4450	4500	4600	4750



111333, 112333 (3 Flute Corner Radius)

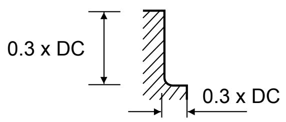
VDI MATERIAL GROUP		Type of cut		Size (mm)							
				2.0	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**
N	30	SIDE CUTTING	v_c (m/min)	250	375	505	630	755	805	815	790
			n	40000	40000	40000	40000	40000	32000	26000	21000
			f_z	0.025	0.035	0.05	0.06	0.07	0.088	0.110	0.130
			f (mm/min)	3000	4200	6000	7200	8400	8400	8600	8200



▶ The feed rate for long series and long necked tools should be reduced by up to 50%

110333 (4 Flute Corner Radius)

VDI MATERIAL GROUP		Type of cut		Size (mm)			
				6.0	**8.0**	**10.0**	**12.0**
N	30	SLOTTING	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 feed rate for long series and long necked tools should be reduced by up to 50%

P 1-5	P 6-9	P 10-11	M 12, 13	M 14	K 15-16	K 17-20	N 21-25	N 26-28	N 29.1	N 29.2	N 30	S 31-35	S 36-37	H 38-39	Code	Item	Description	Page No.
															2-FLUTE END MILLS			
●	●	○	●	●	●	●									100140		Short Length ø3.0mm - 25.0mm	P.306
●	●	○	●	●	●	●									101140		Long Length ø3.0mm - 25.0mm	P.307
●	●	○	●	●	●	●									112140		Short Length Ball Nose ø3.0mm - 25.0mm	P.308
●	●	○	●	●	●	●									114140		Long Length Ball Nose ø3.0mm - 25.0mm	P.309
															3-FLUTE END MILLS			
●	●	○	●	●	●	●									103140		Short Length ø3.0mm - 25.0mm	P.310
●	●	○	●	●	●	●									104140		Long Length ø3.0mm - 25.0mm	P.311
															4-FLUTE END MILLS			
●	●	○	●	●	●	●									107140		Short Length ø3.0mm - 25.0mm	P.312
●	●	○	●	●	●	●									108140		Long Length ø3.0mm - 25.0mm	P.313
															ROUGHING END MILLS			
●	●	○	●	●	●	●						○			190140		Short Length Fine Pitch ø6.0mm - 25.0mm	P.314
●	●	○	●	●	●	●						○			191140		Long Length Fine Pitch ø6.0mm - 25.0mm	P.315
●	●	○	●	●	●	●									121240		Extended Neck Fine Pitch 45º Helix ø4.0mm - 25.0mm	P.316
●	●	○	●	●	●	●									118140		Short Length Coarse Pitch ø6.0mm - 25.0mm	P.317
●	●	○	●	●	●	●									119140		Long Length Coarse Pitch ø6.0mm - 25.0mm	P.318
●	●	○	●	●	●	●									192140		Extended Neck Coarse Pitch ø10.0mm - 25.0mm	P.319
																	Cutting Data	P.321

MACHINING GUIDE

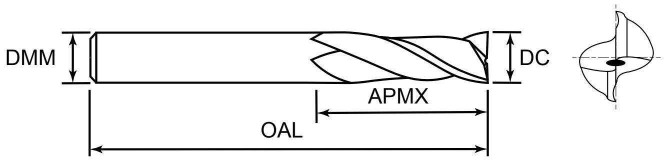
▸ For material group examples, refer to page 4
▸ For full material group tables, refer to pages 334-347

SHORT LENGTH

HSS PM | ZEFP 2 | FHA 30° | DIN 1835B

Series No. 100140

▶ cutting conditions : p.322



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1001400300	**3.0**	6	5.0	49
1001400400	**4.0**	6	7.0	51
1001400500	**5.0**	6	8.0	52
1001400600	**6.0**	6	8.0	52
1001400800	**8.0**	8	11.0	61
1001401000	**10.0**	10	13.0	63
1001401200	**12.0**	12	16.0	73
1001401600	**16.0**	16	19.0	79
1001402000	**20.0**	20	22.0	88
1001402500	**25.0**	25	26.0	102

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	-0.020 / -0.038	h6
8.0, 10.0	-0.025 / -0.047	
12.0, 16.0	-0.032 / -0.059	
20.0, 25.0	-0.040 / -0.073	

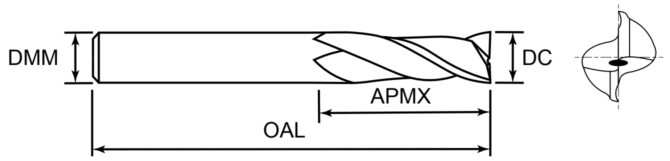
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

LONG LENGTH

HSS PM | ZEFP 2 | FHA 30° | DIN 1835B

Series No. 101140

▶ cutting conditions : p.322



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

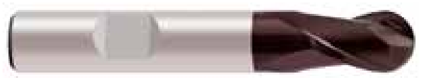
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1011400300	**3.0**	6	8.0	52
1011400400	**4.0**	6	11.0	55
1011400500	**5.0**	6	13.0	57
1011400600	**6.0**	6	13.0	57
1011400800	**8.0**	8	19.0	69
1011401000	**10.0**	10	22.0	72
1011401200	**12.0**	12	26.0	83
1011401600	**16.0**	16	32.0	92
1011402000	**20.0**	20	38.0	104
1011402500	**25.0**	25	45.0	121

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	-0.020 / -0.038	h6
8.0, 10.0	-0.025 / -0.047	
12.0, 16.0	-0.032 / -0.059	
20.0, 25.0	-0.040 / -0.073	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

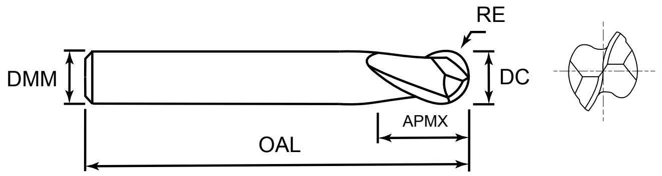
SHORT LENGTH BALL NOSE

HSS PM | ZEFP 2 | FHA 30° | DIN 1835B



Series No. 112140

▶ cutting conditions : p.323



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1121400300	**3.0**	1.5	6	5.0	49
1121400400	**4.0**	2.0	6	7.0	51
1121400500	**5.0**	2.5	6	8.0	52
1121400600	**6.0**	3.0	6	8.0	52
1121400800	**8.0**	4.0	8	11.0	61
1121401000	**10.0**	5.0	10	13.0	63
1121401200	**12.0**	6.0	12	16.0	73
1121401600	**16.0**	8.0	16	19.0	79
1121402000	**20.0**	10.0	20	22.0	88
1121402500	**25.0**	12.5	25	26.0	102

Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
	RETOLL	**RETOLU**	
0.00 / -0.03	-0.020	+0.020	h6

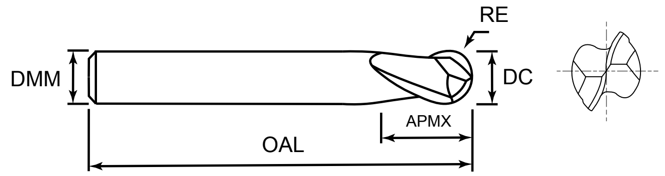
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

LONG LENGTH BALL NOSE

HSS PM | ZEFP 2 | FHA 30° | DIN 1835B

Series No.114140

▶ cutting conditions : p.323



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1141400300	**3.0**	6	8.0	56
1141400400	**4.0**	6	11.0	63
1141400500	**5.0**	6	13.0	68
1141400600	**6.0**	6	13.0	68
1141400800	**8.0**	8	19.0	88
1141401000	**10.0**	10	22.0	95
1141401200	**12.0**	12	26.0	110
1141401600	**16.0**	16	32.0	123
1141402000	**20.0**	20	38.0	141
1141402500	**25.0**	25	45.0	166

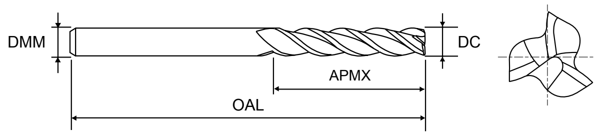
Mill Dia. Tolerance **TCDC**(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance **TCDMM**
	RETOLL	**RETOLU**	
0.00 / -0.03	-0.020	+0.020	h6

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

HSS PM | ZEFP 3 | FHA 30° | DIN 1835B

Series No. 103140

▶ cutting conditions : p.324-325



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1031400300	**3.0**	6	5.0	49
1031400400	**4.0**	6	7.0	51
1031400500	**5.0**	6	8.0	52
1031400600	**6.0**	6	8.0	52
1031400800	**8.0**	8	11.0	61
1031401000	**10.0**	10	13.0	63
1031401200	**12.0**	12	16.0	73
1031401600	**16.0**	16	19.0	79
1031402000	**20.0**	20	22.0	88
1031402500	**25.0**	25	26.0	102

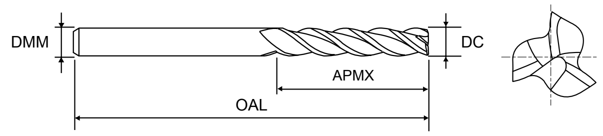
Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	-0.020 / -0.038	h6
8.0, 10.0	-0.025 / -0.047	
12.0, 16.0	-0.032 / -0.059	
20.0, 25.0	-0.040 / -0.073	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

HSS PM | ZEFP 3 | FHA 30° | DIN 1835B

Series No.104140

▶ cutting conditions : p.324-325



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

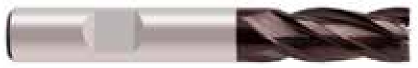
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1041400300	**3.0**	6	8.0	52
1041400400	**4.0**	6	11.0	55
1041400500	**5.0**	6	13.0	57
1041400600	**6.0**	6	13.0	57
1041400800	**8.0**	8	19.0	69
1041401000	**10.0**	10	22.0	72
1041401200	**12.0**	12	26.0	83
1041401600	**16.0**	16	32.0	92
1041402000	**20.0**	20	38.0	104
1041402500	**25.0**	25	45.0	121

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
3.0 - 6.0	-0.020 / -0.038	h6
8.0, 10.0	-0.025 / -0.047	
12.0, 16.0	-0.032 / -0.059	
20.0, 25.0	-0.040 / -0.073	

ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

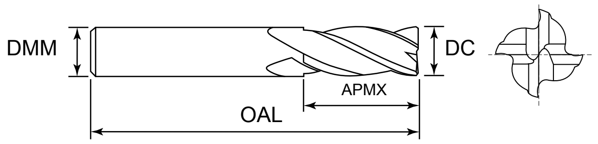
SHORT LENGTH

HSS PM | ZEFP 4 | FHA 30° | DIN 1835B



Series No. 107140

▶ cutting conditions : p.326



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1071400300	**3.0**	6	8.0	52
1071400400	**4.0**	6	11.0	55
1071400500	**5.0**	6	13.0	57
1071400600	**6.0**	6	13.0	57
1071400800	**8.0**	8	19.0	69
1071401000	**10.0**	10	22.0	72
1071401200	**12.0**	12	26.0	83
1071401600	**16.0**	16	32.0	92
1071402000	**20.0**	20	38.0	104
1071402500	**25.0**	25	45.0	121

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

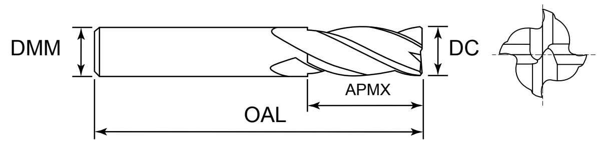
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

LONG LENGTH

HSS PM | ZEFP 4 | FHA 30° | DIN 1835B

Series No.108140

▶ cutting conditions : p.326



Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**
1081400300	**3.0**	6	12.0	56
1081400400	**4.0**	6	19.0	63
1081400500	**5.0**	6	24.0	68
1081400600	**6.0**	6	24.0	68
1081400800	**8.0**	8	38.0	88
1081401000	**10.0**	10	45.0	955
1081401200	**12.0**	12	53.0	110
1081401600	**16.0**	16	63.0	123
1081402000	**20.0**	20	75.0	141
1081402500	**25.0**	25	90.0	166

Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

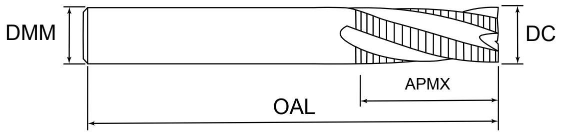
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●								

SHORT LENGTH FINE PITCH

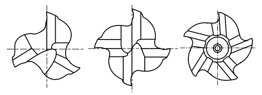
HSS PM | ZEFP 3 | ZEFP 4 | ZEFP 5 | KCH 45° | FHA 30° | DIN 1835B | ≤ø20 | >ø20 | FINE

Series No. 190140

▶ cutting conditions : p.328



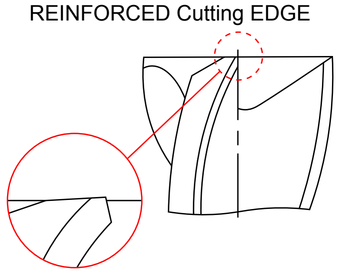
Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.



EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**	CHAMFER WIDTH **CHW**
1901400600	**6.0**	6	13.0	57	3	0.18
1901400700	**7.0**	10	16.0	66	3	0.18
1901400800	**8.0**	10	19.0	69	3	0.18
1901400900	**9.0**	10	19.0	69	3	0.18
1901401000	**10.0**	10	22.0	72	4	0.18
1901401200	**12.0**	12	26.0	83	4	0.18
1901401400	**14.0**	12	26.0	83	4	0.25
1901401600	**16.0**	16	32.0	92	4	0.25
1901401800	**18.0**	16	32.0	92	4	0.25
1901402000	**20.0**	20	38.0	104	4	0.25
1901402200	**22.0**	20	38.0	104	5	0.36
1901402500	**25.0**	25	45.0	121	5	0.36

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
6.0	+0.060 / -0.060	h6
7.0 - 10.0	+0.075 / -0.075	
12.0 - 16.0	+0.090 / -0.090	
18.0 - 25.0	+0.105 / -0.105	

REINFORCED Cutting EDGE



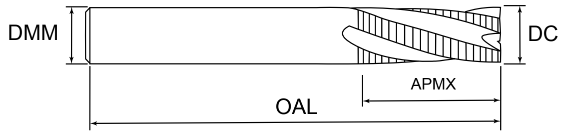
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●						○		

LONG LENGTH FINE PITCH

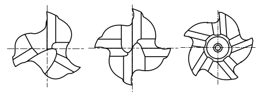
HSS PM | ZEFP 3 | ZEFP 4 | ZEFP 5 | KCH 45° | FHA 30° | DIN 1835B | ≤ø20 | >ø20 | FINE

Series No.191140

▶ cutting conditions : p.328



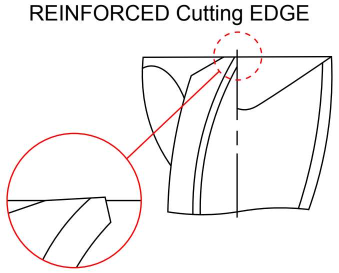
Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.



EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	OVERALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**	CHAMFER WIDTH **CHW**
1911400600	**6.0**	6	24.0	68	3	0.18
1911400700	**7.0**	10	30.0	80	3	0.18
1911400800	**8.0**	10	38.0	88	3	0.18
1911400900	**9.0**	10	38.0	88	3	0.18
1911401000	**10.0**	10	45.0	92	4	0.18
1911401200	**12.0**	12	53.0	110	4	0.18
1911401400	**14.0**	12	53.0	110	4	0.25
1911401600	**16.0**	16	63.0	123	4	0.25
1911401800	**18.0**	16	63.0	123	4	0.25
1911402000	**20.0**	20	75.0	141	4	0.25
1911402200	**22.0**	20	75.0	141	5	0.36
1911402500	**25.0**	25	90.0	168	5	0.36

Mill Dia. **DC**	Mill Dia. Tolerance **TCDC**(mm)	Shank Dia. Tolerance **TCDMM**
6.0	+0.060 / -0.060	h6
7.0 - 10.0	+0.075 / -0.075	
12.0 - 16.0	+0.090 / -0.090	
18.0 - 25.0	+0.105 / -0.105	

REINFORCED Cutting EDGE

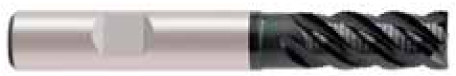


ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●						○		

EXTENDED NECK FINE PITCH

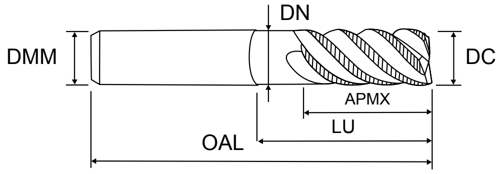
HSS PM | ZEFP 4 | ZEFP 5 | ZEFP 6 | KCH 45° | FHA 45° | DIN 1835B | NECK | FINE

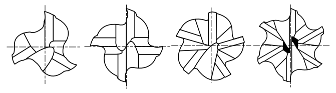
Series No. 121240



▶ cutting conditions : p.328

Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.

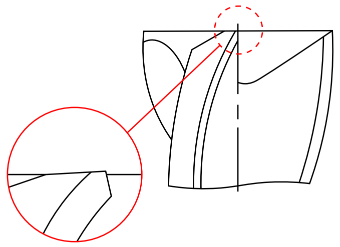




EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN	NO. OF FLUTES ZEFP	CHAMFER WIDTH CHW
1212400400	**4.0**	6	11.0	-	57	-	3	0.10
1212400500	**5.0**	6	13.0	-	57	-	4	0.13
1212400600	**6.0**	6	13.0	-	57	-	4	0.15
1212400800	**8.0**	10	19.0	-	69	-	4	0.18
1212401000	**10.0**	10	22.0	31.0	72	9.5	4	0.20
1212401200	**12.0**	12	26.0	37.0	83	11.5	4	0.20
1212401400	**14.0**	12	26.0	-	83	-	5	0.20
1212401600	**16.0**	16	32.0	44.0	92	15.0	5	0.20
1212401800	**18.0**	20	38.0	-	104	-	6	0.20
1212402000	**20.0**	20	38.0	54.0	104	19.0	6	0.20
1212402500	**25.0**	25	45.0	63.0	121	24.0	6	0.20

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0	+0.060 / -0.060	h6
8.0, 10.0	+0.075 / -0.075	
12.0, 16.0	+0.090 / -0.090	
20.0, 25.0	+0.105 / -0.105	

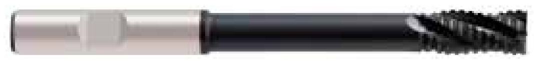
REINFORCED Cutting EDGE



ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●						○		

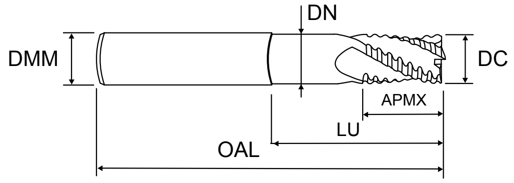
EXTENDED NECK COARSE PITCH

HSS PM | ZEFP 3 | ZEFP 4 | ZEFP 5 | KCH 45° | FHA 30° | DIN 1835B | NECK | COARSE



Series No.192140

▶ cutting conditions : p.327



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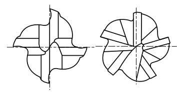
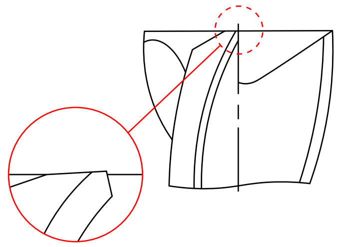


EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN	NO. OF FLUTES ZEFP	CHAMFER WIDTH CHW
1921401000	**10.0**	10	22.0	69.0	110	8.5	4	0.34
1921401200	**12.0**	12	26.0	78.0	125	10.5	4	0.50
1921401600	**16.0**	16	32.0	87.0	138	14.0	4	0.55
1921402000	**20.0**	20	38.0	108.0	160	18.0	5	0.55
1921402500	**25.0**	25	45.0	155.0	216	23.0	5	0.55

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0	+0.060 / -0.060	h6
8.0, 10.0	+0.075 / -0.075	
12.0, 16.0	+0.090 / -0.090	
20.0, 25.0	+0.105 / -0.105	

REINFORCED Cutting EDGE



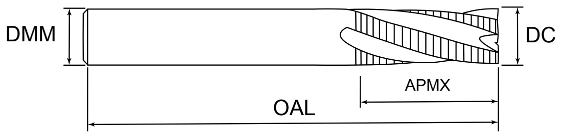
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●						○		

SHORT LENGTH COARSE PITCH

HSS PM | ZEFP 3 | ZEFP 4 | ZEFP 5 | KCH 45° | FHA 30° | DIN 1835B | ≤ø20 | >ø20 | COARSE

Series No. 118140

▶ cutting conditions : p.329



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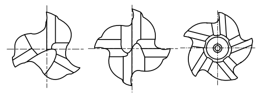
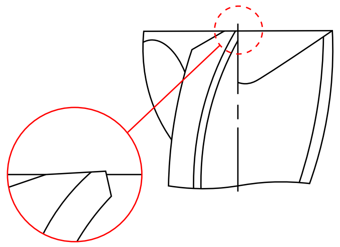
Suitable for use on difficult to cut materials.



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP	CHAMFER WIDTH CHW
1181400600	**6.0**	6	13.0	57	3	0.25
1181400800	**8.0**	10	19.0	69	3	0.25
1181401000	**10.0**	10	22.0	72	4	0.36
1181401200	**12.0**	12	26.0	83	4	0.50
1181401600	**16.0**	16	32.0	92	4	0.55
1181402000	**20.0**	20	38.0	104	4	0.55
1181402500	**25.0**	25	45.0	121	5	0.55

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0	+0.060 / -0.060	h6
8.0, 10.0	+0.075 / -0.075	
12.0, 16.0	+0.090 / -0.090	
20.0, 25.0	+0.105 / -0.105	

REINFORCED Cutting EDGE



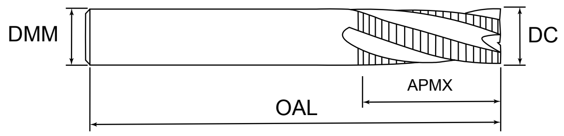
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●						○		

LONG LENGTH COARSE PITCH

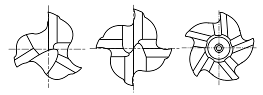
HSS PM | ZEFP 3 | ZEFP 4 | ZEFP 5 | KCH 45° | FHA 30° | DIN 1835B | ≤ø20 | >ø20 | COARSE

Series No.119140

▶ cutting conditions : p.329



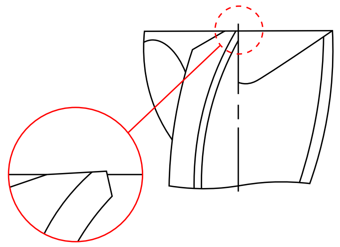
Newly developed Sabre coating for increased wear resistance at high speeds.
Designed for steels, stainless steels and cast iron.
Suitable for use on difficult to cut materials.



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP	CHAMFER WIDTH CHW
1191400600	**6.0**	6	24.0	68	3	0.25
1191400800	**8.0**	10	38.0	88	3	0.25
1191401000	**10.0**	10	45.0	92	4	0.36
1191401200	**12.0**	12	53.0	110	4	0.50
1191401600	**16.0**	16	63.0	123	4	0.55
1191402000	**20.0**	20	75.0	141	4	0.55
1191402500	**25.0**	25	90.0	168	5	0.55

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0	+0.060 / -0.060	h6
8.0, 10.0	+0.075 / -0.075	
12.0, 16.0	+0.090 / -0.090	
20.0, 25.0	+0.105 / -0.105	

REINFORCED Cutting EDGE



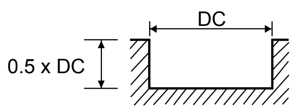
ISO	P			M		K		N					S		H
VDI	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39
EMG	11-12	13-14	15	21-22	23	31-32	33-34	71-74	61-64	81-82	83	84	51-53	41-43	16
● Excellent ○ Good	●	●	○	●	●	●	●						○		

SABRE

CUTTING DATA

100140, 101140 (2 Flute)

VDI 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	1-5	< 20	v_c (m/min)	40	45	50	55	55	55	55	60	50	50
			n	4100	3600	3250	2900	2200	1800	1450	1150	780	630
			f_z	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.085	0.106	0.111
			f (mm/min)	135	175	2000	210	240	265	240	195	165	140
	6-9	20-30	v_c (m/min)	30	40	40	45	45	45	45	45	45	40
			n	3350	3150	2600	2300	1800	1450	1150	890	700	490
			f_z	0.017	0.025	0.036	0.041	0.056	0.079	0.091	0.101	0.107	0.117
			f (mm/min)	115	160	185	190	200	230	210	180	150	115
	10-11	30-40	v_c (m/min)	45	55	60	65	65	65	70	70	60	60
			n	5000	4300	3900	3500	2600	2100	1800	1350	950	750
			f_z	0.016	0.027	0.033	0.038	0.053	0.071	0.076	0.098	0.116	0.103
			f (mm/min)	160	230	255	265	275	300	275	265	220	155
M	12, 13		v_c (m/min)	40	45	50	55	55	55	55	60	50	50
			n	4100	3600	3250	2900	2200	1800	1450	1150	780	630
			f_z	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.085	0.106	0.111
			f (mm/min)	135	175	200	210	240	265	240	195	165	140
K	15-20		v_c (m/min)	40	45	50	55	55	55	55	60	50	50
			n	4100	3600	3250	2900	2200	1800	1450	1150	780	630
			f_z	0.016	0.024	0.031	0.036	0.055	0.074	0.083	0.085	0.106	0.111
			f (mm/min)	135	175	200	210	240	265	240	195	165	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: $n = \frac{v_c * 1000}{\pi * ø}$

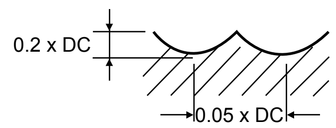
To calculate cutting speed from RPM: $v_c = \frac{n * \pi * ø}{1000}$

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.

CUTTING DATA

112140, 114140 (2 Flute Ball Nose)

VDI 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	1-5	< 20	v_c (m/min)	55	60	60	65	65	65	70	65	65	60
			n	5800	4620	3820	3500	2600	2100	1800	1300	1000	740
			f_z	0.02	0.031	0.038	0.046	0.067	0.0.95	0.097	0.123	0.14	0.142
			f (mm/min)	230	290	295	320	350	400	350	320	280	210
	6-9	20-30	v_c (m/min)	35	40	40	45	45	45	45	45	45	35
			n	3900	3000	2550	2300	1800	1400	1200	890	680	470
			f_z	0.016	0.027	0.033	0.039	0.056	0.082	0.083	0.101	0.11	0.122
			f (mm/min)	125	160	170	180	200	230	200	180	150	115
	10-11	30-40	v_c (m/min)	20	20	20	25	20	20	20	20	25	20
			n	2000	1600	1280	1200	890	680	580	440	360	250
			f_z	0.014	0.023	0.03	0.035	0.048	0.075	0.073	0.091	0.097	0.104
			f (mm/min)	55	75	76	85	85	102	85	80	70	52
M	12, 13		v_c (m/min)	20	20	20	25	25	25	25	25	25	20
			n	2200	1600	1280	1320	980	750	640	490	400	275
			f_z	0.014	0.023	0.03	0.036	0.048	0.073	0.074	0.092	0.1	0.1
			f (mm/min)	60	75	76	95	95	110	95	90	80	55
K	15-20		v_c (m/min)	55	60	60	65	65	65	70	65	65	60
			n	5800	4620	3820	3500	2600	2100	1800	1300	1000	740
			f_z	0.02	0.031	0.038	0.046	0.067	0.095	0.097	0.123	0.14	0.142
			f (mm/min)	230	290	290	320	350	400	350	320	280	210



▶ 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

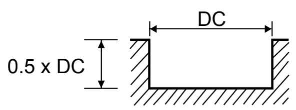
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

103140, 104140 (3 Flute) SLOTTING

VDI 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	1-5	< 20	v_c (m/min)	35	45	50	55	55	55	55	60	50	50
			n	3900	3600	3200	2800	2200	180	1450	1150	790	630
			f_z	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.061	0.08	0.111
			f (mm/min)	85	115	130	190	210	210	230	210	190	210
	6-9	20-30	v_c (m/min)	30	40	40	45	45	45	45	45	45	40
			n	3350	3000	2600	2300	1800	1400	1200	890	700	490
			f_z	0.005	0.009	0.012	0.02	0.028	0.038	0.047	0.056	0.067	0.109
			f (mm/min)	52	80	92	140	150	160	170	150	140	160
	10-11	30-40	v_c (m/min)	20	25	25	25	30	30	30	30	30	30
			n	2200	1900	1700	1450	1150	890	740	560	440	360
			f_z	0.007	0.009	0.012	0.021	0.03	0.043	0.052	0.061	0.07	0.094
			f (mm/min)	45	52	62	92	102	115	115	102	92	102
M	12, 13		v_c (m/min)	15	20	20	20	20	20	20	20	25	20
			n	1800	1500	1300	1100	890	680	580	440	360	250
			f_z	0.008	0.012	0.014	0.023	0.032	0.045	0.053	0.064	0.074	0.113
			f (mm/min)	45	55	55	75	85	92	92	85	80	85
K	15-20		v_c (m/min)	35	45	50	55	55	55	55	60	50	50
			n	3900	3600	3200	2800	2200	1800	1450	1150	790	630
			f_z	0.007	0.011	0.014	0.023	0.032	0.039	0.053	0.061	0.08	0.111
			f (mm/min)	85	115	130	190	210	210	230	210	190	210



▶ 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

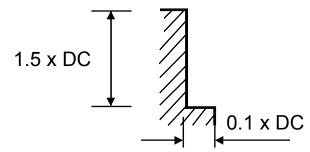
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

103140, 104140 (3 Flute) SIDE CUTTING

VDI 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	1-5	< 20	v_c (m/min)	45	55	65	70	65	65	70	65	65	65
			n	4800	4400	4000	3600	2600	2100	1800	1300	1050	840
			f_z	0.008	0.012	0.015	0.023	0.035	0.046	0.056	0.071	0.081	0.109
			f (mm/min)	120	1555	175	250	270	290	300	275	255	275
	6-9	20-30	v_c (m/min)	35	45	45	50	50	50	55	50	50	50
			n	3800	3500	2900	2600	2000	1600	1400	1000	780	630
			f_z	0.007	0.01	0.014	0.024	0.033	0.044	0055	0.067	0.081	0.111
			f (mm/min)	75	110	125	190	200	210	230	200	190	210
	10-11	30-40	v_c (m/min)	25	30	30	35	35	30	35	35	35	35
			n	2700	2300	2000	1800	1300	1000	900	6606	520	420
			f_z	0.008	0.011	0.014	0.023	0.036	0.050	0.056	0.071	0.08	0.107
			f (mm/min)	65	75	85	125	140	150	150	140	125	135
M	12, 13		v_c (m/min)	20	25	25	30	30	30	30	30	30	30
			n	2200	1900	1700	1500	1100	890	740	550	440	360
			f_z	0.01	0.013	0.015	0.022	0.035	0.047	0.056	0.07	0.083	0.111
			f (mm/min)	65	75	75	100	115	125	125	115	110	120
K	15-20		v_c (m/min)	45	55	65	70	65	65	70	65	65	65
			n	4800	4400	4000	3600	2600	2100	1800	1300	1050	840
			f_z	0.008	0.012	0.015	0.023	0.035	0.045	0.056	0.071	0.081	0.109
			f (mm/min)	120	155	175	250	270	290	300	275	255	275



▶ 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

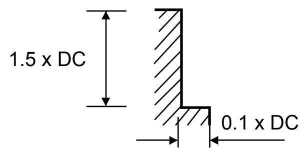
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

107140, 108140 (4 Flute) **SIDE CUTTING**

VDI 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	1-5	< 20	v_c (m/min)	55	60	65	70	65	65	70	70	65	65
			n	6000	4700	400	3600	2600	2100	1800	1400	1050	840
			f_z	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.077	0.088	0.091
			f (mm/min)	350	400	420	450	480	530	480	430	370	305
	6-9	20-30	v_c (m/min)	40	45	45	50	50	50	55	50	50	50
			n	4400	3600	2900	2600	2000	1600	1400	1000	780	630
			f_z	0.014	0.021	0.028	0.032	0.046	0.059	0.066	0.085	0.088	0.091
			f (mm/min)	250	300	320	330	370	380	370	340	275	230
	10-11	30-40	v_c (m/min)	25	30	30	35	35	30	35	35	35	35
			n	2700	2300	2000	1800	1400	1000	890	680	530	420
			f_z	0.017	0.022	0.028	0.032	0.043	0.066	0.067	0.081	0.083	0.089
			f (mm/min)	180	200	220	230	240	265	240	220	175	150
M	12, 13		v_c (m/min)	25	25	25	25	30	30	25	30	30	30
			n	2400	2000	1700	1450	1150	890	720	550	440	360
			f_z	0.013	0.019	0.024	0.031	0.04	0.056	0.064	0.075	0.080	0.087
			f (mm/min)	125	150	160	180	185	200	185	165	140	125
K	15-20		v_c (m/min)	55	60	650	70	65	65	70	70	65	65
			n	6000	4700	4000	3600	2600	2100	1800	1400	1050	840
			f_z	0.015	0.021	0.026	0.031	0.046	0.063	0.067	0.077	0.088	0.091
			f (mm/min)	350	400	420	450	480	530	480	430	370	305



▶ 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

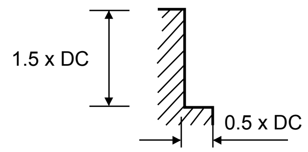
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

192140 (Multiflute Rougher, Extended Neck, Coarse Pitch)

VDI MATERIAL GROUP		HRc		Size (mm) 10.0	12.0	16.0	20.0	25.0
P	1-5	< 20	v_c (m/min)	47	47	47	47	47
			n	1500	1200	950	760	600
			f_z	0.045	0.058	0.074	0.092	0.09
			f (mm/min)	270	280	280	280	270
	6-9	20-30	v_c (m/min)	33	33	33	33	33
			n	1050	900	660	530	420
			f_z	0.039	0.054	0.074	0.092	0.088
			f (mm/min)	165	195	195	195	185
	10-11	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	12, 13		v_c (m/min)	30	30	30	30	30
			n	950	800	600	480	390
			f_z	0.038	0.055	0.073	0.091	0.087
			f (mm/min)	145	175	175	175	170
K	15-20		v_c (m/min)	47	47	47	47	47
			n	1500	1200	950	760	600
			f_z	0.045	0.058	0.074	0.092	0.09
			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

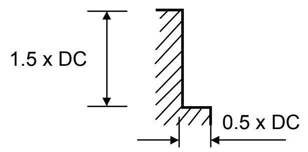
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

190140, 191140, 121240 (Multiflute Rougher, Fine Pitch)

VDI 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	1-5	< 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
			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
	6-9	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
			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
	10-11	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	12, 13		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
			f_z	0.019	0.029	0.045	0.064	0.059	0.068	0.062	0.071	0.079	0.085
			f (mm/min)	110	140	170	205	205	205	205	205	205	200
K	15-20		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
			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
S	31-35		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
			f_z	0.018	0.028	0.042	0.061	0.055	0.066	0.06	0.069	0.077	0.082
			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

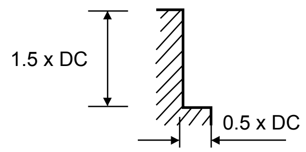
To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * ø}$

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.

118140, 119140 (Multiflute Rougher, Coarse Pitch)

VDI 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	1-5	< 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
			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
	6-9	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
			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
	10-11	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	12, 13		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
			f_z	0.019	0.029	0.045	0.064	0.059	0.068	0.062	0.071	0.079	0.085
			f (mm/min)	110	140	170	205	205	205	205	205	205	200
K	15-20		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
			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



▶ 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.

INFORMATION

- GENERAL INFORMATION
- MILLING FORMULAE
- TROUBLESHOOTING
- MATERIAL CHARTS

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

Milling Formulae

SPINDLE SPEED (n)	CUTTING SPEED (v_c)	TABLE FEED RATE (v_f)
$n = \frac{v_c \times 1000}{\pi \times D_c}$ (rev/min)	$v_c = \frac{D_c \times \pi \times n}{1000}$ (m/min)	$v_f = f_z \times z_n \times n$ (mm/min)

FEED PER TOOTH (f_z)	POWER CONSUMPTION (P_c)	METAL REMOVAL RATE (Q)
$f_z = \frac{v_f}{n \times z_n}$ (mm)	$P_c = \frac{a_p \times a_e \times v_f \times k_c}{60 \times 10^6}$ (kW)	$Q = \frac{a_p \times a_e \times v_f}{1000}$ (cm^3/min)

TORQUE (M_c)
$M_c = \frac{P_c \times 30 \times 10^3}{\pi \times n}$ (Nm)

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

P — VDI 3323 1 — Non-alloyed steel — About 0.15% C, Annealed — ≤125 HB

W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0037	St 37-2		4360 40 B	S235JR	E24-2	1311	Fe 360 B		
1.0038	St 37-3	A570.36	4360 40 C	S275J2G3	E28-3	1312	Fe 360 D FF		
1.0045	S 355 JR			S 1207	E36-2		Fe 510 BFN		
1.0050	St 50-2	A570 Gr. 50	4360 50 B	E 295	A50-2	2172	Fe 490		
1.0060	St 60-2	A572 Gr. 65	4360 55 E		A60-2	1650	Fe 60-2		
1.0114	S 235 J0		En 40C	S 235 J0	E24-3		Fe 360 CFN		
1.0143	S 275 J0			S 275 J0	E28-3	1414	Fe 430 C		
1.0144	St 44-3 N	A573 Gr. 81	4360 43C	S 275 J2 G3	E28-3	1412	Fe 430 D FF		
1.0149	Ro St 44-2		43C	S 275 J0 H		1412	Fe430C		
1.0301	C10	1010	045M10	C10	34C10, XC10		C10	F.1511	G10100
1.0330	St 12		DC 01	Fe P01	DC 01/Fe P01	1142	Fe P01		
1.0335	DD13 (StW 24)	A622(1008)	H S 3	D D 13	3C		FeP13		
1.0338	St 4	A620(1008)	14491CR	Fe P04	Fe 14	1147	DC04/FeP04		
1.0345	P235 GH	A516 Gr. 65	P 235 GH	P 235 GH	A 37 CP	1330	Fe E 235		K02503
1.0401	C15	1015	080M15		C18RR, XC18	1350	C15, C16	F.1110	G10170
1.0402	C22	1020	050 A 20	1 C 22	C20	1450	C 20	F.1120	G10200
1.0425	P265GH/H11				A42CP	1430	Fe4101KW		K02801
1.0443	GS-45	A2765-35	A1		E23-45M	1305			
1.0539	S355NH				TSE355-4	2134	Fe510B		
1.0545	S355N		4360-50E		E355R	2334	FeE355KG		
1.0546	S355NL		4360-50EE		E355FP	2135	FeE355KT		
1.0547	S355J0H		4360-50C		TSE355-3	2172	Fe510C		
1.0549	S355NLH					2135	Fe510D		
1.0533	St52-3U	A14880-10	4360-50C		320-560M	1606	Fe510C		
1.0562	StE355	A633 Gr.C	P355N		FeE355KGN	2132	FeE355KG		K12000
1.0565	WStE355		P355NH		P355NH	2106	FeE355KGW		K01600
1.0566	T St E 355		P 355 NL1		P 355 NL1	2107	Fe E 355 KT		
1.0570	St 52-3	1	4360-50 C	S355JR	E36-3	2172	Fe 510 B		
1.0715	9SMn28	1213	230M07		S250	1912	CFSMn28	F.2111	G12130
1.0718	9SMnPb28	12L13			S250Pb	1914	CF9SMnPb28	F.2112	G12134
1.0721	10S20	1108	10S20		10S20		CF10S20	F.2121	G11080
1.0722	10SPb20	11L08			10PbF2		CF10SPb20		G11084
1.0736	9SMn36	1215			S300		CF9Mn36	F.2113	G12150
1.0737	9SMnPb36	12L14			S300Pb	1926	CF9SMnPb36	F.2114	G12144
1.0972	S315MC		1501-40F30		E315D				
1.0976	S355MC		1501-43F35		E355D	2642	FeE355TM		
1.0982	S460MC		1501-50F45						
1.0984	S500MC				E490D	2662	FeE490TM		
1.0986	S500MC		1501-60F55		E560D		FeE560TM		
1.1121	Ck10	1010	040A10		XC10	1265	C10	F.1510	G10100
1.1141	Ck15	1015	040A15	32C	XC15	1370	C15	F.1110	G10150
1.1151	C22E	1020	055M15		2C22	1450	C20	F.1120	G10230
1.8900	StE380	A572-60	436055E			2145	FeE390KG		
	St44-2	A36	436043A		NFA35-501E28	1411			
	StE320-3Z		1501160			1421			

MATERIAL CHARTS

P — VDI 3323 2 — Non-alloyed steel — About 0.45% C, Annealed — ≤13 HRc ≤190 HB

W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0501	C35	1035	080A32		1C35	1572	C35	F.113	G10350
1.0503	C45	1045	060A47		XC42H1TS	1672	C45	F.114	G10450
1.0511	C40	1040	080M40		1C40		C40	F.114.A	G10400
1.0540	C50					1674	C50		G10500
1.0551	GS-52	A2770-36	A2		280-480M	1505			
1.0553	St52-3U	A14880-40	4360-50C		320-560M	1606	Fe510C		
1.0577	S 355 J 2 G 4	A738	Fe 510 D 2 FF		A52FP	2107			
1.0726	35S20	1140	212M36	8M	35MF6	1957			G11400
1.0727	45S20	1146			45MF4	1973			G11460
1.1157	40Mn4	1039	150M36	15	40M5				G10390
1.1158	C25E	1025	070M25		XC25		C25	F.1120	G10250
1.1166	34Mn5	1536						TO.B	G15360
1.1167	36Mn5	1335	150M36		40M5	2120	36Mn6	F.1203	G13350
1.1170	28Mn6	1330	150M28	14A	20M5		C28Mn	28Mn6	G13300
1.1178	C30E		080M30		XC32		C30	2C30	G10300
1.1180	C35R	1035	080A35		3C35	1572		F.1135	G10350
1.1181	C35E	1035	080A35		XC38	1572	C36	F.1130	G10340
1.1191	Ck45	1045	080A46		XC45	1672	C45	F.1140	
1.1206	C50E	1050	080M50		2C50	1674	C50		G10500
1.1213	Cf53	1050	070M55		XC48HTS	1674	C53		G10500

VDI 3323 3 — Non-alloyed steel — About 0.45% C, Annealed — ≤25 HRc ≤250 HB

W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0481	17 Mn 4/P 295 GH	A516 Gr. 70	224-460B	P 295 GH	A 48 CP	2102	Fe E 295	A47RCI	K03501
1.0501	C35	1035	080A32		1C35	1572	C35	F.1130	G10350
1.0503	C45	1045	060A47		XC42H1TS	1672	C45	F.1140	G10450
1.0614	C76D	1074			XC75				G10750
1.0616	C86D	1086			XC80		C85		G10860
1.0618	C92D	1095			XC90				G10950
1.0726	35S20	1140	212M36	8M	35MF6	1957			G11400
1.1157	40Mn4	1039	150M36	15	40M5				G10390
1.1165	30Mn5	1036	120M36		35M5		30Mn5	F.8211	K13300
1.1167	36Mn5	1335	150M36		40M5	2120	36Mn6	F.1203	G13350
1.1186	C40E	1040	060A40		2C40		C40		G10400
1.1191	Ck45	1045	080M46		2C45	1672	C45	F.1140	
1.1201	C45R	1049	080M46		3C45	1660	C45	F.1145	
1.1213	Cf53	1050	070M55		XC48HTS	1674	C53		G10500
1.7242	18CrMo4								
1.7337	16CrMo4-4	A387 Gr.12					A18CrMo45KW		K11564
1.7362	12CrMo195		3606-625		Z10CD5-05		16CrMo205		K41545
	17MnV6	A572-60	436055E		NFA35-501E36	2142			

P

VDI 3323 4 — Non-alloyed steel — About 0.75% C, Annealed — ≤28 HRc ≤270 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0603	C67	107	080A67		XC65		C67		G10700
1.0605	C75	1075	144980HS				C75		G10740
1.1203	Ck55	1055	060A57		2C55	1655	C55	F.1150	G10550
1.1209	C55R	1055	070M55		3C55		C55	F.1155	G10550
1.1221	Ck60	1060	060A62	43D	2C60	1678	C60	F.1150	G10640
1.1231	C67E	1070	060A67		XC68	1770	C70	F.5103	G10700
1.1248	C75E	1074	060A78		XC75	1774	C75	F.5107	G10800
1.1269	C85E	1086			XC90		C90		G10900
1.1274	Ck101	1095	060A96	C100S	XC100	1870	C100	F.5117	G10950
1.1545	C105W1	W1	BW2	C105U	Y1105	1880	C100KU	F.5118	
1.1663	C125W	W112			Y2120				

VDI 3323 5 — Non-alloyed steel — About 0.75% C, Quenched & Tempered — ≤32 HRc ≤300 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0070	St70-2	1055	Fe690-2FN		A70-2	1655	Fe690	F.1150	
1.0535	C55	1055	070M55		1C55	1655	C55		J05000
1.0601	C60	1060	060A62	43D	1C60		C60		G10600
1.1203	Ck55	1055	060A57		2C55	1655	C55	F.1150	G10550
1.1221	Ck60	1060	060A62	43D	2C60	1678	C60	F.1150	G10640
1.1274	Ck101	1095	060A96	C100S	XC100	1870	C100	F.5117	G10950
1.1545	C105W1	W1	BW2	C105U	Y1105	1880	C100KU	F.5118	
1.1663	C125W	W112			Y2120				
1.5120	38MnSi4								
1.5710	26NiCr6	3135	640A35	111A	35NC6				
1.7701	51CrMoV4						51CrMoV4		

VDI 3323 6 — Low-alloyed steel — Annealed — ≤10 HRc ≤180 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0116	St37-3	A570Gr.36	4360-40C	S235J2G3	E24-3	1312	Fe360D1(2)	AE235D	
1.0904	55Si7	9255	250A53	45	55S7	2085	55Si8	56Si7	G92550
1.0961	60SiCr7	9262			60SC6		60SiCr8	60SiCr8	G92620
1.2067	100Cr6	L3	BL3		Y100C6			100Cr6	
1.2108	90CrSi5	L1				2092	105WCR5		
1.2210	115CrV3	L2			100C3		107CrV3KU	F.250L	
1.2241	51CrV4								
1.2330	35CrMo4	4135	708A37		34CD4	2234	35CrMo4		
1.2419	105WCr6		105WC13		105WC13	2140	10WCr6		
1.2510	100MnCrW4	01	B01		90MWCV5	2140	95MnWCr5KU	F.5220	
1.2542	45WCrV7	S1	BS1			2710	45WCrV8KU		
1.2550	60WCrV7	S1			55WC20	2710	58WCr9KU		
1.2713	55NiCrMoV6	L6			55NCDV7			F.520S	
1.2721	50NiCr13	L6			55NCV6	2550		F.528	
1.2842	90MnCrV8	02	B02		90MV8				T31502
1.3501	100Cr2	E50100							
1.3505	100Cr6	52100	2S135	31	100C6	2258	100Cr6	F.1310	
1.5024	46Si7				45S7		46Si7	F.1451	

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VDI 3323 6 — Low-alloyed steel — Annealed — ≤10 HRc ≤180 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.5025	51Si7	9259H		50Si7	51S7	2090	50Si7	F.1450	
1.5026	55Si7			56Si7	55S7	2085	55Si7	F.1440	G92550
1.5027	60Si7	9260	251A60	60Si7	60S7		60Si7	F.1441	G92600
1.5028	65Si7	9260H							
1.5415	15Mo3	A204Gr.A	1503-243B		15D3	2912	16Mo3(KG)	F.2601	K11820
1.5419	20Mo4	4419	1503-243-430			2512	G20Mo5		G44190
1.5423	16Mo5	4520	1503-245-420				16Mo5(KG)	F.2602	K11522
1.5622	14Ni6	A350-LF5			16N6		14Ni6(KG)	F.2641	
1.5732	14NiCr10	3415			14NC11		16NiCr11		
1.5752	14NiCr14	3310	655M13	36A	12NC15				
1.6511	36NiCrMo4	9840	816M40	110	40NCD3		36NiCrMo4(KB)		
1.6523	21NiCrMo2	8620	805M20	362	20NCD2	2506	20NiCrMo2		
1.6546	40NiCrMo2-2	8740	311-Type7				40NiCrMo2(KB)		
1.6566	17NiCrMo6-4								
1.6587	17NiCrMo6		820A16		18NCD6		14NiCrMo13		
1.6657	10NiCrMo13-4						14NiCrMo131		
1.7015	10Cr3	5015	523M15		12C3				G50150
1.7033	34Cr4	5132	530A32	18B	32C4		34Cr4(KB)		G51300
1.7035	41Cr4	5140	530M40	18	42C4	2245	41Cr4		G51400
1.7131	16MnCr5	5115	527M17		16MC5	2511	16MnCr5		G51150
1.7139	16MnCrS5					2127			
1.7176	55Cr3	5155	527A60	48	55C3	2253	55Cr3		
1.7218	25CrMo4	4130	CDS110		25CD4	2225	25CrMo4(KB)		
1.7220	34CrMo4	4135	708A37		35CD4	2234	34CrMo4		
1.7223	41CrMo4	4142					41CrMo4		
1.7225	42CrMo4	4140	708M40	42CrMo4	42CD4	2244	42CrMo4	F.1252	
1.7228	55NiCrMoV6G		823M30	33		2512	655M31		
1.7262	15CrMo5				12CD4	2216	12CrMo4		
1.7321	20CrMo4					2625			
1.7335	13CrMo4-4	A182-F11	1501-620		15CD4-5	2216	14CrMo45		
1.7361	32CrMo12		722M24	40B	30CD12	2240	30CrMo12	F.124A	
1.7380	10CrMo9-10	A182-F22	1501-622		12CD9-10	2218	12CrMo9		
1.7715	14MoV6-3		1503-660-440				13MoCrV6		
1.8159	50CrV4	6150	735A50	47	50CrV4	2230	50CrV4		G61500
1.8161	58CrV4								
1.8509	41CrAlMo7	A355A	905M39	41B	40CAD6-12	2940	41CrAlMo7		
1.8523	39CrMoV13-9		897M39	40C			36CrMoV12		

VDI 3323 7 — Low-alloyed steel — Quenched & Tempered — ≤29 HRc ≤275 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.5415	15Mo3	A204Gr.A	1503-243B		15D3	2912	16Mo3(KG)	F.2601	K11820
1.5423	16Mo5	4520	1503-245-420				16Mo5(KG)	F.2602	K11522
1.5622	14Ni6	A350-LF5			16N6		14Ni6(KG)	F.2641	
1.5732	14NiCr10	3415			14NC11		16NiCr11		
1.5752	14NiCr14	3310	655M13	36A	12NC15				
1.5755	31NiCr14		653M31		18NC13	2534		F.1270	

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VDI 3323 7 — Low-alloyed steel — Quenched & Tempered — ≤29 HRc ≤275 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.6565	40NiCrMo6	4340	817M40	24	35NCD6	2541	35NiCrMo6(KB)		
1.6587	17NiCrMo6		820A16		18NCD6		14NiCrMo13		
1.6657	10NiCrMo13-4						14NiCrMo131		
1.6957	26NiCrMoV14-5								
1.7015	10Cr3	5015	523M15		12C3				G50150
1.7262	15CrMo5				12CD4	2216	12CrMo4		
1.7335	13CrMo4-4	A182-F11	1501-620		15CD4-5	2216	14CrMo45		
1.7380	10CrMo9-10	A182-F22	1501-622		12CD9-10	2218	12CrMo9		
1.7715	14MoV6-3		1503-660-440				13CrMoV6		
1.7733	24CrMoV55				20CDV6		21CrMoV511		
1.7755	GS-45CrMoV10-4								
1.8070	21CrMoV511						35NiCr9		

VDI 3323 8 — Low-alloyed steel — Quenched & Tempered — ≤32 HRc ≤300 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.1730	C45W3	C45W			XC48				
1.2332	47CrMo4	4142	708M40	19A	42CD4	2244	42CrMo4		
1.5736	36NiCr10	3435			30NC11				
1.6523	21NiCrMo2	8620	805M20	362	20NCD2	2506	20NiCrMo2		
1.7033	34Cr4	5132	530A32	18B	32C4		34Cr4(KB)		G51300
1.7218	25CrMo4	4130	CDS110		25CD4	2225	25CrMo4(KB)		
1.8515	32CrMo12		722M24	40B	30CD12	2240	32CrMo12	F.124A	

VDI 3323 9 — Low-alloyed steel — Quenched & Tempered — ≤38 HRc ≤350 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0904	55Si7	9255	250A3	45	55S7	2085	55Si8		G92550
1.0961	60SiCr7	9262			60SC6		60SiCr8		G92620
1.2067	100Cr6	L3	BL3		Y100C6		100Cr6		
1.2419	105WCr6		105WC13		105WC13	2140	10WCr6		
1.2542	45WCRV7	S1	BS1			2710	45WCrV8KU		
1.2713	55NiCrMoV6	L6			55NCDV7			F.250S	
1.4882	X50CrMnNiNbN219				Z50CMNNb21-09				
1.5120	38MnSi4								
1.5710	36NiCr6	3135	640A35	111A	35NC6				
1.5755	31NiCr14		830M31		18NC13	2534		F.1270	
1.6511	36CrNiMo4	9840	816M40	110	40NCD3		36NiCrMo4(KB)		
1.6546	40NiCrMo2-2	8740	311-Type7				40NiCrMo2(KB)		
1.7035	41Cr4	5140	530M40	18	42C4	2245	41Cr4		G51400
1.7176	55Cr3	5155	527A60	48	55C3	2253	55Cr3		
1.7220	34CrMo4	4135	708A37		35CD4	2234	34CrMo4		
1.7223	41CrMo4	4142					41CrMo4		
1.7225	42CrMo4	4140	708M40	42CrMo4	42CD4	2244	42CrMo4	F.1252	
1.7361	32CrMo12		722M24	40B	30CD12	2240	30CrMo12	F.124A	

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VDI 3323 9 — Low-alloyed steel — Quenched & Tempered — ≤38 HRc ≤350 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.8159	50CrV4	6150	735A50	47	50CrV4	2230	50CrV4	51CrV4	G61500
1.8161	58CrV4								
1.8509	41CrAiMo7	A355A	905M39	41B	40CAD6-12	2940	41CrAiMo7		
1.8523	39CrMoV13-9		897M39	40C			36CrMoV12		

VDI 3323 10 — High-alloyed steel, Tool steel — Annealed — ≤15 HRc ≤200 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0347	RRSt3	A619	CR3	FeP03	F13	1922	DC03/FeP03		
1.0723	15S22		210A15					F.210F	
1.2080	X210Cr12	D3	BD3	X210Cr12	Z200C12		X205Cr12KU		T30403
1.2162	21MnCr5				20MC5				
1.2311	40CrMnMo7				40CMD8		35CrMo8KU		
1.2312	40CrMnMoS8.6	P20+S			40CMD8S				
1.2316	X36CrMo17			X38CrMo16					
1.2343	X38CrMoV5-1	H11	BH11		Z38CDV5		X37CrMoV51KU		T20811
1.2344	X40CrMoV5-1	H13	BH13		Z40CDV5	2242	X40CrMoV51KU	F.5318	T20813
1.2363	X100CrMoV5-1	A2	BA2		Z100CDV5	2260	X100CrMoV51KU	F.5227	
1.2379	X155CrMoV121	D2	BD2		Z160CDV12	2310	X165CrMoV51KU		T30402
1.2436	X210CrW12	D4(D6)	BD6		Z200CD12	2312	X215CrW121KU	F35213	
1.2510	100MnCrW4	01	B01		90MWCV5	2140	95MnWCr5KU	F.5220	T20821
1.2581	X30WCrV9-3	H21	BH21		Z30WCV9		X30WCrV93KU	F.526	
1.2601	X165CrMoV12					2310	X160CrMoV12		
1.2606	X37CrMoW51	H12	BH12		Z35CWDV5		X35CrMoW5KU	F.537	T20812
1.2764	X19NiCrMo4								
1.2767	X45NiCrMo4				45NCD16		40NiCrMoV8KU		
1.2842	90MnCrV8	02	B02		90MV8		90MnCrV8KU		T31502
1.3243	S6-5-2-5	T15			KCV06-05-05-04-02	2723	HS6-5-2-5		
1.3249	S18-1-2-5	T4	BT4		Z80WKCV18-05-04				
1.3343	S6-5-2	M2	BM2		Z85WDCV	2722	HS652	F.5604	
1.3348	S2-9-2	M7			Z100DCWV09-04-02	2782	HS292	F.5607	
1.3355	S18-0-1	T1	BT1		Z80WCV18-4-01				
1.4718	X45CrSi9-3	HNV3	401S45	52	Z45CS9		X45CrSi8	F.322	
1.5662	X8Ni9	ASMA353	502-650		9Ni		X10Ni9	F.2645	
1.5680	12Ni19	2515	12Ni19		Z18NS				

VDI 3323 11 — High-alloyed steel, Tool steel — Quenched & Tempered — ≤35 HRc ≤325 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.2080	X210Cr12	D3	BD3	X210Cr12	Z200C12		X205Cr12KU		T30403
1.2344	X40CrMoV5-1	H13	BH13		Z40CDV5	2242	X40CrMoV51KU	F.5318	T20813
1.2363	X100CrMoV5-1	A2	BA2		Z100CDV5	2260	X100CrMoV51KU	F.5227	
1.2436	X210CrW12	D4(D6)	BD6		Z200CD12	2312	X215CrW121KU	F.5213	
1.2581	X30WCrV9-3	H21	BH21		Z30WCV9		X30WCrV93KU	F.526	T20821
1.2601	X165CrMoV12					2310	X160CrMoV12		
1.2714	55NiCrMoV7	6F3/L6			55NiCrMoV7			F.520S	
1.3202	S12-1-4-5		BT15				HS12-1-5-5		

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P — VDI 3323 11 — High-alloyed steel, Tool steel — Quenched & Tempered — ≤35 HRc ≤325 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.3207	S10-4-3-10		BT42		Z130WKCDV				
1.3243	S6-5-2-5	T15			KCV06-05-05-04-02	2723	HS6-5-2-5		
1.3246	S7-4-2-5	M35			Z110WKCDV07-05-04		HS7-4-2-5		
1.3247	S2-10-1-8	M42	BM42		Z110WKCDV09-08-04		HS2-9-1-8		
1.3255	S18-1-2-5	T4	BT4		Z80WKCV18-05-04				
1.3343	S6-5-2	M2	BM2		Z85WDCV	2722	HS652	F.5604	
1.3348	S2-9-2	M7			Z100DCWV09-04-02	2782	HS292	F.5607	
1.3355	S18-0-1	T1	BT1		Z80WCV18-4-01				
1.4718	X45CrSi9-3	HNV3	401S45	52	Z45CS9		X45CrSi8	F.322	
1.4935	X20CrMoWV121	422							S42200
1.5680	12Ni19	2515	12Ni19		Z18N5				

M — VDI 3323 12 — Stainless steel — Ferritic/Martensitic, Annealed — ≤15 HRc ≤200 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4000	X6Cr13	403	403S17		Z6C13	2301	X6Cr13	F.3110	S40300
1.4001	X7Cr14	410S	403S7		Z8C13	2301		F.8401	
1.4002	X6CrAl13	405	405S17		Z6CA13	2302	X6CrAl13		S40500
1.4005	X12CrS13	416	416S21		Z11CF13	2380	X12CrS13	F.3411	S41600
1.4006	X12Cr13	410	410S21	56A	Z10C13	2302	X12Cr13	F.3401	S41000
1.4016	X6Cr17	430	430S15	X8Cr17	Z8C17	2320	X8Cr17	F.3113	S43000
1.4027	GX20Cr14		420C29		Z20C13M				
1.4028	X30Cr13	420	420S45		Z30C13	2304			S42020
1.4034	X46Cr13		420S45		Z40C14		X40Cr14	F.3405	
1.4057	X19CrNi17-2	431	431S29	57	Z15CN16-02	2321	X16CrNi16	F.3427	S43100
1.4086	GX120Cr29		452C11						
1.4104	X12CrMoS17	430F	420S37		Z10CF17	2383	X10CrS17	F.3117	S43020
1.4112	X90CrMoV18	440B							S44003
1.4113	X6CrMo17	434	434S17		Z8CD17-01	2325	X8CrMo17		S43400
1.4313	X3CrNi13-4	CA6-NM	425C11		Z4CND13-04M	2385	(G)X6CrNi304		J91540
1.4341	GX40CrNi274								J92615
1.4417	X2CrNoMoSi195	S31500				2376			S39215
1.4418	X4CrNiMo165				Z6CND16-04-01	2387			
1.4510	X6CrTi17	XM8			Z4CT17		X6CrTi17	F.3115	S43035
1.4511	X6CrNb17				Z4CNb17		X6CrNb17	F.3122	
1.4512	X6CrTi12	409	LW19		Z3CT12		X6CrTi12		S40900
1.4720	X20CrMo13								
1.4724	X10CrA113	405	405S17		Z10C13		X10CrA112	F.311	
1.4742	X10CrA118	430	439S15	60	Z10CAS18		X8Cr17	F.3113	S43000
1.4747	X80CrNiSi20	HNV6	443S65	59	Z80CSN20-02		X80CrNiSi20	F.320B	S65006
1.4749	X18CrNi28	446							
1.4762	X10CrA124	446			Z10CAS24	2322	X16Cr26		S44600
1.4871	X53CrMnNi21-9	EV8	349S54		Z52CMN21-09		X53CrMnNi219		S63008
	X10CrNi15	429							
	X12CrNi18-9	302	302S31		Z10CN18-09	2330			

M — VDI 3323 13 — Stainless steel — Martensitic, Quenched & Tempered — ≤23 HRc ≤240 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4000	X6Cr13	403	403S17		Z6C13	2301	X6Cr13	F.3110	S40300
1.4001	X7Cr14	410S	403S7		Z8C13	2301		F8401	
1.4006	X12Cr13	410	410S21	56A	Z10C13	2303	X12Cr13	F3.401	S41000
1.4016	X6Cr17	430	430S15	X8Cr17	Z8C17	2320	X8Cr17	F.3113	S43000
1.4021	X20Cr13	420	420S37		Z20C13	2303	14210	F.5261	S42000
1.4027	GX20Cr14		420C29		Z20C13M				
1.4031	X40Cr13	420			Z40C14	2304		F.3404	S42080
1.4034	X46Cr13		420S45		Z40C14		X40Cr14	F.3405	
1.4057	X19CrNi17-2	431	431S29	57	Z15CN16-02	2321	X16CrNi16	F.3427	S43100
1.4104	X12CrMoS17	430F	420S37		Z10CF17	2383	X10CrS17	F.3117	S43020
1.4113	X6CrMo17	434	434S17		Z8CD17-01	2325	X8CrMo17		S43400
1.4313	X3CrNi13-4	CA6-NM	425C11		Z4CND13-04M	2385	(G)X6CrNi304		J91540
1.4544	A700	321	S.524		Z10CNT18-11		X6CrNiTi1811		J92630
1.4546	X5CrNiNb18-10	348	347S31				X6CrNiNb1811		J92640
1.4871	X53CrMnNi21-9	EV8	349S54		Z52CMN21-09		X53CrMnNi219		S63008
1.4922	X20CrMoV12-1					2317	X20CrMoNi1201		
1.4923	X22CrMoV12-1								

VDI 3323 14 — Stainless steel — Austenitic — ≤10 HRc ≤180 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4301	X5CrNi18-10	304	304S15		Z5CN18-09	2332		F.3551	S30409
1.4305	X10CrNiS18-10	303	303S21	58M	Z8CNF18-09	2346	X10CrNiS1809	F.3508	S30300
1.4306	X2CrNi1911	304L	304C12	X3CrNi1810KD	Z2CN18-09	2352	GX2CrNi1910	F.3503	S30403
1.4308	GX6CrNi18-9	CF-8	304C15	58E	Z6CN18-10M	2333			
1.4310	X10CrNi18-8	301	301S21		Z12CN17-07	2331	X2CrNi1807	F.3517	S30100
1.4311	X2CrNiN1810	304LN	304S62		Z2CN18-10	2371	X2CrNiN1810	F.3541	S30453
1.4312	GX10CrNi188	305	302C25		Z10CN18-9M				
1.4350	X5CrNi18-9	304	304S15	58E	Z6CN18-09	2332	X5CrNi1810	F.3551	S30400
1.4362	X2CrNiN234	S32304			Z2CN23-04AZ	2327			S32304
1.4371	X3CrMnNiN18887	202	284S16		Z8CMN18-08-05				
1.4401	X5CrNiMo17-12-2	316	316S13		Z3CND17-11-01	2347	X5CrNiMo17122	F.3534	S31600
1.4414	X2CrNiMo17-13-2	316L	316S11		Z2CND17-12	2348	X2CrNiMo1712	F.3533	S31603
1.4406	X2CrNiMo17-12-2	316LN	316S61		Z2CND17-12AZ		X2CrNiMoN1712	F.3542	S31653
1.4408	GX6CrNiMo18-10	CF-8M	316C16			2343	X7CrNiMo2010	F.8414	J92900
1.4410	GX10CrNiMo18-9	Super Duplex			Z5CND20-12M	2328			S32750
1.4429	X2CrNiMoN17-13-3	316LN	316S62		Z2CND17-13AZ	2375	X2CrNiMoN17133	F.3543	
1.4435	X2CrNiMo18-14-3	316L	316S11		Z3CND17-12-03	2375	X2CrNiMo17132	F.3533	S31603
1.4436	X3CrNiMo17-13-3	316	316S19		Z6CND18-12-03	2343	X5CrNiMo17122	F.3543	S31600
1.4438	X2CrNiMo18-16-4	317L	317S12		Z2CND19-15-04	2367	X2CrNiMo18164	F.3539	S31703
1.4439	X2CrNiMoN17-13-5	S31726			Z3CND18-14-06AZ				
1.4440	X2CrNiMo18-16								
1.4449	X5CrNiMo17-13-3	317	317S16				X5CrNiMo1815		S31700
1.4460	X8CrNiMo275	329				2324			S32900
1.4462	X2CrNiMoN2253	Duplex	318S13		Z3CND22-05AZ	2377			S31803
1.4500	X7NiCrMoCuNb25205				Z3NCDU25-20M				J95150
1.4521	X2CrMoTi18-2	443/444				2326	X2CrMoTiNb182	F.3123	

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EUROPA TOOL

M

VDI 3323 14 — Stainless steel — Austenitic — ≤10 HRc ≤180 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4539	X1NiCrMoCuN25205				Z2NCDU25-20	2562			N08904
1.4541	X14CrNiTi18-10	321	321S31		Z6CNT18-10	2337	X6CrNiTi1811	F.3523	S32100
1.4542	X5CrNiCuNb174	17-4PH							
1.4545	Z7CNU15.05	15-5PH			Z7CNU15-05				S15500
1.4547	X1CrNiMoN20187	S31254				2378			S31254
1.4550	X6CrNiNb18-10	347	347S31	58F	Z6CNNb18-10	2338	X6CrNiNb1811	F.3552	S34700
1.4552	GX7CrNiNb18-9				Z4CNNb19-10M				J92710
1.4568	X7CrNiAl177		316S111		Z9CAN17-7	2388	Z8CNA17-07		S17700
1.4571	X6CrNiMoTi17-12-2	316Ti	320S31	58J	Z6NDT17-12	2350	X6CrNiMoTi1712	F.3535	
1.4581	GX5CrNiMoNb18		318C17		Z4CNDNb18-12M				
1.4583	X6CrNiMoNb18-12	318	303S21		Z15CNS20-12		X15CrNiSi212		
1.4585	GX7CrNiMoCuNb1818						X6CrNiMoTi1712		J94651
1.4821	X20CrNiSi254				Z20CNS25-04				S44635
1.4823	GX40CrNiSi274								J92604
1.4828	X15CrNiSi20-12	309	309S24	58C	Z15CNS20-12			F.8414	S30900
1.4833	X6CrNi2213	309S	309S13		Z15CN24-13				J93400
1.4845	X12CrNi25-21	310S	310S24		Z12CN25-20	2361	X6CrNi2520	F.331	S31008
1.4878	X12CrNiTi18-9	321	321S20	58B	Z6CNT18-12(B)	2337	X6CrNiTi1811	F.3553	S32100
1.4891	X5CrNiNb18-10	S30415				2372			
1.4893	X8CrNiNb11	S30815				2368			
1.4948	X6CrNi1811	304H	304S51		Z5CN18-09	2333			S30480
1.4980	X5NiCrTi2515	660				2570			S33286
	X5NiCrN3525								
	X2CrNiMoN18134	S31753							
	X2CrNiMoN25227								

K

VDI 3323 15 — Grey cast iron — Pearlitic/Ferritic — ≤10 HRc ≤180 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.6010	GG10	A4820B	Grade 100	GJL-100	Ft10D	0100	G10	FG10	
0.6015	GG15	A4825B	Grade150	GJL-150	Ft15D	0115	G15	FG15	W06020
0.6020	GG20	A4830B	Grade 220	GJL-200	Ft20D	0120	G20	FG20	
0.6025	GG25	A4840B	Grade 260	GJL-250	Ft25D	0125	G25	FG25	
0.6660	GGL-NiCr202	1050/700/7	Grade F2	GJLA-XNiCr20-2	L-NC202	0523			F41002

VDI 3323 16 — Grey cast iron — Pearlitic (Martensitic) — ≤26HRc ≤260HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.6025	GG25	A4840B	Grade 260	GJL-250	Ft25D	0125	G25	FG25	
0.6030	GG30	A4845B	Grade 300	GJL-300	Ft30D	0130	G30	FG30	
0.6035	GG35	A4850B	Grade 350	GJL-350	Ft35D	0135	G35	FG35	
0.6040	GG40	A4860B	Grade 400	GJL-400	Ft40D	0140	G40	FG40	

VDI 3323 17 — Nodular cast iron — Ferritic — ≤3 HRc ≤160 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.7033	GGG35.3		350-22L40	GJS-350-22-LT	FGS370-17	0717-15			
0.7040	GGG40	60-40-18	SNG420-12	GJS-400-15	FGS400-12	0717-02	GS400-12	FGE38-17	F32800
0.7042	GGG40.3	60-40-18	SNG370-17	GJS-400-18-LT	FGS370-17	0717-12	GSO42-17		

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VDI 3323 18 — Nodular cast iron — Pearlitic — ≤25HRc ≤250HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.7050	GGG50	80-55-06	SNG500-7	GJS-500-7	FGS500-7	0727-02	GS500-7	FGE50-7	F33100
0.7060	GGG60	80-55-06	SNG600-3	GJS-600-3	FGS60-3	0732-03	GS600-3	FGE60-2	
0.7070	GGG70	100-70-03	SNG700-2	GJS-700-2	FGS700-2	0737-01	GS700-2	FGE70-2	F34800
0.7652	GGGNiMn13-7		Grade S6	GJSA-XNiMn13-7	FGSNi13Mn7	0772			
0.7660	GGGNiCr20-2	A436D2	Grade S2	GJSA-XNiCr20-2	FGSNi20Cr2	0776			

VDI 3323 19 — Malleable cast iron — Ferritic — ≤130 HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.8055	GTW55								
0.8135	GTS-35	32510	B340-12	GJMB350-10	Mn35-10	0815	GMN35	GTS35	
0.8145	GTS45	A220-40010	P440-7	GJMB450-6	Mn450-6	0815-00			

VDI 3323 20 — Malleable cast iron — Pearlitic — ≤21HRc ≤230HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.8155	GTS-55	50005	P510-4	GJMB-550-4	MP50-5	0854	GMN55		
0.8165	GTS-65	70003	P570-3	GJMB-650-2	MN650-3	0856	GMN65		
0.8170	GTS-70	90001	P690-2	GJMB-700-2	MN700-2	0862	GMN70		

N

VDI 3323 21 — Aluminium wrought, alloyed — Not curable — ≤60HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
3.0205	Al99	Al99							
3.0255	Al99.5	1000	L31		A59050C				
3.3315	AlMg1								

VDI 3323 22 — Aluminium wrought, alloyed — Curable, hardened — ≤100HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
3.1325	AlCuMg1								
3.1655	AlCuSiPb								
3.2314	AlMgSi1								
3.4345	AlZnMgCu0.5	7050	L86		AZ4GU/9051		811-04		
3.4365	AlZnMgCu1.5	7075	7075		7075		AlZn5.8MgCuCr		

VDI 3323 23 — Aluminium cast, alloyed — ≤12% Si, Not curable — ≤75HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
3.2163	G-AlSi9Cu3								
3.2382	GD-AlSi10Mg								
3.2383	G-AlSi10Mg(Cu)	A360.2	LM9			4253			
3.2581	G-AlSi12								
2.3561	G-AlMg5								
3.5101	G-MgZn4sE1Zr1	ZE41	MAG5						
3.5103	MgSE3Zn27r1	EZ33	MAG6		G-TR3Z2				
3.5812	G-MgAl8Zn1	AZ81	NMAG1						
3.5912	G-MgAl9Zn1	AZ91	MAG7						

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N

VDI 3323 23 — Aluminium cast, alloyed — ≤12% Si, Not curable — ≤75HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
		A356-72	2789		NFA32-201				
		356.1	LM25			4244			
	G-AlSi12	A413.2	LM6			4261			
	G-AlSi12(Cu)	A413.1	LM20			4260			
	GD-AlSi12	A413.0				4247			
	GD-AlSi8Cu3	A380.1	LM24			4250			

VDI 3323 24 — Aluminium cast, alloyed — ≤12% Si, Curable, hardened — ≤90HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.1871	G-AlCu4TiMg								
3.1754	G-AlCu5Ni1.5								
3.2371	G-AlSi7Mg	4218B							
3.2373	G-AlSi9MGWA	SC64D			A-S7G	4251			
3.2381	G-AlSi10Mg								
3.5106	G-MgAg3SE2Zr1	QE22	MAG12						
	G-ALMG5	GD-AlSi12	LM5		A-SU12	4252			

VDI 3323 25 — Aluminium, alloyed — >12% Si & Li alloys — ≤130HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS

To this group belong all Aluminium alloys with >12% Si content and all Aluminium Lithium alloys

VDI 3323 26 — Copper & Cu alloys (Bronze/Brass) — Cutting alloys, >1% Pb — ≤110HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.0375	CuZn36Pb3								
2.1090	G-CuSn75Pb	C93200			U-E7Z5Pb4				
2.1096	G-CuSn5ZnPb	C83600	LG2						
2.1098	G-CuSn2ZnPb	C83600							
2.1182	G-CuPb15Sn	C2300	LB1		U-Pb15E8				

VDI 3323 27 — Copper & Cu alloys (Bronze/Brass) — CuZn, CuSnZn (Brass) — ≤90HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.0240	CuZn15								
2.0321	CuZn37	C27200	CZ108		CuZn36, CuZn37		C2700		
2.0590	G-CuZn40Fe								
2.0592	G-CuZn35Al1	C86500	U-Z36N3		HTB1				
2.0596	G-CuZn34Al2	C86200	HTB1		U-Z36N3				
2.1293	CuCrZr	C18200	CC102		U-Cr0-8Zr				

MATERIAL CHARTS

N

VDI 3323 28 — Copper & Cu alloys (Bronze/Brass) — CuSn, Lead free copper & Electrolytic copper — ≤100HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.0060	E-Cu57								
2.0966	CuAl10Ni5Fe4	C63000	Ca104		U-A10N				
2.0975	G-CuAl10Ni	B-148-52							
2.1050	G-CuSn10	C90700	CT1						
2.1052	G-CuSn12	C90800	Pb2		UE12P				
2.1292	G-CuCrF35	C81500	CC1-FF						

VDI 3323 29 — Thermosetting & reinforced plastics — Acrylics etc.

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS

To this group belong all Acrylics, Nylons, Carbon Fibre reinforced plastics, Glass fibre reinforced plastics

VDI 3323 30 — Non-metals — Hard rubber, Wood etc

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS

To this group belong all non-metal materials such as Graphite, Hard rubber, Wood etc.

S

VDI 3323 31 — Heat resistant super alloys — Fe based, annealed — ≤15HRc ≤200HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4558	X2NiCrAlTi3220	N08800	NA15						
1.4562	X1NiCrMoCu32287	N08031							
1.4563	X1NiCrMoCuN31274	N08028			Z1NCDU31-27-03	2584			
1.4864	X12NiCrSi3616	330	NA17		Z12NCS3718				N08330
1.4865	GX40NiCrSi3818		330C40				XG50NiCr3919		J94605
1.4958	X5NiCrAlTi3120								

VDI 3323 32 — Heat resistant super alloys — Fe based, aged — ≤30HRc ≤280HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4977	X40CoCrNi2020				Z42CKNDWNb				

VDI 3323 33 — Heat resistant super alloys — Ni or Co based, annealed — ≤25HRc ≤250HB

W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.4360	NiCu30Fe	Monel 400	NA13		NU30				N04400
2.4603	NiCr30FeMo	5390A			NC22FeD				
2.4610	NiMo16Cr16Ti	Hastelloy C-4							N26455
2.4630	NiCr20Ti	Nimonic 75	HR5, 203-4		NC20T				N06075
2.4631	NiCr20TiAl		HR40		NC20TA				N07080
2.4642	NiCr29Fe	Inconel 690			Nnc30Fe				N06690
2.4856	NiCr22Mo9Nb	Inconel 625	NA21		NC22FeDNb				N06625
2.4858	NiCr21Mo	Inconel 825	NA16		NC21FeDU				N08825

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S

VDI 3323 34	Heat resistant super alloys			Ni or Co based, aged				≤38HRc ≤350HB	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.4375	NiCu30Al	Monel k-500	NA18		NU30AT				N05500
2.4662	NiFe35Cr14MoTi	5660			Z5NCDT42				N09901
2.4668	NiCr19Fe19NbMo	Inconel 718	HR8		NC19eNB				N07718
2.4670	S-NiCr13A16MoNb	5391	MAR-46		NC12AD				
2.4694	NiCr16Fe7TiAl	Inconel							N07751
2.4955	NiFe25Cr20NbTi								
2.4964	CoCr20W15Ni	5772			KC20WN				
	CoCr22W14Ni	AMS5772			KC22WN				

VDI 3323 35	Heat resistant super alloys			Ni or Co based, cast				≤34HRc ≤320HB	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.4669	NiCr15Fe7TiAl	Inconel X-750			NC15TNbA				N07750
2.4685	G-NiMo28	Hastelloy b							N10665
2.4810	G-NiMo30	Hastelloy C							
2.4973	NiCr19Co11MoTi	AMS5399			NC19KDT				
3.7115	TiAl5SN2								R54520

VDI 3323 36	Titanium alloys			Pure Titanium				Tensile strength 400 Rm	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.4674	NiCo15Cr10MoAlTi	AMS5397							N13100
3.7025	Ti1	R50250	2TA1						R50250
3.7225	Ti1pd	R52250	TP1						R52250

VDI 3323 37	Titanium alloys			Alpha + Beta alloys, hardened				Tensile strength 1050 Rm	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
3.7124	TiCu2		2TA21-24						
3.7145	TiAl6Sn2Zr4Mo2Si	R54620							R54620
3.7165	TiAl6V4	AMSR56400	TA10-13		T-A6V				
3.7185	TiAlMo4Sn2		TA45-51						
3.7195	TiAl3V2.5								R56320
	TiAl4Mo4Sn4Si0.5								
	TiAl5Sn2.5	AMSR54520	TA14/17		T-A5E				
	Ti6Al4VELI	AMSR56401	TA11						

H

VDI 3323 38	Hardened steel			Hardened				≤55HRc ≤550HB	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.1231	Ck67	1070	060A67	C67S	XC68	1770	C70	F.5103	
1.1248	Ck75	1078, 1080	060A78	C75S	XC75	1774	C75	F.5107	
1.1274	Ck101	1095	060A96	C100S	XC100	1870	C100	F.5117	
1.1545	C105W1	W1	BW2	C105U	Y1105	1880	C100KU	F.5118	
1.2762	75CrMoNiW67								
1.3401	GX120Mn12	A128(A)			Z120M12	2183	GX120Mn12	F.8251	
1.6746	32NiCrMo14-5		832M31	32NiCrMo145	35NCD14				
1.7176	55Cr3	5155	527A60	48	55C3	2253	55Cr3		
1.7225	42CrMo4	4140	708M40	42CrMo4	42CD4	2244	42CrMo4	F.1252	

VDI 3323 39	Hardened steel			Hardened				>55HRc	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
To this group belong all steels hardened higher than 55HRc									

VDI 3323 40	Chilled cast iron			Cast				≤42HRc ≤400HB	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.9620	GX260NiCr42	Ni-Hard 2	Grade 2A	GJN-HV250	FBNi4Cr2BC	0512			F45001
0.9625	GX330NiCr42	Ni.Hard 1	Grade 2B	GJN-HV550	FBNi4Cr2HC	0513			F45000
0.9630	GX300CrNiSi952	Ni-Hard 4	Grade 2C	GJN-HV600	FBCr9Ni5	0457			F45003
09640	GX300CrMoNi1521								F45005
0.9650	GX260Cr27		Grade 3D			0466			
0.9655	GX300CrNiMo271		Grade 3E						
1.4841	X15CrNiSi25-20	310	314S31	X15CrNiSi2520	Z15CNS25-20				S31400

VDI 3323 41	Hardened cast iron			Hardened				≤55HRc ≤550HB	
W. Nr	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
0.9635	GX300CrMo153								
0.9645	GX260CrMoNi2021							107WCr5KU	F45007
0.9655	GX300CrNMo271								

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