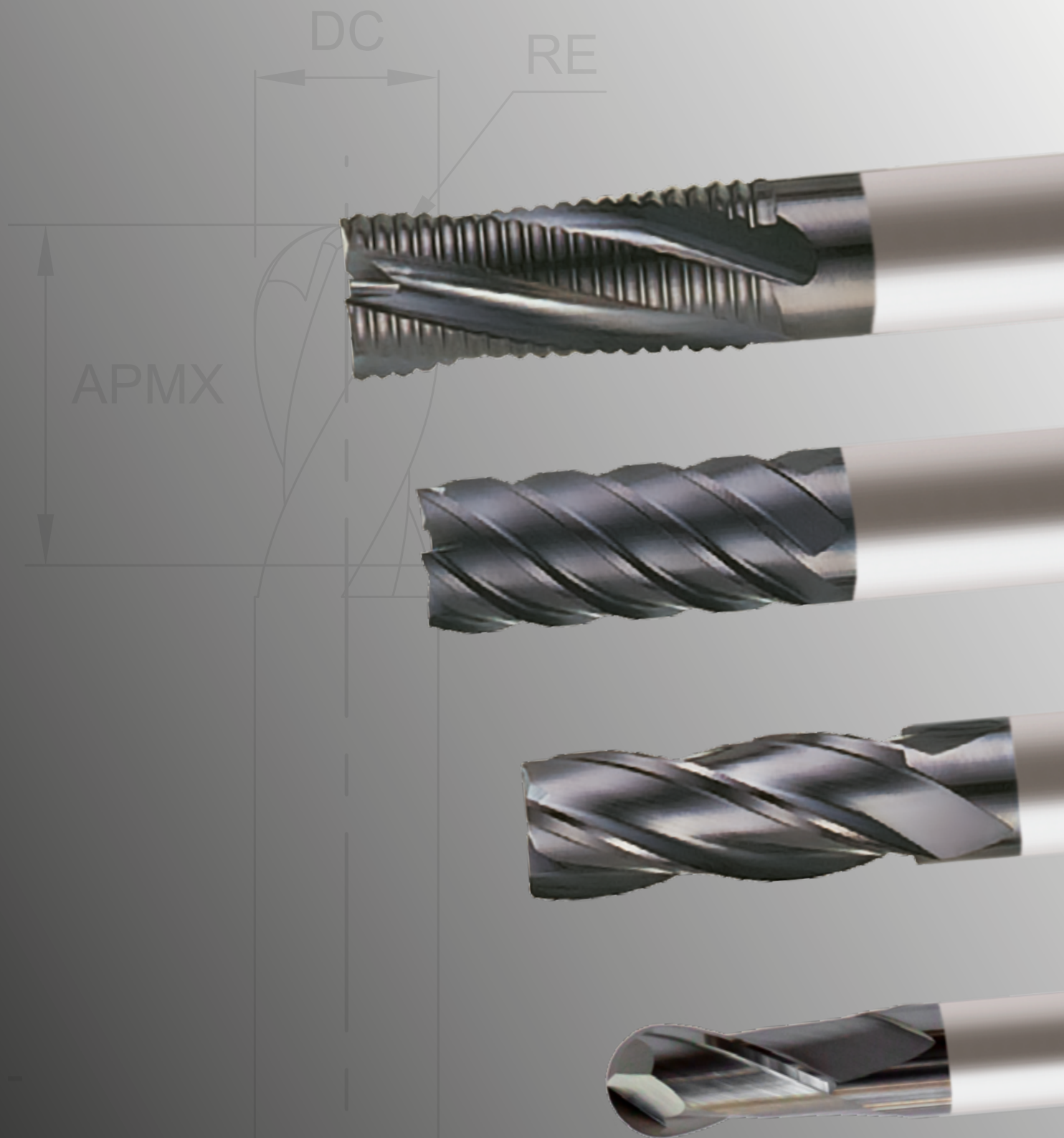


PULSAR XL

Designed specifically for use
in dry cutting conditions for
steels up to HRc55



2 FLUTE END MILLS

Code	Item	Description	Page No.
100370		Miniature & Short Length ø0.4mm - 20.0mm	P.3
155370		Standard Length Corner Radius ø4.0mm - 20.0mm	P.4
118370		Short Length Ball Nose ø3.0mm - 20.0mm	P.5
112370		Standard Length Ball Nose ø1.0mm - 25.0mm	P.6
143370		Rib Processing Ball Nose ø0.6mm - 4.0mm	P.7

4 FLUTE END MILLS

109370		Short Length ø2.0mm - 25.0mm	P.8
111370		Standard Length ø2.0mm - 25.0mm	P.9
156370		Stub Length Corner Radius ø2.0mm - 16.0mm	P.11
157370		Standard Length Corner Radius ø3.0mm - 16.0mm	P.10
115370		Standard Length Ball Nose ø1.0mm - 25.0mm	P.12

6-8 FLUTE END MILLS

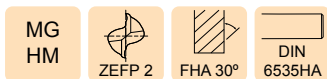
149370		Standard Length 45° Helix ø6.0mm - 25.0mm	P.13
150370		Extra Long Length 45° Helix ø6.0mm - 25.0mm	P.14

ROUGHING END MILLS

147370		Standard Length Multiflute ø6.0mm - 25.0mm	P.15
		Cutting Data	P.16-33



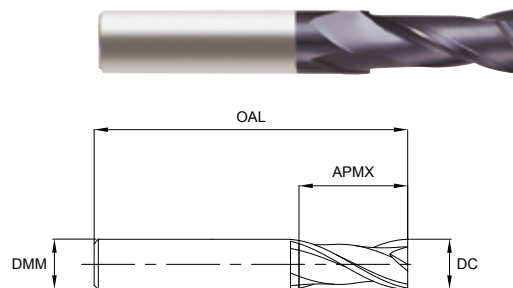
MINIATURE & SHORT LENGTH



Series No. 100370

► cutting conditions : p.17-18

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



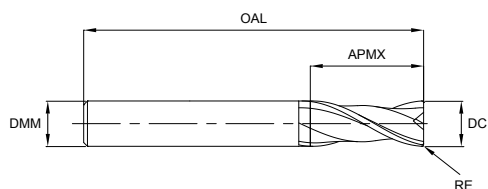
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1003700040	0.4	3	0.8	40
1003700050	0.5		1.0	
1003700060	0.6		1.2	
1003700070	0.7		1.4	
1003700080	0.8		1.6	
1003700090	0.9		2.0	
1003700100	1.0	4	2.5	
1003700120	1.2		4.0	
1003700140	1.4		4.0	
1003700150	1.5		4.0	
1003700200	2.0		6.0	
1003700250	2.5		8.0	
1003700300	3.0	6	8.0	45
1003700350	3.5		10.0	
1003700400	4.0		11.0	50
1003700500	5.0		13.0	
1003700600	6.0	8	13.0	60
1003700700	7.0		16.0	
1003700800	8.0	10	19.0	70
1003700900	9.0		22.0	
1003701000	10.0	12	22.0	75
1003701100	11.0		26.0	
1003701200	12.0	14	26.0	85
1003701400	14.0		32.0	
1003701600	16.0	16	32.0	100
1003701800	18.0		32.0	
1003702000	20.0	20	38.0	105

Mill Dia. Tolerance TCD C (mm)	Shank Dia. Tolerance TCD M M
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary	○	●	●		○	○	○								●	
○ Secondary																



CORNER RADIUS

MG
HM

Series No. 155370

► cutting conditions : p.19

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

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1553709011	4.0	0.5	6	15.0	50
1553700600	6.0	0.5	6	20.0	60
1553709001	6.0	1.0		20.0	
1553700800	8.0	0.5	8	25.0	70
1553709002	8.0	1.0		25.0	
1553701000	10.0	0.5	10	30.0	90
1553709005	10.0	1.0		30.0	
1553709008	12.0	1.0	12	30.0	

Mill Dia. Tolerance TDCD(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●			○	○								●	



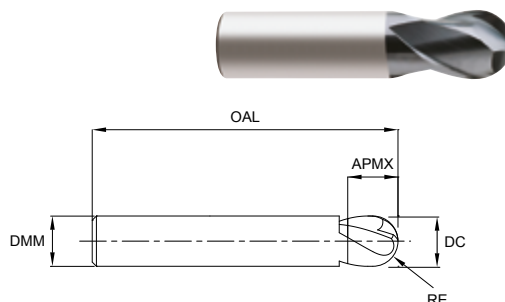
SHORT BALL NOSE



Series No. 118370

► cutting conditions : p.21-24

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



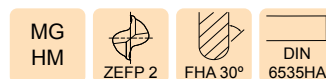
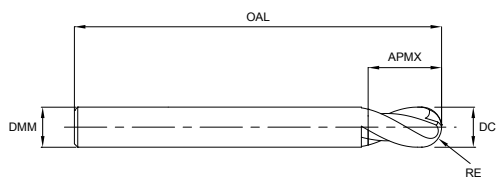
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1183700100	1.0	0.5	3	3.0	38
1183700200	2.0	1.0	6	3.0	50
1183700300	3.0	1.5		4.0	50
1183700400	4.0	2.0		5.0	54
1183700600	6.0	3.0		7.0	54
1183700800	8.0	4.0	8	9.0	58
1183701000	10.0	5.0	10	11.0	66
1183701200	12.0	6.0	12	12.0	73
1183701600	16.0	8.0	16	16.0	82

Mill Dia. Tolerance TDCD(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.03	-0.020	+0.020	h5

ISO		P			M		K		N					S		H	
VDI GROUP		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	40-41
● Primary	○ Secondary	○	●	●			○	○								●	



BALL NOSE



Series No. 112370

► cutting conditions : p.21-24

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	OVERALL LENGTH OAL
1123700100	1.0	0.5	4	2.5	50
1123700200	2.0	1.0	6	5.0	
1123700300	3.0	1.5		8.0	60
1123700400	4.0	2.0		8.0	70
1123700500	5.0	2.5		10.0	80
1123700600	6.0	3.0		12.0	90
1123700800	8.0	4.0	8	14.0	100
1123701000	10.0	5.0	12	18.0	
1123701200	12.0	6.0		22.0	110

Mill Dia. Tolerance TDCD(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.03	-0.020	+0.020	h5

ISO		P			M		K		N					S		H	
VDI GROUP		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	40-41
● Primary	○ Secondary	○	●	●			○	○								●	



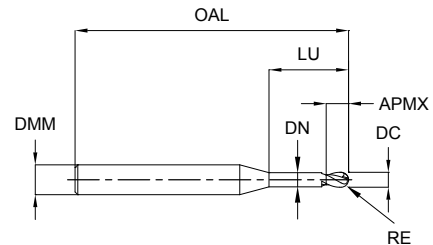
RIB PROCESSING BALL NOSE

MG
HM

Series No. 143370

► cutting conditions : p.20

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



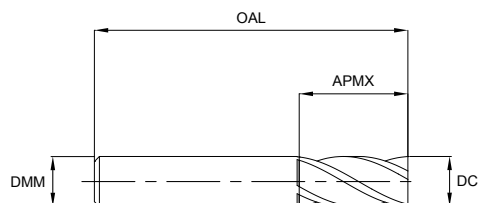
EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1433700080	0.8	0.4	4	1.2	6	45	0.75
1433700100	1.0	0.5	4	1.5	6	45	0.95
1433700101	1.0	0.5	4	1.5	8	45	0.95
1433700103	1.0	0.5	4	1.5	10	45	0.95
1433700102	1.0	0.5	4	1.5	12	45	0.95
1433700105	1.0	0.5	4	1.5	16	50	0.95
1433700120	1.2	0.6	4	1.8	8	45	1.15
1433700150	1.5	0.75	4	2.3	8	45	1.45
1433700152	1.5	0.75	4	2.3	10	45	1.45
1433700151	1.5	0.75	4	2.3	12	50	1.45
1433700200	2.0	1.0	4	3.0	8	45	1.95
1433700201	2.0	1.0	4	3.0	16	50	1.95
1433700202	2.0	1.0	4	3.0	20	55	1.95
1433700203	2.0	1.0	4	3.0	25	60	1.95
1433700204	2.0	1.0	4	3.0	30	70	1.95
1433700305	3.0	1.5	6	4.5	10	50	2.85
1433700300	3.0	1.5	6	4.5	16	55	2.85
1433700301	3.0	1.5	6	4.5	20	60	2.85
1433700302	3.0	1.5	6	4.5	25	65	2.85
1433700402	4.0	2.0	6	6.0	25	70	3.85
1433700403	4.0	2.0	6	6.0	30	70	3.85
1433700404	4.0	2.0	6	6.0	35	80	3.85
1433700500	5.0	2.5	6	7.5	16	60	4.85
1433700600	6.0	3.0	6	9.0	20	80	5.85
1433700601	6.0	3.0	6	9.0	30	90	5.85

Mill Dia. Tolerance TDCD(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.02	-0.010	+0.010	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary	○	●	●			○	○								●	
○ Secondary																



SHORT LENGTH



Series No. 109370

► cutting conditions : p.25

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

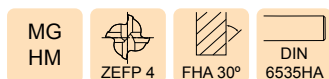
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1093700200	2.0	4	6.0	40
1093700250	2.5		8.0	
1093700300	3.0	6	8.0	45
1093700400	4.0		11.0	
1093700500	5.0		13.0	50
1093700600	6.0		13.0	
1093700800	8.0	8	19.0	60
1093701000	10.0	10	22.0	70
1093701200	12.0	12	26.0	75
1093701400	14.0	14	26.0	85
1093701600	16.0	16	32.0	100

Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●		○	○	○								●	



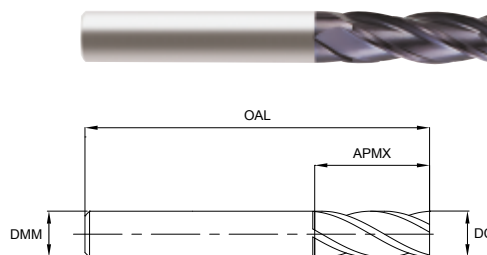
STANDARD LENGTH



Series No. 111370

► cutting conditions : p.26

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



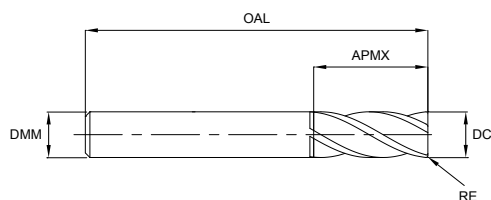
EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1113700200	2.0	4	8.0	40
1113700300	3.0	6	12.0	50
1113700400	4.0		15.0	
1113700500	5.0		20.0	60
1113700600	6.0		20.0	
1113700800	8.0	8	25.0	70
1113701000	10.0	10	30.0	90
1113701200	12.0	12	30.0	
1113701400	14.0	16	40.0	110
1113701600	16.0		50.0	
1113702000	20.0	20	55.0	

Mill Dia. Tolerance TDCD(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●			○	○								●	



STANDARD LENGTH CORNER RADIUS



Series No. 157370

► cutting conditions : p.27

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

EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1573700300	3.0	0.3	6	12.0	50
1573700400	4.0	0.3	6	15.0	50
1573709012	4.0	0.5		15.0	
1573709013	5.0	0.5	6	20.0	60
1573709011	6.0	0.3	6	20.0	60
1573700600	6.0	0.5		20.0	
1573709001	6.0	1.0		20.0	
1573700800	8.0	0.5	8	25.0	70
1573709002	8.0	1.0		25.0	
1573709004	8.0	2.0		25.0	
1573701000	10.0	0.5	10	30.0	90
1573709005	10.0	1.0		30.0	
1573709006	10.0	1.5		30.0	
1573709007	10.0	2.0		30.0	
1573701200	12.0	0.5	12	30.0	
1573709008	12.0	1.0		30.0	
1573709009	12.0	1.5		30.0	
1573709010	12.0	2.0		30.0	
1573709020	16.0	1.0	16	50.0	110
1573709021	16.0	2.0		50.0	
1573709022	20.0	2.0	20	55.0	

Mill Dia. Tolerance TDCD(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●			○	○								●	



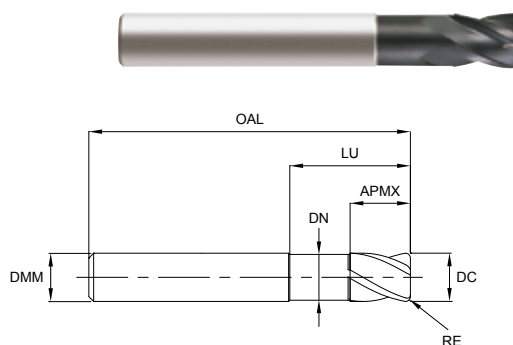
STUB CUT LENGTH CORNER RADIUS



Series No. 156370

► cutting conditions : p.28

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



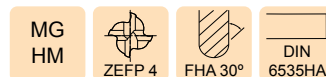
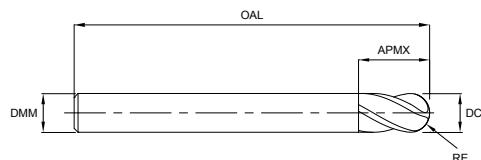
EUROPA CODE ORDCODE	DIAMETER DC	CORNER RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	EFFECTIVE LENGTH LU	OVERALL LENGTH OAL	NECK DIAMETER DN
1563700200	2.0	0.2	6	2.5	5.0	50	1.9
1563700300	3.0	0.3		4.0	7.0		2.8
1563700400	4.0	0.4		5.0	9.0		3.7
1563700600	6.0	0.6		7.0	14.0	55	5.6
1563700800	8.0	0.8	8	10.0	18.0	60	7.4
1563701000	10.0	1.0	10	12.0	25.0	70	9.4
1563701200	12.0	1.2	12	15.0	30.0	80	11.4

Mill Dia. Tolerance TDCD(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●			○	○								●	



BALL NOSE



Series No. 115370

► cutting conditions : p.29-30

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

EUROPA CODE ORDCODE	DIAMETER DC	RADIUS RE	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1153700200	2.0	1.0	6	5	
1153700300	3.0	1.5		8	60
1153700400	4.0	2.0		8	70
1153700500	5.0	2.5		10	80
1153700600	6.0	3.0		12	90
1153700800	8.0	4.0	8	14	100
1153701000	10.0	5.0	10	18	
1153701200	12.0	6.0	12	22	110
1153701600	16.0	8.0	16	30	140

Mill Dia. Tolerance TDCD(mm)	Radius Tolerance (mm)		Shank Dia. Tolerance TCDMM
	RETOLL	RETOLU	
0.00 / -0.03	-0.010	+0.010	h5

ISO		P			M		K		N					S		H	
VDI GROUP		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	40-41
● Primary	○ Secondary	○	●	●			○	○								●	



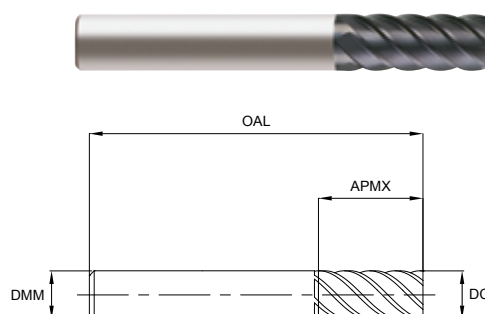
STANDARD LENGTH 45° HELIX



Series No. 149370

► cutting conditions : p.32

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



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1493700600	6.0	6	13.0	57	6
1493700800	8.0	8	19.0	63	6
1493701000	10.0	10	22.0	72	6
1493701200	12.0	12	26.0	83	6
1493701600	16.0	16	32.0	92	6
1493702000	20.0	20	38.0	104	8

Mill Dia. Tolerance TDCD(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●												●	

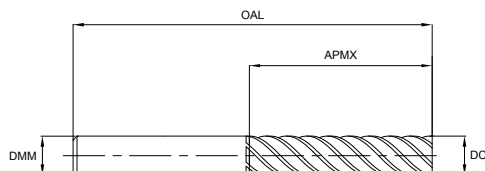


EXTRA LENGTH 45° HELIX



Series No. 150370

► cutting conditions : p.33



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

EUROPA CODE ORCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL
1503700600	6.0	6	26.0	70
1503700800	8.0	8	36.0	90
1503701000	10.0	10	46.0	100
1503701200	12.0	12	56.0	110
1503701600	16.0	16	66.0	130
1503702000	20.0	20	76.0	140
1503702500	25.0	25	92.0	180

Mill Dia. Tolerance TDCD(mm)	Shank Dia. Tolerance TCDMM
0.00 / -0.03	h5

ISO		P			M		K		N					S		H	
VDI GROUP		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	40-41
● Primary	○ Secondary	○	●	●			○	○								●	



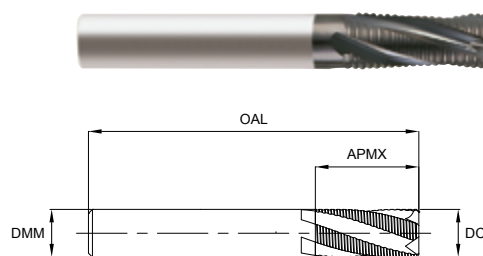
MULTIFLUTE ROUGHER 20° HELIX



Series No. 147370

► cutting conditions : p.31

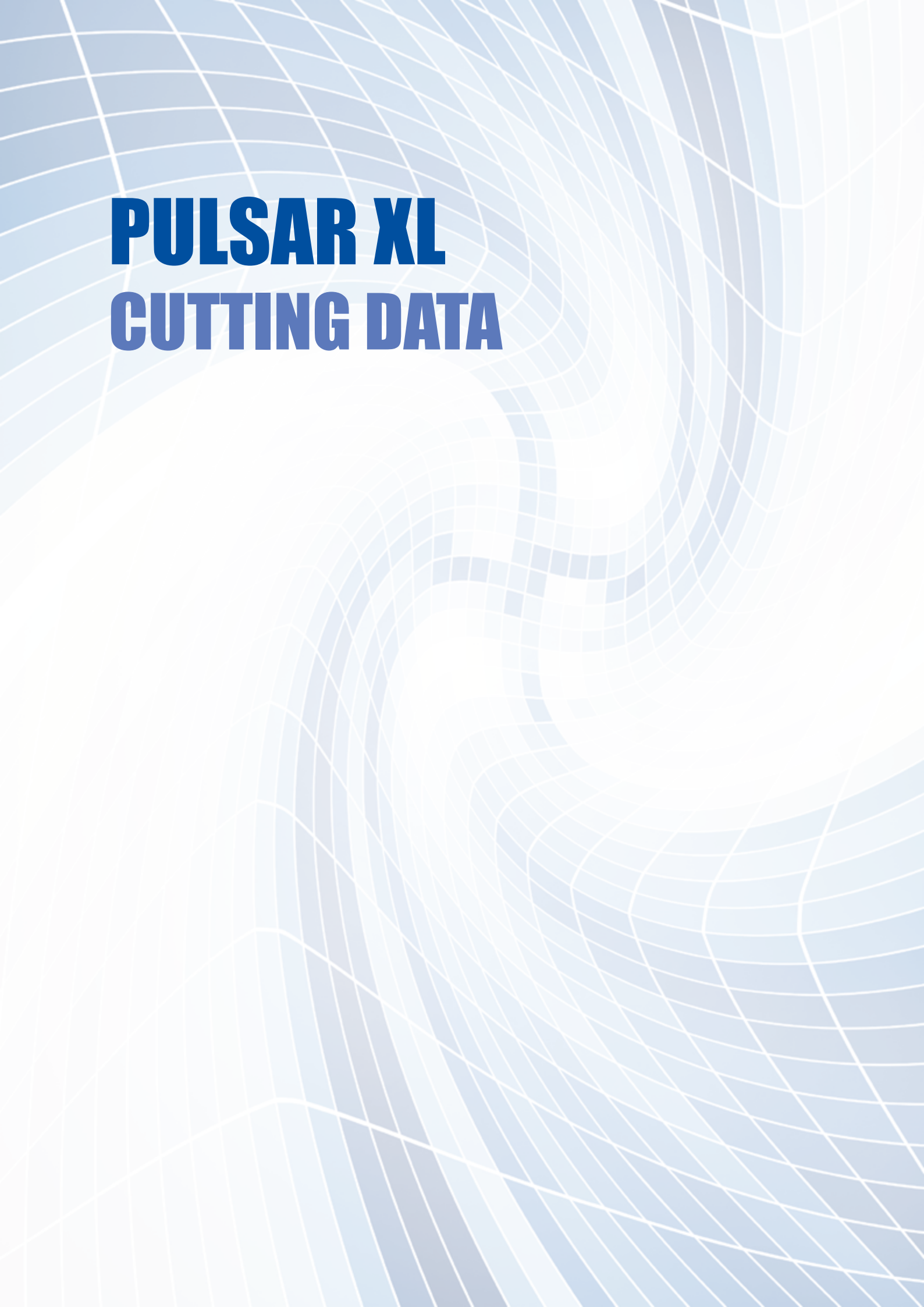
Designed to machine tool steels, alloy steels, mould steels and other hardened materials.
Used for high speed, high feed milling.



EUROPA CODE ORDCODE	DIAMETER DC	SHANK DIAMETER DMM	LENGTH OF CUT APMX	OVERALL LENGTH OAL	NO. OF FLUTES ZEFP
1473700600	6.0	6	16.0	57	3
1473700800	8.0	8	16.0	63	3
1473701000	10.0	10	22.0	72	4
1473701200	12.0	12	26.0	83	4
1473701600	16.0	16	32.0	92	4
1473702000	20.0	20	38.0	104	4

Mill Dia. DC	Mill Dia. Tolerance TCDC(mm)	Shank Dia. Tolerance TCDMM
6.0 - 10.0	0.00 / -0.058	h5
12.0 - 16.0	0.00 / -0.070	
20.0	0.00 / -0.084	

ISO	P			M		K		N					S		H	
VDI GROUP	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	40-41
● Primary ○ Secondary	○	●	●		○	○	○								●	



PULSAR XL

CUTTING DATA



CUTTING DATA

100370 (2 Flute Miniature)															
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)										
					0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.4	1.5	
P	1-5	Non-alloy Steel	<25	v _c (m/min)	40	45	55	60	65	70	70	65	65	60	
				n	31830	28660	29190	27290	25860	24770	22280	17240	14780	12730	
				f _z	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.005	0.005	0.006	
				f (mm/min)	125	115	115	160	155	150	175	170	145	150	
	6-9	Low alloy Steel	25-35	v _c (m/min)	40	45	55	60	65	70	70	65	65	60	
				n	31830	28660	29190	27290	25860	24770	22280	17240	14780	12730	
				f _z	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.005	0.005	0.006	
				f (mm/min)	125	115	115	160	155	150	175	170	145	150	
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	40	45	55	60	65	70	70	65	65	60	
				n	31830	28660	29190	27290	25860	24770	22280	17240	14780	12730	
				f _z	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.005	0.005	0.006	
				f (mm/min)	125	115	115	160	155	150	175	170	145	150	
H	38	Hardened Steel	45-55	v _c (m/min)	30	35	40	45	50	50	50	50	50	45	
				n	23870	22290	21230	20470	19890	17690	15910	13260	11370	9550	
				f _z	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.004
				f (mm/min)	45	45	40	80	80	105	95	80	70	75	

MATERIAL GROUP
P

< ø 1.0mm: 0.15 x DC
≥ ø 1.0mm: 0.25 x DC

MATERIAL GROUP
H

< ø 1.0mm: 0.02 x DC
≥ ø 1.0mm: 0.05 x DC

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



CUTTING DATA

100370 (2 Flute Short)														
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)									
					2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	65	75	85	90	95	95	90	95	100	95
				n	10340	7960	6760	5730	5040	3780	2860	2520	1990	1510
				f _z	0.01	0.015	0.025	0.032	0.039	0.057	0.064	0.064	0.062	0.063
				f (mm/min)	205	240	335	365	390	430	365	320	245	190
	6-9	Low alloy Steel	25-35	v _c (m/min)	45	45	50	55	55	55	55	55	60	60
				n	7160	4770	3980	3500	2920	2190	1750	1460	1190	955
				f _z	0.01	0.016	0.024	0.032	0.041	0.05	0.05	0.048	0.051	0.047
				f (mm/min)	140	150	190	225	240	220	175	140	120	90
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	45	45	50	55	55	55	55	55	60	60
				n	7160	4770	3980	3500	2920	2190	1750	1460	1190	955
				f _z	0.01	0.016	0.024	0.032	0.041	0.05	0.05	0.048	0.051	0.047
				f (mm/min)	140	150	190	225	240	220	175	140	120	90
M	14	Austenitic Stainless Steel	v _c (m/min)	35	40	45	45	50	45	45	45	50	45	
			n	5570	4240	3580	2860	2650	1790	1430	1190	990	715	
			f _z	0.009	0.016	0.024	0.032	0.039	0.053	0.06	0.059	0.066	0.06	
			f (mm/min)	100	135	170	180	205	190	170	140	130	85	
K	15-20	Cast Iron	v _c (m/min)	65	75	85	90	95	95	90	95	100	95	
			n	10340	7960	6760	5730	5040	3780	2860	2520	1990	1510	
			f _z	0.01	0.015	0.025	0.032	0.039	0.057	0.064	0.064	0.062	0.063	
			f (mm/min)	205	240	335	365	390	430	365	320	245	190	
H	38	Hardened Steel	45-55	v _c (m/min)	30	30	35	35	35	40	40	40	40	40
				n	4770	3180	2780	2230	1850	1590	1270	1060	795	635
				f _z	0.004	0.007	0.009	0.013	0.017	0.023	0.027	0.029	0.028	0.028
				f (mm/min)	40	45	50	55	60	70	70	60	45	35

MATERIAL GROUP
P, M, K

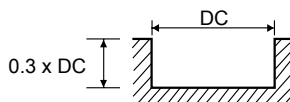
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
 All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long series and long necked tools it may be necessary to 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



CUTTING DATA

155370 (2 Flute Standard, Corner Radius)					Size (mm)				
VDI MATERIAL GROUP	MATERIAL	HRc			4.0	6.0	8.0	10.0	12.0
P	1-5	Non-alloy Steel	<25	v_c (m/min)	75	80	85	85	85
				n	5970	4240	3380	2705	2255
				f_z	0.016	0.032	0.045	0.053	0.051
				f (mm/min)	190	270	300	285	230
	6-9	Low alloy Steel	25-35	v_c (m/min)	45	50	55	55	60
				n	3580	2650	2190	1750	1590
				f_z	0.013	0.025	0.033	0.039	0.041
				f (mm/min)	90	130	145	135	130
	10-11	High alloy Steel, Tool Steel	35-45	v_c (m/min)	45	50	55	55	60
				n	3580	2650	2190	1750	1590
				f_z	0.013	0.025	0.033	0.039	0.041
				f (mm/min)	90	130	145	135	130
K	15-20	Cast Iron		v_c (m/min)	75	80	85	85	85
				n	5970	4240	3380	2705	2255
				f_z	0.016	0.032	0.045	0.053	0.051
				f (mm/min)	190	270	300	285	230
H	38	Hardened Steel	45-55	v_c (m/min)	30	35	35	35	35
				n	2385	1855	1390	1115	930
				f_z	0.006	0.01	0.013	0.016	0.019
				f (mm/min)	30	35	35	35	35



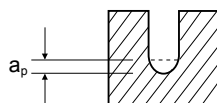
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
 All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long series and long necked tools it may be necessary to 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



CUTTING DATA

143370 (2 Flute Rib Processing, Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)								
					0.8 LU=6.0	1.0 LU=10.0	1.2 LU=8.0	1.5 LU=10.0	2.0 LU=20.0	3.0 LU=16.0	4.0 LU=30.0	5.0 LU=16.0	6.0 LU=20.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.036	0.067	0.055	0.1	0.13	0.2	0.27	0.225	0.27
				v _c (m/min)	75	105	90	100	105	110	120	105	105
				n	32550	33430	25200	21230	16720	11670	9550	7140	5990
				f _z	0.004	0.007	0.005	0.011	0.015	0.021	0.025	0.018	0.022
				f (mm/min)	235	465	265	465	500	490	475	265	265
	6-9	Low alloy Steel	25-35	a _p (mm)	0.027	0.067	0.055	0.1	0.13	0.2	0.27	0.225	0.27
				v _c (m/min)	40	70	65	70	75	75	80	70	75
				n	23630	22290	17850	14860	11940	7960	6370	4830	4100
				f _z	0.002	0.006	0.004	0.008	0.01	0.015	0.018	0.014	0.016
				f (mm/min)	115	265	130	235	240	240	230	130	130
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.027	0.067	0.055	0.1	0.13	0.2	0.27	0.225	0.27
				v _c (m/min)	40	70	65	70	75	75	80	70	75
				n	23630	22290	17850	14860	11940	7960	6370	4830	4100
				f _z	0.002	0.006	0.004	0.008	0.01	0.015	0.018	0.014	0.016
				f (mm/min)	115	265	130	235	240	240	230	130	130
K	15-20	Cast Iron	a _p (mm)	0.036	0.067	0.055	0.1	0.13	0.2	0.27	0.225	0.27	
			v _c (m/min)	75	105	90	100	105	110	120	105	107	
			n	32550	33430	25200	21230	16720	11670	9550	7140	5990	
			f _z	0.004	0.007	0.005	0.011	0.015	0.021	0.025	0.018	0.022	
			f (mm/min)	235	465	265	465	500	490	475	265	265	
H	38	Hardened Steel	45-55	a _p (mm)	0.005	0.013	0.01	0.021	0.026	0.05	0.052	0.044	0.053
				v _c (m/min)	25	45	40	45	50	50	55	50	50
				n	15020	14330	11340	9550	7960	5300	4380	3260	2730
				f _z	0.004	0.007	0.006	0.01	0.012	0.018	0.021	0.02	0.024
				f (mm/min)	115	200	130	190	190	190	185	130	130



► The data given is based on LU length shown. Please adjust machining conditions according to length.

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)

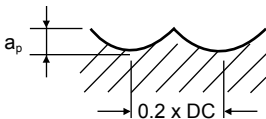
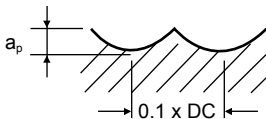
f - feed rate (mm/min)

a_p - axial depth of cut

a_e - radial depth of cut



CUTTING DATA

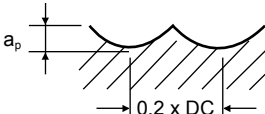
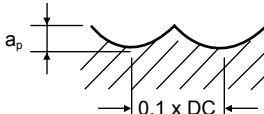
118370, 112370 (2 Flute Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc	NORMAL SPEED	Size (mm)								
					1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0	7.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	55	70	85	100	140	150	160	180	190
				n	17500	18570	18030	15910	14850	11930	10180	9550	8650
				f _z	0.008	0.009	0.011	0.026	0.026	0.035	0.045	0.06	0.075
				f (mm/min)	280	330	395	830	770	835	915	1145	1295
	6-9	Low alloy Steel	25-35	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	45	55	65	75	105	120	130	145	150
				n	14330	14590	13790	11930	11140	9550	8270	7690	6820
				f _z	0.008	0.009	0.011	0.023	0.023	0.032	0.04	0.06	0.07
				f (mm/min)	230	260	300	550	510	610	660	920	955
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	45	55	65	75	105	120	130	145	150
				n	14320	14590	13790	11930	11140	9550	8270	7690	6820
				f _z	0.008	0.009	0.011	0.023	0.023	0.032	0.04	0.06	0.07
				f (mm/min)	230	260	300	550	510	610	660	920	955
K	15-20	Cast Iron	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			v _c (m/min)	55	70	85	100	140	150	160	180	190	
			n	17500	18570	18030	15910	14850	11930	10180	9550	8650	
			f _z	0.008	0.009	0.011	0.026	0.026	0.035	0.045	0.06	0.075	
			f (mm/min)	280	330	395	830	770	835	915	1145	1295	
H	38	Hardened Steel	45-55	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	20	25	30	35	50	60	65	65	65
				n	6360	6630	6360	5570	5300	4770	4140	3450	2950
				f _z	0.008	0.009	0.011	0.016	0.017	0.021	0.024	0.03	0.035
				f (mm/min)	100	120	140	175	180	200	200	205	205
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

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



CUTTING DATA

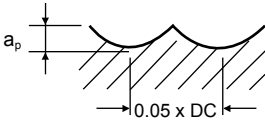
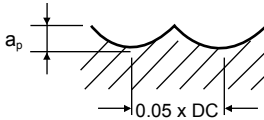
118370, 112370 (2 Flute Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc	NORMAL SPEED	Size (mm)								
					8.0	9.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	200	215	225	245	255	270	280	290	300
				n	7960	7600	7160	6500	5800	5370	4950	4610	3820
				f _z	0.09	0.1	0.12	0.15	0.16	0.18	0.19	0.2	0.25
				f (mm/min)	1430	1520	1720	1950	1855	1935	1180	1845	1910
	6-9	Low alloy Steel	25-35	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	160	170	180	195	200	215	220	230	235
				n	6360	6010	5730	5170	4550	4280	3890	3660	2990
				f _z	0.08	0.09	0.1	0.12	0.13	0.14	0.15	0.16	0.17
				f (mm/min)	1020	1080	1145	1240	1180	1200	1165	1170	1020
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	160	170	180	195	200	215	220	230	235
				n	6360	6010	5730	5170	4550	4280	3890	3660	2990
				f _z	0.08	0.09	0.1	0.12	0.13	0.14	0.15	0.16	0.17
				f (mm/min)	1020	1080	1145	1240	1180	1200	1165	1170	1020
K	15-20	Cast Iron	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
			v _c (m/min)	200	215	225	245	255	270	280	290	300	
			n	7960	7600	7160	6500	5800	5370	4950	4610	3820	
			f _z	0.09	0.1	0.12	0.15	0.16	0.18	0.19	0.2	0.25	
			f (mm/min)	1430	1520	1720	1950	1855	1935	1180	1845	1910	
H	38	Hardened Steel	45-55	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	70	70	70	75	75	75	75	80	80
				n	2780	2470	2230	1990	1700	1490	1330	1270	1020
				f _z	0.044	0.05	0.055	0.07	0.08	0.091	0.1	0.113	0.12
				f (mm/min)	245	245	245	280	275	270	265	290	245
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
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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



CUTTING DATA

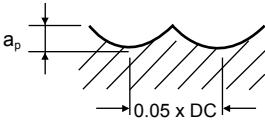
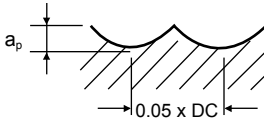
118370, 112370 (2 Flute Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc	HIGH SPEED	Size (mm)								
					1.0	1.2	1.5	2.0	3.0	4.0	5.0	6.0	7.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	90	105	120	150	220	295	370	445	455
				n	28650	27860	25460	23870	23340	23470	23550	23610	20700
				f _z	0.026	0.027	0.03	0.035	0.048	0.07	0.086	0.092	0.11
				f (mm/min)	1490	1505	1530	1670	2240	3285	4050	4485	4554
	6-9	Low alloy Steel	25-35	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	90	105	120	150	220	295	370	445	455
				n	28650	27860	25460	23870	23340	23470	23550	23610	20700
				f _z	0.026	0.027	0.03	0.035	0.048	0.07	0.086	0.092	0.11
				f (mm/min)	1490	1505	1530	1670	2240	3285	4050	4485	4554
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	90	105	120	150	220	295	370	445	455
				n	28650	27860	25460	23870	23340	23470	23550	23610	20700
				f _z	0.026	0.027	0.03	0.035	0.048	0.07	0.086	0.092	0.11
				f (mm/min)	1490	1505	1530	1670	2240	3285	4050	4485	4554
K	15-20	Cast Iron	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			v _c (m/min)	90	105	120	150	220	295	370	445	455	
			n	28650	27860	25460	23870	23340	23470	23550	23610	20700	
			f _z	0.026	0.027	0.03	0.035	0.048	0.07	0.086	0.092	0.11	
			f (mm/min)	1490	1505	1530	1670	2240	3285	4050	4485	4554	
H	38	Hardened Steel	45-55	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
				v _c (m/min)	90	105	120	150	180	190	210	220	225
				n	28650	27860	25460	23870	19100	15120	13370	11670	10230
				f _z	0.016	0.017	0.019	0.022	0.031	0.042	0.05	0.06	0.068
				f (mm/min)	920	950	970	1050	1180	1270	1335	1400	1400
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

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



CUTTING DATA

118370, 112370 (2 Flute Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc	HIGH SPEED	Size (mm)								
					8.0	9.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	470	485	495	515	530	540	550	560	570
				n	18700	17160	15750	13660	12050	10740	9730	8910	7260
				f _z	0.12	0.128	0.139	0.16	0.17	0.181	0.19	0.2	0.22
				f (mm/min)	4490	4390	4380	4370	4100	3890	3700	3565	3195
	6-9	Low alloy Steel	25-35	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	470	485	495	515	530	540	550	560	570
				n	18700	17160	15750	13660	12050	10740	9730	8910	7260
				f _z	0.12	0.128	0.139	0.16	0.17	0.181	0.19	0.2	0.22
				f (mm/min)	4490	4390	4380	4370	4100	3890	3700	3565	3195
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	470	485	495	515	530	540	550	560	570
				n	18700	17160	15750	13660	12050	10740	9730	8910	7260
				f _z	0.12	0.128	0.139	0.16	0.17	0.181	0.19	0.2	0.22
				f (mm/min)	4490	4390	4380	4370	4100	3890	3700	3565	3195
K	15-20	Cast Iron	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
			v _c (m/min)	470	485	495	515	530	540	550	560	570	
			n	18700	17160	15750	13660	12050	10740	9730	8910	7260	
			f _z	0.12	0.128	0.139	0.16	0.17	0.181	0.19	0.2	0.22	
			f (mm/min)	4490	4390	4380	4370	4100	3890	3700	3565	3195	
H	38	Hardened Steel	45-55	a _p (mm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
				v _c (m/min)	235	240	245	255	265	270	275	280	285
				n	9350	8490	7800	6760	6020	5370	4860	4455	3630
				f _z	0.075	0.08	0.086	0.095	0.1	0.105	0.11	0.115	0.12
				f (mm/min)	1405	1360	1340	1285	1200	1130	1070	1025	870
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

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

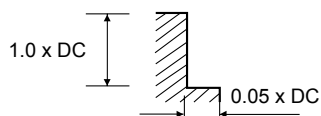


CUTTING DATA

109370 (4 Flute Short Length)														
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)									
					2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	80	95	105	110	115	120	115	115	120	125
				n	12730	10080	8350	7000	6100	4775	3660	3050	2730	2490
				f _z	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.047
				f (mm/min)	305	360	635	670	730	800	690	570	510	470
	6-9	Low alloy Steel	25-35	v _c (m/min)	55	60	65	65	70	70	70	70	75	75
				n	8750	6360	5170	4140	3710	2785	2230	1855	1705	1490
				f _z	0.006	0.009	0.019	0.024	0.031	0.038	0.037	0.037	0.037	0.037
				f (mm/min)	210	230	390	395	460	420	330	275	250	220
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	55	60	65	65	70	70	70	70	75	75
				n	8750	6360	5170	4140	3710	2785	2230	1855	1705	1490
				f _z	0.006	0.009	0.019	0.024	0.031	0.038	0.037	0.037	0.037	0.037
				f (mm/min)	210	230	390	395	460	420	330	275	250	220
M	14	Austenitic Stainless Steel	v _c (m/min)	45	50	55	55	60	60	60	55	60	60	
			n	7160	5300	4370	3500	3180	2385	1910	1460	1365	1195	
			f _z	0.005	0.009	0.018	0.024	0.029	0.041	0.045	0.044	0.045	0.046	
			f (mm/min)	140	190	315	335	370	390	345	255	245	220	
K	15-20	Cast Iron	v _c (m/min)	80	95	105	110	115	120	115	115	120	125	
			n	12730	10080	8350	7000	6100	4775	3660	3050	2730	2490	
			f _z	0.006	0.009	0.019	0.024	0.03	0.042	0.047	0.047	0.047	0.047	
			f (mm/min)	305	360	635	670	730	800	690	570	510	470	
H	38	Hardened Steel	45-55	v _c (m/min)	35	35	40	40	40	45	50	50	50	50
				n	5570	3710	3180	2545	2120	1790	1590	1325	1140	995
				f _z	0.005	0.004	0.005	0.008	0.01	0.017	0.016	0.017	0.017	0.016
				f (mm/min)	45	60	65	80	85	120	100	90	80	65

1.0 x DC

0.05 x DC

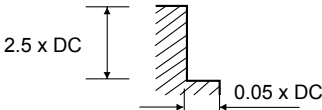
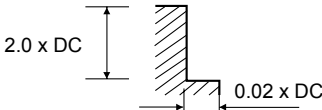


Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
 All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long series and long necked tools it may be necessary to 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

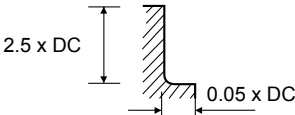
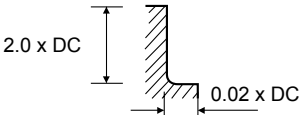


CUTTING DATA

111370 (4 Flute Standard Length)															
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)										
					2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	60	65	70	75	80	80	85	80	85	90	85
				n	9550	6900	5570	4775	4240	3180	2705	2120	1930	1790	1350
				f _z	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.048	0.05	0.049
				f (mm/min)	230	250	310	400	490	520	530	400	370	355	265
	6-9	Low alloy Steel	25-35	v _c (m/min)	35	40	40	45	45	45	50	50	50	50	50
				n	5570	4240	3180	2865	2385	1790	1590	1325	1135	995	795
				f _z	0.004	0.007	0.01	0.014	0.021	0.028	0.033	0.035	0.035	0.035	0.033
				f (mm/min)	90	120	125	160	200	200	210	185	160	140	105
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	35	40	40	45	45	45	50	50	50	50	50
				n	5570	4240	3180	2865	2385	1790	1590	1325	1135	995	795
				f _z	0.004	0.007	0.01	0.014	0.021	0.028	0.033	0.035	0.035	0.035	0.033
				f (mm/min)	90	120	125	160	200	200	210	185	160	140	105
K	15-20	Cast Iron	v _c (m/min)	60	65	70	75	80	80	85	80	85	90	85	
			n	9550	6900	5570	4775	4240	3180	2705	2120	1930	1790	1350	
			f _z	0.006	0.009	0.014	0.021	0.029	0.041	0.049	0.047	0.048	0.05	0.049	
			f (mm/min)	230	250	310	400	490	520	530	400	370	355	265	
H	38	Hardened Steel	45-55	v _c (m/min)	20	25	25	30	30	30	30	30	30	30	30
				n	3180	2650	1990	1910	1590	1190	955	795	680	595	475
				f _z	0.004	0.006	0.008	0.011	0.016	0.021	0.027	0.026	0.026	0.026	0.027
				f (mm/min)	50	65	65	85	100	100	100	80	70	60	50
MATERIAL GROUP P, K					MATERIAL GROUP H										
															



CUTTING DATA

157370 (4 Flute Standard Length, Corner Radius)													
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)								
					3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	70	75	80	80	85	85	85	95	85
				n	7430	5970	5090	4240	3380	2700	2255	1890	1350
				f _z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023	0.022
				f (mm/min)	180	240	245	235	255	250	200	175	120
	6-9	Low alloy Steel	25-35	v _c (m/min)	45	45	50	50	55	55	60	60	55
				n	4775	3580	3180	2650	2190	1750	1590	1195	875
				f _z	0.008	0.011	0.016	0.018	0.024	0.029	0.029	0.03	0.028
				f (mm/min)	150	160	200	190	210	195	185	140	100
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	45	45	50	50	55	55	60	60	55
				n	4775	3580	3180	2650	2190	1750	1590	1195	875
				f _z	0.008	0.011	0.016	0.018	0.024	0.029	0.029	0.03	0.028
				f (mm/min)	150	160	200	190	210	195	185	140	100
K	15-20	Cast Iron	v _c (m/min)	70	75	80	80	85	85	85	95	85	
			n	7430	5970	5090	4240	3380	2700	2255	1890	1350	
			f _z	0.006	0.01	0.012	0.014	0.019	0.023	0.022	0.023	0.022	
			f (mm/min)	180	240	245	235	255	250	200	175	120	
H	38	Hardened Steel	45-55	v _c (m/min)	25	30	35	35	35	35	35	35	35
				n	2650	2385	2230	1855	1390	1115	925	695	555
				f _z	0.006	0.008	0.011	0.013	0.017	0.021	0.020	0.022	0.023
				f (mm/min)	65	75	95	95	95	95	75	60	50
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

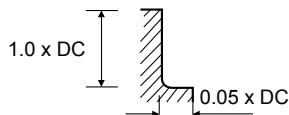
Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
 All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long series and long necked tools it may be necessary to 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



CUTTING DATA

156370 (4 Flute Stub Length, Corner Radius)											
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)						
					2.0	3.0	4.0	6.0	8.0	10.0	12.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	95	110	125	140	140	135	135
				n	15120	11670	9945	7425	5570	4295	3580
				f _z	0.006	0.009	0.019	0.03	0.042	0.047	0.048
				f (mm/min)	360	420	755	890	935	805	685
	6-9	Low alloy Steel	25-35	v _c (m/min)	65	70	75	85	85	85	85
				n	10340	7425	5970	4500	3380	2706	2255
				f _z	0.006	0.009	0.019	0.03	0.038	0.037	0.037
				f (mm/min)	250	265	450	540	510	400	330
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	65	70	75	85	85	85	85
				n	10340	7425	5970	4500	3380	2706	2255
				f _z	0.006	0.009	0.019	0.03	0.038	0.037	0.037
				f (mm/min)	250	265	450	540	510	400	330
K	15-20	Cast Iron	v _c (m/min)	95	110	125	140	140	135	135	
			n	15120	11670	9945	7425	5570	4295	3580	
			f _z	0.006	0.009	0.019	0.03	0.042	0.047	0.048	
			f (mm/min)	360	420	755	890	935	805	685	
H	38	Hardened Steel	45-55	v _c (m/min)	40	40	50	50	55	55	60
				n	6365	4240	3980	2650	2190	1750	1590
				f _z	0.002	0.004	0.005	0.01	0.016	0.017	0.017
				f (mm/min)	50	65	80	105	140	120	105

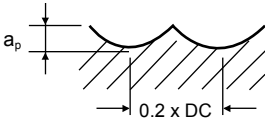
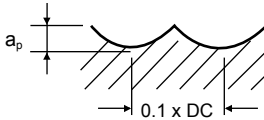


Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
 All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long series and long necked tools it may be necessary to 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



CUTTING DATA

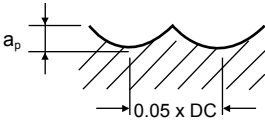
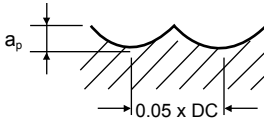
115370 (4 Flute Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc	NORMAL SPEED	Size (mm)								
					2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	105	130	140	150	170	190	210	230	250
				n	16710	13790	11140	9550	9020	7560	6685	6100	4975
				f _z	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136
				f (mm/min)	870	1045	1160	1300	1620	2055	2405	2710	2705
	6-9	Low alloy Steel	25-35	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	75	100	110	120	135	150	170	185	200
				n	11935	10640	8750	7640	7160	5970	5410	4905	3980
				f _z	0.01	0.17	0.024	0.03	0.045	0.06	0.075	0.089	0.106
				f (mm/min)	475	720	840	915	1290	1430	1620	1745	1685
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	75	100	110	120	135	150	170	185	200
				n	11935	10640	8750	7640	7160	5970	5410	4905	3980
				f _z	0.01	0.17	0.024	0.03	0.045	0.06	0.075	0.089	0.106
				f (mm/min)	475	720	840	915	1290	1430	1620	1745	1685
K	15-20	Cast Iron	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	
			v _c (m/min)	105	130	140	150	170	190	210	230	250	
			n	16710	13790	11140	9550	9020	7560	6685	6100	4975	
			f _z	0.013	0.019	0.026	0.034	0.045	0.068	0.09	0.111	0.136	
			f (mm/min)	870	1045	1160	1300	1620	2055	2405	2710	2705	
H	38	Hardened Steel	45-55	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	30	45	55	60	65	65	65	70	70
				n	4775	4775	4375	3820	3445	2585	2070	1855	1390
				f _z	0.008	0.012	0.016	0.018	0.022	0.033	0.041	0.053	0.069
				f (mm/min)	150	230	280	275	300	340	340	395	385
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

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



CUTTING DATA

115370 (4 Flute Ball Nose)													
VDI MATERIAL GROUP		MATERIAL	HRc	HIGH SPEED	Size (mm)								
					2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
P	1-5	Non-alloy Steel	<25	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	140	210	275	345	415	440	460	485	505
				n	22280	22280	21880	21960	22015	17505	14640	12865	10045
				f _z	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
				f (mm/min)	2315	3210	4550	5620	6253	6300	6150	6175	5465
	6-9	Low alloy Steel	25-35	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	140	210	275	345	415	440	460	485	505
				n	22280	22280	21880	21960	22015	17505	14640	12865	10045
				f _z	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
				f (mm/min)	2315	3210	4550	5620	6253	6300	6150	6175	5465
	10-11	High alloy Steel, Tool Steel	35-45	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	140	210	275	345	415	440	460	485	505
				n	22280	22280	21880	21960	22015	17505	14640	12865	10045
				f _z	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136
				f (mm/min)	2315	3210	4550	5620	6253	6300	6150	6175	5465
K	15-20	Cast Iron	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	
			v _c (m/min)	140	210	275	345	415	440	460	485	505	
			n	22280	22280	21880	21960	22015	17505	14640	12865	10045	
			f _z	0.026	0.036	0.052	0.064	0.071	0.09	0.105	0.12	0.136	
			f (mm/min)	2315	3210	4550	5620	6253	6300	6150	6175	5465	
H	38	Hardened Steel	45-55	a _p (mm)	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
				v _c (m/min)	140	170	180	200	210	220	230	240	250
				n	22280	18035	14320	12730	11140	8750	7320	6365	4975
				f _z	0.017	0.023	0.032	0.038	0.045	0.056	0.064	0.071	0.079
				f (mm/min)	1515	1660	1830	1935	2005	1960	1870	1805	1570
MATERIAL GROUP P, K					MATERIAL GROUP H								
													

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



CUTTING DATA

147370 (Multiflute Roughing)										
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)					
					6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	310	305	305	315	315	315
				n	16440	12135	9710	8355	6265	5010
				f _z	0.05	0.067	0.063	0.075	0.1	0.113
				f (mm/min)	2465	2440	2450	2505	2505	2265
	6-9	Low alloy Steel	25-35	v _c (m/min)	245	245	250	240	255	240
				n	12995	9750	7955	6365	5070	3820
				f _z	0.023	0.03	0.028	0.033	0.04	0.039
				f (mm/min)	895	875	890	840	810	595
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	245	245	250	240	255	240
				n	12995	9750	7955	6365	5070	3820
				f _z	0.023	0.03	0.028	0.033	0.04	0.039
				f (mm/min)	895	875	890	840	810	595
M	14	Austenitic Stainless Steel	v _c (m/min)	165	165	170	165	175	160	
			n	8750	6565	5410	4375	3480	2545	
			f _z	0.023	0.03	0.028	0.064	0.039	0.038	
			f (mm/min)	600	590	605	595	540	385	
K	15-20	Cast Iron	v _c (m/min)	310	305	305	315	315	315	
			n	16440	12135	9710	8355	6265	5010	
			f _z	0.05	0.067	0.063	0.075	0.1	0.113	
			f (mm/min)	2465	2440	2450	2505	2505	2265	
H	38	Hardened Steel	45-55	v _c (m/min)	65	65	65	65	65	65
				n	3450	2585	2070	1720	1290	1035
				f _z	0.026	0.033	0.036	0.039	0.034	0.038
				f (mm/min)	270	255	295	270	175	155

MATERIAL GROUP
P, M, K

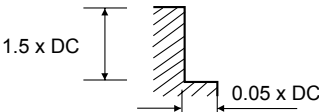
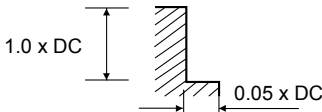
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Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
 All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up.
For long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



CUTTING DATA

149370 (6&8 Flute 45° Helix)										
VDI MATERIAL GROUP		MATERIAL	HRc	NORMAL SPEED	Size (mm)					
					6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	105	110	110	110	110	105
				n	5570	4375	3500	2920	2185	1670
				f _z	0.06	0.079	0.099	0.099	0.1	0.075
				f (mm/min)	2005	2075	2080	1730	1310	1000
	6-9	Low alloy Steel	25-35	v _c (m/min)	75	75	75	75	75	75
				n	3980	2985	2385	1990	1490	1190
				f _z	0.059	0.078	0.098	0.097	0.099	0.075
				f (mm/min)	1410	1395	1400	1155	885	715
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	75	75	75	75	75	75
				n	3980	2985	2385	1990	1490	1190
				f _z	0.059	0.078	0.098	0.097	0.099	0.075
				f (mm/min)	1410	1395	1400	1155	885	715
H	38	Hardened Steel	45-55	v _c (m/min)	75	75	75	75	75	75
				n	3980	2985	2385	1990	1490	1190
				f _z	0.059	0.078	0.098	0.097	0.099	0.075
				f (mm/min)	1410	1395	1400	1155	885	715
VDI MATERIAL GROUP		MATERIAL	HRc	HIGH SPEED	Size (mm)					
					6.0	8.0	10.0	12.0	16.0	20.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	325	325	320	325	325	325
				n	17240	12930	10185	8620	6465	5170
				f _z	0.06	0.081	0.4	0.4	0.4	0.076
				f (mm/min)	6205	6285	6110	5170	3880	3145
	6-9	Low alloy Steel	25-35	v _c (m/min)	325	325	320	325	325	325
				n	17240	12930	10185	8620	6465	5170
				f _z	0.06	0.081	0.4	0.4	0.4	0.076
				f (mm/min)	6205	6285	6110	5170	3880	3145
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	325	325	320	325	325	325
				n	17240	12930	10185	8620	6465	5170
				f _z	0.06	0.081	0.4	0.4	0.4	0.076
				f (mm/min)	6205	6285	6110	5170	3880	3145
H	38	Hardened Steel	45-55	v _c (m/min)	325	325	320	325	325	325
				n	17240	12930	10185	8620	6465	5170
				f _z	0.06	0.081	0.4	0.4	0.4	0.076
				f (mm/min)	6205	6285	6110	5170	3880	3145
MATERIAL GROUP P					MATERIAL GROUP H					
										

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)

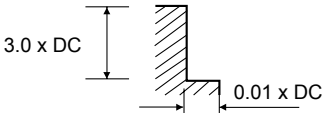
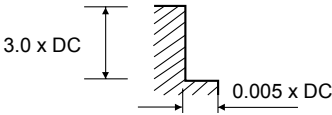
f - feed rate (mm/min)

a_p - axial depth of cut

a_e - radial depth of cut



CUTTING DATA

150370 (6 Flute Extra Length 45° Helix)											
VDI MATERIAL GROUP		MATERIAL	HRc		Size (mm)						
					6.0	8.0	10.0	12.0	16.0	20.0	25.0
P	1-5	Non-alloy Steel	<25	v _c (m/min)	45	45	45	45	45	45	45
				n	2385	1790	1430	1190	895	715	570
				f _z	0.035	0.045	0.055	0.06	0.065	0.07	0.074
				f (mm/min)	500	480	470	430	350	300	255
	6-9	Low alloy Steel	25-35	v _c (m/min)	30	30	30	30	30	30	30
				n	1590	1190	955	795	595	475	380
				f _z	0.035	0.044	0.05	0.053	0.061	0.067	0.071
				f (mm/min)	335	315	285	250	215	190	160
	10-11	High alloy Steel, Tool Steel	35-45	v _c (m/min)	30	30	30	30	30	30	30
				n	1590	1190	955	795	595	475	380
				f _z	0.035	0.044	0.05	0.053	0.061	0.067	0.071
				f (mm/min)	335	315	285	250	215	190	160
K	15-20	Cast Iron	v _c (m/min)	45	45	45	45	45	45	45	
			n	2385	1790	1430	1190	895	715	570	
			f _z	0.035	0.045	0.055	0.06	0.065	0.07	0.074	
			f (mm/min)	500	480	470	430	350	300	255	
H	38	Hardened Steel	45-55	v _c (m/min)	25	25	25	25	25	25	25
				n	1325	995	795	660	495	395	315
				f _z	0.03	0.038	0.046	0.051	0.054	0.06	0.064
				f (mm/min)	240	225	220	200	160	140	120
MATERIAL GROUP P, K					MATERIAL GROUP H						
											

Recommended cutting depths are **maximum** depths, and **speeds and feeds are a starting point** based on these depths.
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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