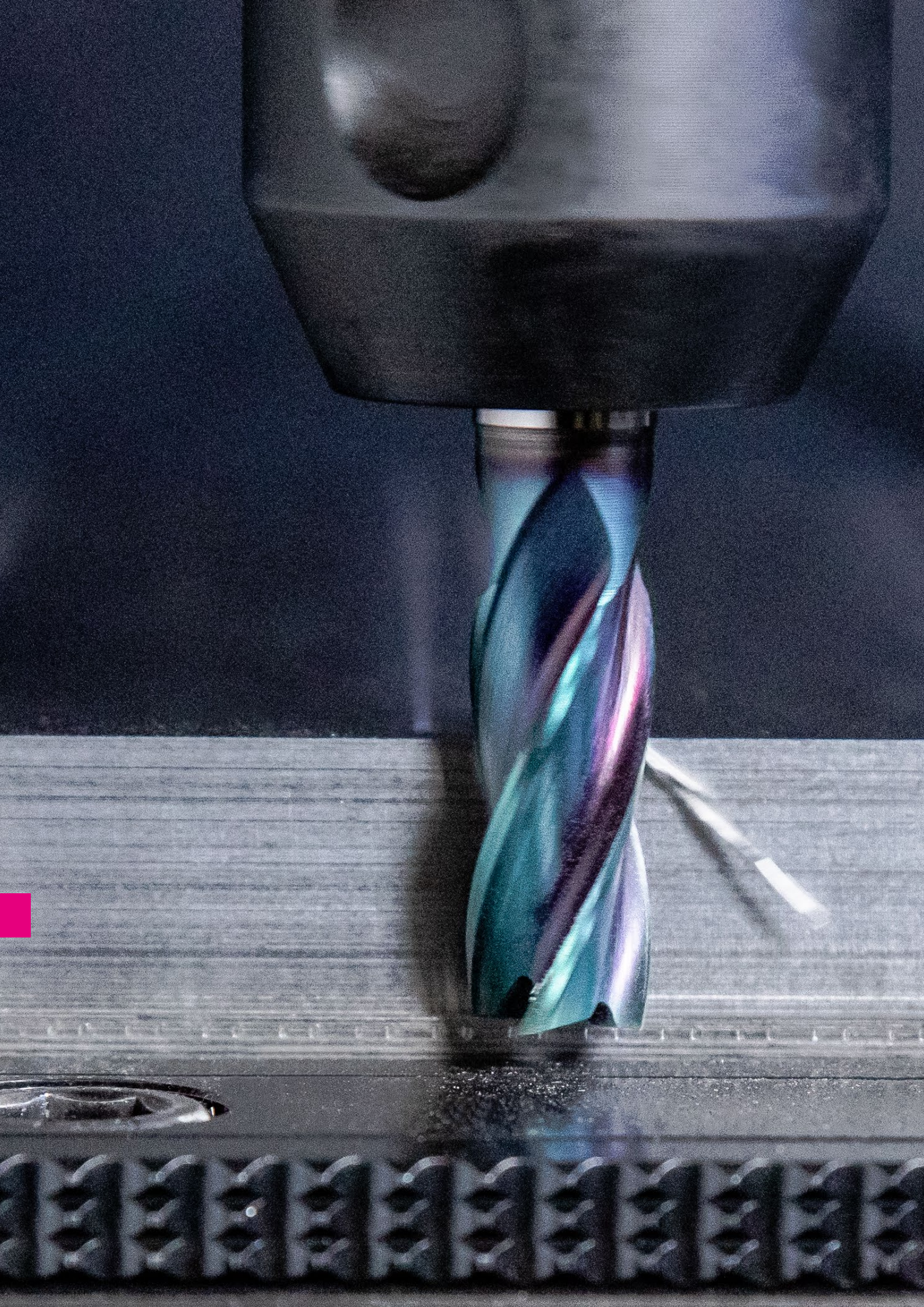


Table of contents

WNT \ Performance

Premium quality tools for high performance.

The premium quality tools from the **WNT Performance** product line have been designed for specific applications and are distinguished by their outstanding performance. If you make high demands on the performance of your production and want to achieve the very best results, we recommend the Premium tools in this product line.

Symbol explanation

Shank

Shank type

Length: extra short / short / medium / long / extra long

Cutting edge preparation

Sharp

Corner chamfer (CHW = chamfer width in mm)

Full Radius

Application

Machining example

The red arrows describe the possible feed directions

Cutting geometry
λ_s = helix angle
γ_s = rake angle

ZEFP = Number of flutes

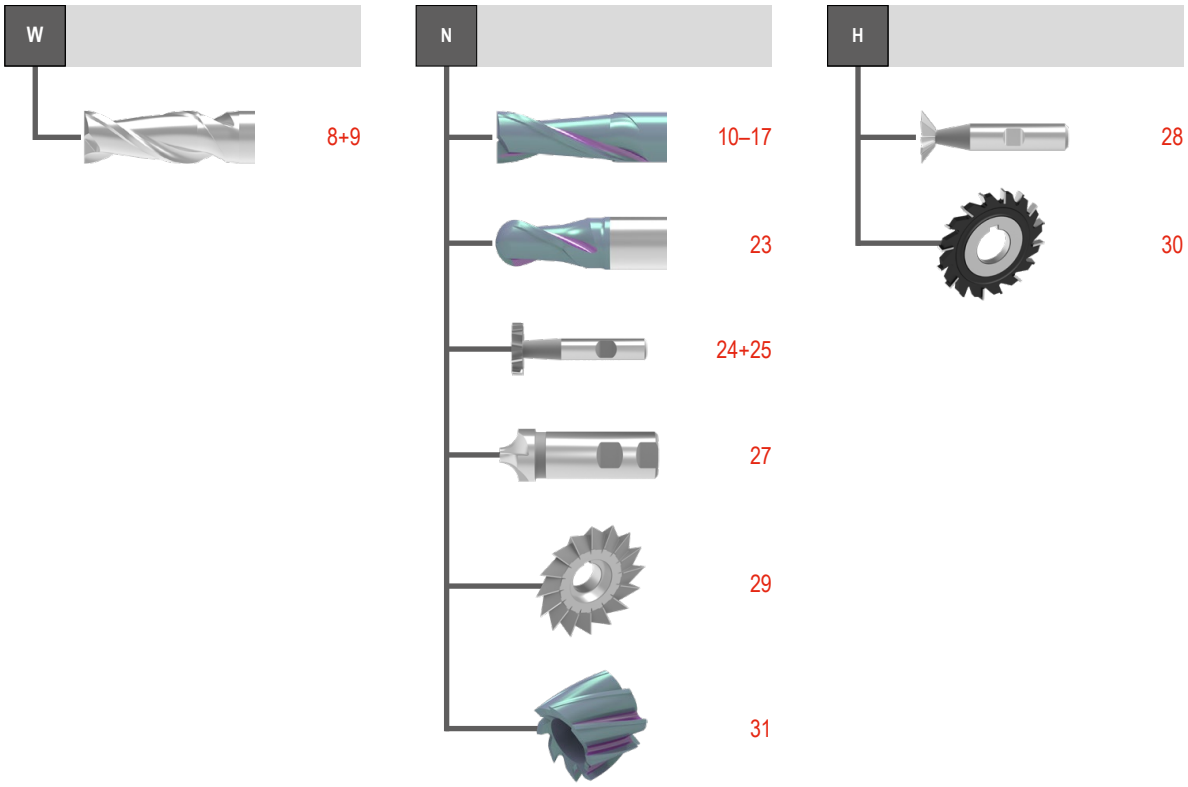
● = **Main Application**

○ = Extended application

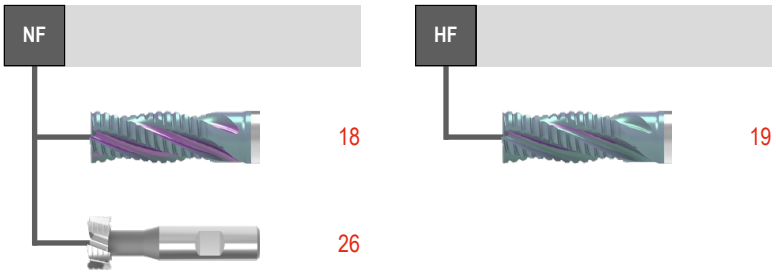
Toolfinder

softer — Material to machine — harder

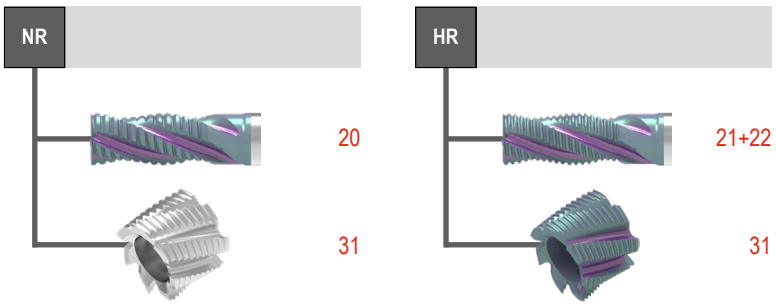
Finish milling



Rough and finish machining

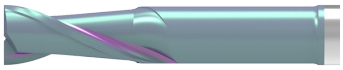
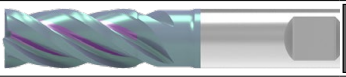
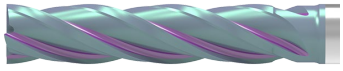
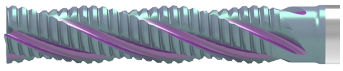
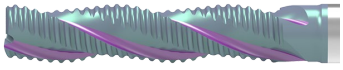


Rough machining



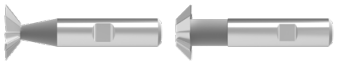
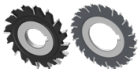
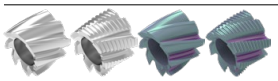
13

Overview HSS milling cutters

	Tool type	Number of flutes ZEFP	Diameter in mm Ø DC	Steel P	Stainless steel M	Cast iron K	Non-ferrous metals N	Heat-resistant S	Tempered steel H	Non-metal materials O	Sharp	Corner chamfer	Corner radius	Full Radius	Length	Material, e.g. PM = Powdersteel	coated	uncoated	WNT \ Performance
Finishing cutter																			
	W	2	2–20				●			●	■				▤	HSS-E		□	8
	W	3–4	2–32				●			●	■				▤	HSS-E		□	9
	N	2	1–26	●	●	●	○	○		○	■				▤	HSS-E	■	□	10+11
	N	3	1–10	●	●	●	○	○		○	■				▤	HSS-E	■	□	12
	N	3	1,8–22,0	●	●	●	○	○		○	■				▤	HSS-E	■		13+14
	N	4	4–20	○	●	○	●	●		●	■				▤	HSS-E	■	□	15
	N	4–8	2–50	●	●	●	○	○		○	■				▤	HSS-E	■	□	16+17
Rough and finish milling cutters																			
	NF	4	6–25	●	○	●	○	○		○	■				▤	HSS-E	■		18
	HF	4	6–20	●	○	●	○	○		○	■				▤	PM	■		19
Rough milling cutters																			
	NR	3	6–25	●	○	●	○	○		○		■			▤	HSS-E	■		20
	HR	4–6	6–32	●	●	●	○	○		○		■			▤	PM	■		21
	HR	3–6	4–32	●	●	●	○	○		○		■			▤	HSS-E	■		22
Ball nose end milling cutters																			
	N	2	2–30	●	○	●	○	○		○				◡	▤	HSS-E	■	□	23

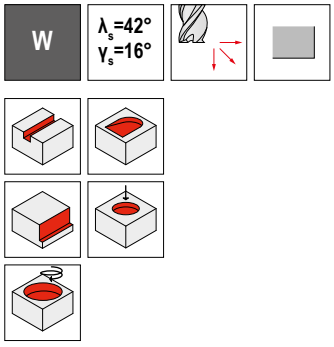
Overview HSS milling cutters

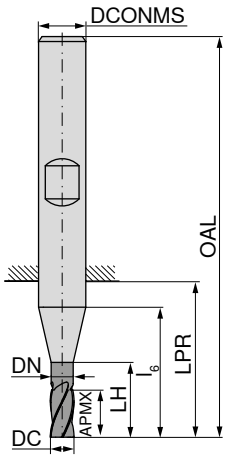
Form / Side and Face / Shell milling cutters

	Tool type	Number of flutes ZEFP	Diameter in mm Ø DC	Steel P	Stainless steel M	Cast iron K	Non-ferrous metals N	Heat-resistant S	Tempered steel H	Non-metal materials O	Sharp	Corner chamfer	Corner radius	Full Radius	Length	Material, e.g. PM = Powdersteel	coated	uncoated	WNT \ Performance
	N	6–10	11–60	●	○	●	○	○		○						HSS-E		☐	24
	N	6–12	10,5–45,5	●	○	●	○	○		○						HSS-E		☐	25
	NF	6–8	21–45	●	○	●	○	○		○						HSS-E		☐	26
	N	4–6	6–16	●	○	●	○	○		○						HSS-E		☐	27
	H	10	16–25	●	○	●	○	○		○						HSS-E		☐	28
	N	14–28	40–125	●	○	●	○	○		○						HSS-E		☐	29
	H	16–48	50–160	●	○	●	●	●		●						HSS-E		☐	30
		7–10	40–80	●	●	●	●	○		●						HSS-E	☐	☐	31

13

Slot milling cutter HSS-E Co 8





DIN 844

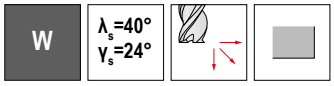
50 144 ...

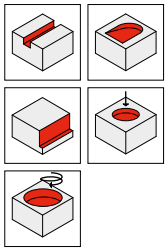
DC e8 mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS h6 mm	ZEFP	
2,0	7		7	13	15	51	6	2	**020**
2,5	8		8	14	16	52	6	2	**025**
3,0	8		8	14	16	52	6	2	**030**
4,0	11		11	17	19	55	6	2	**040**
5,0	13		13	19	21	57	6	2	**050**
6,0	13		13	19	21	57	6	2	**060**
6,5	16	6,0	22	24	26	66	10	2	**065**
8,0	19	7,5	25	27	29	69	10	2	**080**
10,0	22	9,5	30	30	32	72	10	2	**100**
12,0	26	11,5	36	36	38	83	12	2	**120**
14,0	26	11,5	36	36	38	83	12	2	**140**
16,0	32	15,0	42	42	44	92	16	2	**160**
18,0	32	15,0	42	42	44	92	16	2	**180**
20,0	38	19,0	52	52	54	104	20	2	**200**

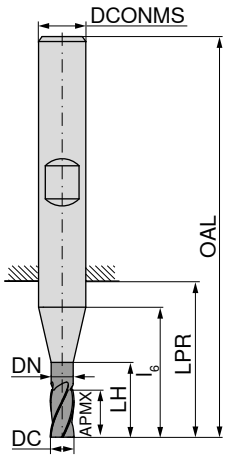
P	
M	
K	
N	●
S	
H	
O	●

→ v_c/f_z Page 33–35

End milling cutter HSS-E Co 8







	DIN 69844	DIN 844
	50 120 ...	50 121 ...

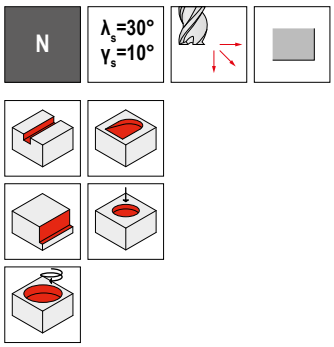
DC k10 mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS h6 mm	ZEFP		
2	7		7	13	15	51	6	3	020	
3	8		8	14	16	52	6	3	030	
3	12		12	18	20	56	6	3		030
4	11		11	17	19	55	6	3	040	
4	19		19	25	27	63	6	3		040
5	13		13	19	21	57	6	3	050	
5	24		24	30	32	68	6	3		050
6	13	5,5	19	19	21	57	6	3	060	
6	24	5,5	30	30	32	68	6	3		060
7	16	6,5	22	24	26	66	10	3	070	
7	30	6,5	36	38	40	80	10	3		070
8	19	7,5	25	27	29	69	10	3	080	
8	38	7,5	44	46	48	88	10	3		080
9	19	8,5	26	27	29	69	10	3	090	
9	38	8,5	45	46	48	88	10	3		090
10	22	9,5	30	30	32	72	10	3	100	
10	45	9,5	53	53	55	95	10	3		100
12	26	11,5	36	36	38	83	12	3	120	
12	53	11,5	63	63	65	110	12	3		120
14	26	11,5	36	36	38	83	12	3	140	
14	53	11,5	63	63	65	110	12	3		140
16	32	15,0	42	42	44	92	16	3	160	
16	63	15,0	73	73	75	123	16	3		160
18	32	15,0	42	42	44	92	16	3	180	
18	63	15,0	73	73	75	123	16	3		180
20	38	19,0	52	52	54	104	20	3	200	
20	75	19,0	89	89	91	141	20	3		200
22	38	19,0	52	52	54	104	20	3	220	
22	75	19,0	89	89	91	141	20	3		220
24	90	23,0	106	108	110	166	25	3		240
25	45	24,0	63	45	65	121	25	4	250	
25	90	24,0	108	108	110	166	25	4		250
28	90	24,0	108	108	110	166	25	4		280
30	90	24,0	108	108	110	166	25	4		300
32	106	31,0	123	123	126	186	32	4		320

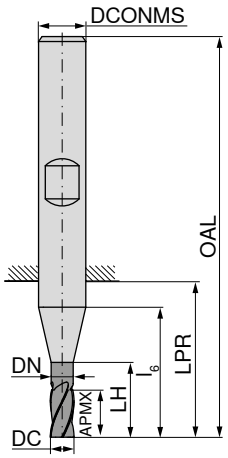
P		
M		
K		
N	●	●
S		
H		
O	●	●

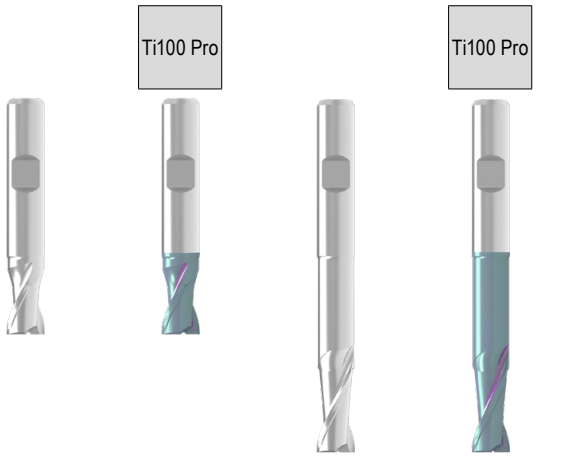
→ v_c/f_z Page 33–35

13

Slot milling cutter HSS-E Co 8







	DIN 327	DIN 327	Factory standard	Factory standard
	50 100 ...	54 025 ...	50 122 ...	54 020 ...

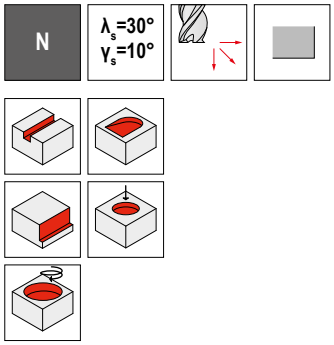
DC mm	DC Tol.	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	ZEFP				
1,0	h10	2,5		2,5	9	11	47	6	2	010 [1]	010 [1]		
1,5	h10	3,0		3,0	9	11	47	6	2	015 [1]	015 [1]		
1,8	h10	4,0		4,0	10	12	48	6	2	018	018		
2,0	e8	4,0		4,0	10	12	48	6	2	020	020		
2,5	e8	5,0		5,0	11	13	49	6	2	025	025		
3,0	e8	5,0		5,0	11	13	49	6	2	030	030		
3,0	e8	8,0		8,0	18	20	56	6	2			030	030
3,5	h10	6,0		6,0	12	14	50	6	2	035	035		
4,0	e8	7,0		7,0	13	15	51	6	2	040	040		
4,0	e8	11,0		11,0	25	27	63	6	2			040	040
4,5	h10	7,0		7,0	13	15	51	6	2	045	045		
5,0	e8	8,0		8,0	14	16	52	6	2	050	050		
5,0	e8	13,0		13,0	30	32	68	6	2			050	050
5,5	h10	8,0		8,0	14	16	52	6	2	055	055		
6,0	e8	8,0	5,50	14,0	14	16	52	6	2	060	060		
6,0	e8	13,0	5,50	30,0	30	32	68	6	2			060	060
6,5	h10	10,0	6,00	16,0	18	20	60	10	2	065	065		
7,0	e8	10,0	6,50	16,0	18	20	60	10	2	070	070		
7,0	e8	16,0	6,35	36,0	38	40	80	10	2			070	070
7,5	h10	10,0	7,00	16,0	18	20	60	10	2	075	075		
8,0	e8	11,0	7,50	17,0	19	21	61	10	2	080	080		
8,0	e8	19,0	7,35	44,0	46	48	88	10	2			080	080
8,5	h10	11,0	8,00	18,0	19	21	61	10	2	085	085		
9,0	h10	11,0	8,50	18,0	19	21	61	10	2	090	090		
9,0	h10	19,0	8,35	45,0	46	48	88	10	2			090	090
9,5	h10	11,0	9,00	18,0	19	21	61	10	2	095	095		
10,0	e8	13,0	9,50	21,0	21	23	63	10	2	100	100		
10,0	e8	22,0	9,35	53,0	53	55	95	10	2			100	100
10,5	h10	13,0	10,00	21,0	23	25	70	12	2	105	105		
11,0	h10	13,0	10,50	21,0	23	25	70	12	2	110	110		
11,0	h10	22,0	10,50	53,0	55	57	102	12	2			110	110
11,5	h10	13,0	11,00	21,0	23	25	70	12	2	115	115		
12,0	e8	16,0	11,50	26,0	26	28	73	12	2	120	120		
12,0	e8	26,0	11,50	63,0	63	65	110	12	2			120	120
13,0	h10	16,0	11,50	26,0	26	28	73	12	2	130	130		
14,0	e8	16,0	11,50	26,0	26	28	73	12	2	140	140		
14,0	e8	26,0	11,50	63,0	63	65	110	12	2			140	140
15,0	h10	16,0	11,50	26,0	26	28	73	12	2	150	150		
15,0	h10	26,0	11,50	63,0	63	65	110	12	2			150	150
16,0	e8	19,0	15,00	29,0	29	31	79	16	2	160	160		
16,0	e8	32,0	15,00	73,0	73	75	123	16	2			160	160
P										●	●	●	●
M										○	●	○	●
K										●	●	●	●
N										○	○	○	○
S										○	○	○	○
H													
O										○	○	○	○

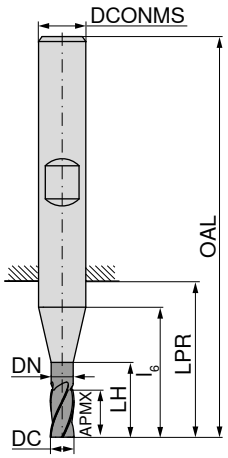
1) Factory standard

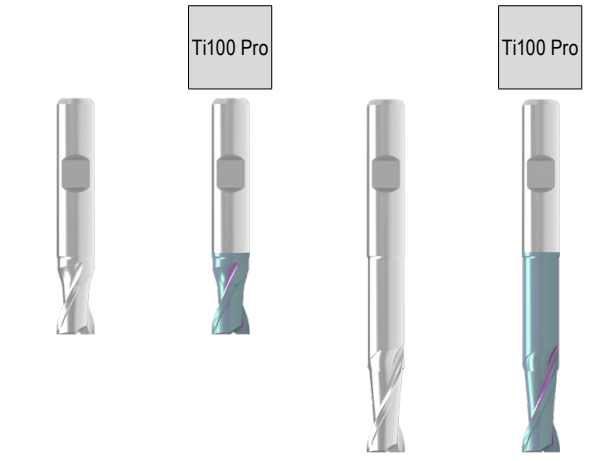
→ v_c/f_z Page 33–35

Continued on next page

Slot milling cutter HSS-E Co 8







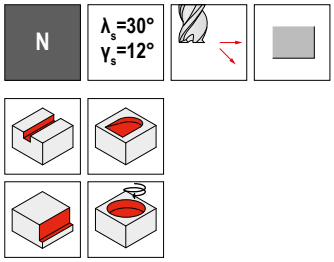
										DIN 327		DIN 327		Factory standard		Factory standard	
										50 100 ...		54 025 ...		50 122 ...		54 020 ...	
DC mm	DC Tol.	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	ZEFP								
17,0	h10	19,0	15,00	29,0	29	31	79	16	2	**170**		**170**					
18,0	e8	19,0	15,00	29,0	29	31	79	16	2	**180**		**180**					
18,0	e8	32,0	15,00	73,0	73	75	123	16	2					**180**		**180**	
19,0	h10	19,0	15,00	29,0	29	31	79	16	2	**190**		**190**					
20,0	e8	22,0	19,00	36,0	36	38	88	20	2	**200**		**200**					
20,0	e8	38,0	19,00	89,0	89	91	141	20	2					**200**		**200**	
22,0	e8	22,0	19,00	36,0	36	38	88	20	2	**220**		**220**					
24,0	e8	26,0	23,00	42,0	44	46	102	25	2	**240**		**240**					
25,0	e8	26,0	24,00	44,0	44	46	102	25	2	**250**		**250**					
26,0	h10	26,0	24,00	44,0	44	46	102	25	2	**260**		**260**					
P										●		●		●		●	
M										○		●		○		●	
K										●		●		●		●	
N										○		○		○		○	
S										○		○		○		○	
H																	
O										○		○		○		○	

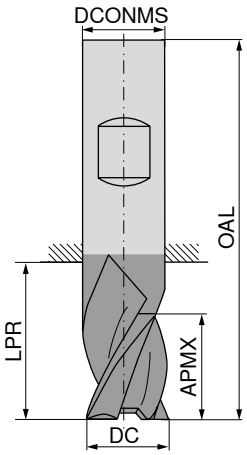
1) Factory standard

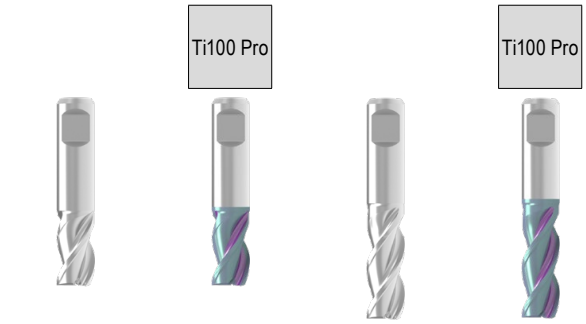
→ v_c/f_z Page 33–35

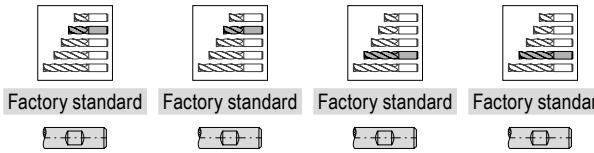
Throw-away milling cutter, HSS-E Co 8

▲ Shank similar to DIN 1835 B









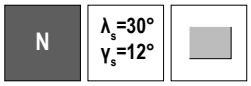
DC e8 mm	APMX mm	LPR mm	OAL mm	DCONMS h6 mm	ZEFP	50 092 ...	54 014 ...	50 093 ...	54 042 ...
1,00	2	8	34	6	3	010	010		
1,50	3	8	34	6	3	015	015		
1,50	4	10	35	6	3			015 [1]	015 [1]
1,80	3	8	34	6	3	018	018		
2,00	4	9	35	6	3	020	020		
2,00	7	12	38	6	3			020 [1]	020
2,30	4	9	35	6	3	023	023		
2,50	5	10	36	6	3	025	025		
2,50	8	13	39	6	3			025 [1]	025
2,80	5	10	36	6	3	028	028		
3,00	5	10	36	6	3	030	030		
3,00	8	13	39	6	3			030 [1]	030
3,30	6	11	37	6	3	033	033		
3,50	6	11	37	6	3	035	035		
3,50	10	15	41	6	3			035 [1]	035
3,80	7	12	38	6	3	038	038		
4,00	7	12	38	6	3	040	040		
4,00	11	16	42	6	3			040 [1]	040
4,30	7	12	38	6	3	043	043		
4,50	7	12	38	6	3	045	045		
4,50	11	16	42	6	3			045 [1]	045
4,80	8	13	39	6	3	048	048		
5,00	8	13	39	6	3	050	050		
5,00	13	18	44	6	3			050 [1]	050
5,30	8	13	39	6	3	053	053		
5,50	8	13	39	6	3	055	055		
5,50	13	18	44	6	3			055 [1]	055
5,75	8	13	39	6	3	057	057		
6,00	8	13	39	6	3	060	060		
6,00	13	18	44	6	3			060 [1]	060
6,50	10	14	42	8	3	065	065		
6,50	16	20	48	8	3			065 [1]	065
7,00	10	14	42	8	3	070	070		
7,00	16	20	48	8	3			070 [1]	070
7,50	10	14	42	8	3	075	075		
7,50	16	20	48	8	3			075 [1]	075
8,00	11	15	43	8	3	080	080		
8,00	19	23	51	8	3			080 [1]	080
8,50	11	16	48	10	3	085	085		
8,50	19	24	56	10	3			085 [1]	085
9,00	11	16	48	10	3	090	090		
9,00	19	24	56	10	3			090 [1]	090
9,50	11	16	48	10	3	095	095		
9,50	19	24	56	10	3			095 [1]	095
10,00	13	18	50	10	3	100	100		
10,00	22	27	59	10	3			100 [1]	100
P						●	●	●	●
M						○	●	○	●
K						●	●	●	●
N						○	○	○	○
S						○	○	○	○
H									
O						○	○	○	○

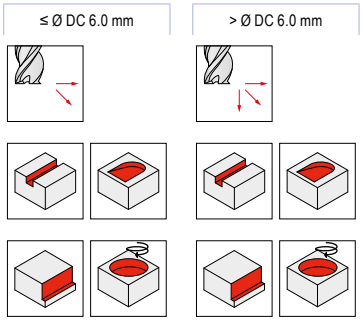
1) Shank tolerance -0,025 / -0,0323

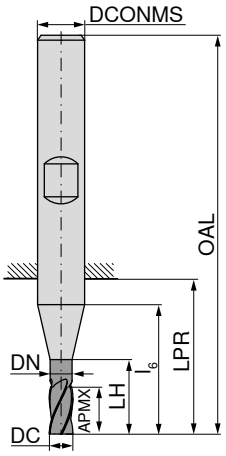
→ v_c/f_z Page 33–35

End milling cutter HSS-E Co 8

▲ ≤ Ø DC 6 mm, 3 cutting edges to centre







DIN 327 | DIN 844 K

DC	DC Tol.	APMX	DN	LH	l_6	LPR	OAL	DCONMS	ZEFP	54 021 ...	54 016 ...
mm		mm	mm	mm	mm	mm	mm	mm			
1,8	h10	4		4	10	12	48	6	3	018	
2,0	e8	4		4	10	12	48	6	3	020	
2,5	e8	5		5	11	13	49	6	3	025	
3,0	e8	5		5	11	13	49	6	3	030	
3,0	e8	8		8	14	16	52	6	3		030
3,5	h10	6		6	12	14	50	6	3	035	
3,5	h10	10		10	16	18	54	6	3		035
4,0	e8	7		7	13	15	51	6	3	040	
4,0	e8	11		11	17	19	55	6	3		040
4,5	h10	7		7	13	15	51	6	3	045	
4,5	h10	11		11	17	19	55	6	3		045
5,0	e8	8		8	14	16	52	6	3	050	
5,0	e8	13		13	19	21	57	6	3		050
5,5	h10	8		8	14	16	52	6	3	055	
5,5	h10	13		13	19	21	57	6	3		055
6,0	e8	8	5,5	14	14	16	52	6	3	060	
6,0	e8	13	5,5	19	19	21	57	6	3		060
6,5	h10	10	6,0	16	18	20	60	10	3	065	
6,5	h10	16	6,0	22	24	26	66	10	3		065
7,0	e8	10	6,5	16	18	20	60	10	3	070	
7,0	e8	16	6,5	22	24	26	66	10	3		070
7,5	h10	10	7,0	16	18	20	60	10	3	075	
7,5	h10	16	7,0	22	24	26	66	10	3		075
8,0	e8	11	7,5	17	19	21	61	10	3	080	
8,0	e8	19	7,5	25	27	29	69	10	3		080
8,5	h10	11	8,0	18	19	21	61	10	3	085	
8,5	h10	19	8,0	26	27	29	69	10	3		085
9,0	h10	11	8,5	18	19	21	61	10	3	090	
9,0	h10	19	8,5	26	27	29	69	10	3		090
9,5	h10	11	9,0	18	19	21	61	10	3	095	
9,5	h10	19	9,0	26	27	29	69	10	3		095
10,0	e8	13	9,5	21	21	23	63	10	3	100	
10,0	e8	22	9,5	30	30	32	72	10	3		100
10,5	h10	13	10,0	21	23	25	70	12	3	105	
11,0	h10	13	10,5	21	23	25	70	12	3	110	
11,0	h10	22	10,5	30	32	34	79	12	3		110
11,5	h10	13	11,0	21	23	25	70	12	3	115	
11,5	h10	22	11,0	30	32	34	79	12	3		115
12,0	e8	16	11,5	26	26	28	73	12	3	120	
12,0	e8	26	11,5	36	36	38	83	12	3		120

P	●	●
M	●	●
K	●	●
N	○	○
S	○	○
H		
O	○	○

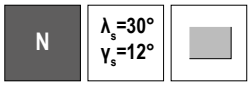
→ v_c/f_z Page 33–35

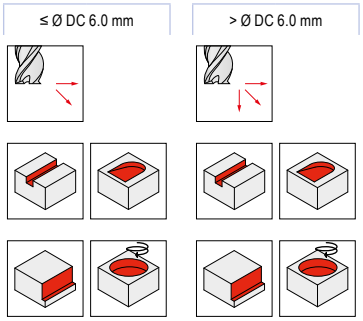
13

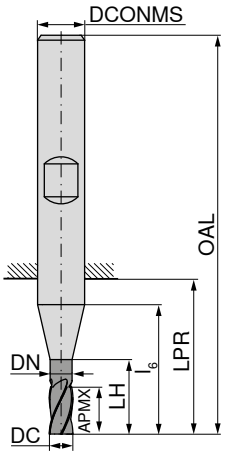
Continued on next page

End milling cutter HSS-E Co 8

▲ ≤ Ø DC 6 mm, 3 cutting edges to centre





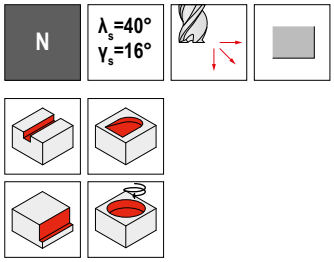


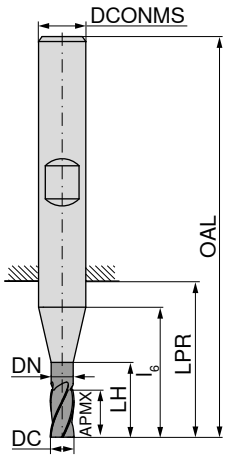
DIN 327 | DIN 844 K

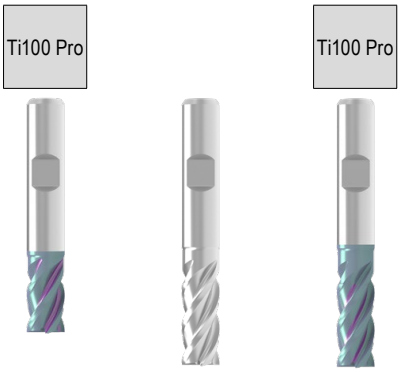
DC mm	DC Tol.	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS mm	ZEFP	54 021 ...	54 016 ...
13,0	h10	16	11,5	26	26	28	73	12	3	**130**	
13,0	h10	26	11,5	36	36	38	83	12	3		**130**
14,0	e8	16	11,5	26	26	28	73	12	3	**140**	
14,0	e8	26	11,5	36	36	38	83	12	3		**140**
15,0	h10	16	11,5	26	26	28	73	12	3	**150**	
15,0	h10	26	11,5	36	36	38	83	12	3		**150**
15,5	h10	32	15,0	42	42	44	92	16	3		**155**
16,0	e8	19	15,0	29	29	31	79	16	3	**160**	
16,0	e8	32	15,0	42	42	44	92	16	3		**160**
17,0	h10	19	15,0	29	29	31	79	16	3	**170**	
17,0	h10	32	15,0	42	42	44	92	16	3		**170**
18,0	e8	19	15,0	29	29	31	79	16	3	**180**	
18,0	e8	32	15,0	42	42	44	92	16	3		**180**
19,0	h10	19	15,0	29	29	31	79	16	3	**190**	
19,0	h10	32	15,0	42	42	44	92	16	3		**190**
19,5	h10	38	19,0	52	52	54	104	20	3		**195**
20,0	e8	22	19,0	36	36	38	88	20	3	**200**	
20,0	e8	38	19,0	52	52	54	104	20	3		**200**
22,0	e8	38	19,0	52	52	54	104	20	3		**220**
P										●	●
M										●	●
K										●	●
N										○	○
S										○	○
H											
O										○	○

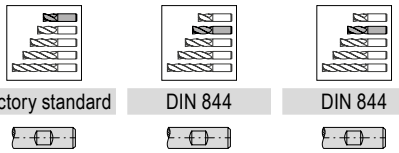
→ v_c/f_z Page 33–35

End milling cutter HSS-E Co 8









	Factory standard	DIN 844	DIN 844
	54 017 ...	50 124 ...	54 011 ...

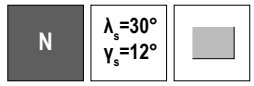
DC mm	DC Tol.	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	ZEFP				
4	k10	11		11	17	19	55	6	4			**040**	**040**
5	k10	13		13	19	21	57	6	4			**050**	**050**
6	e8	8	5,5	14	14	16	52	6	4	**060**			
6	k10	13	5,5	19	19	21	57	6	4			**060**	**060**
8	e8	11	7,5	17	19	21	61	10	4	**080**			
8	k10	19	7,5	25	27	29	69	10	4			**080**	**080**
10	e8	13	9,5	21	21	23	63	10	4	**100**			
10	k10	22	9,5	30	30	32	72	10	4			**100**	**100**
12	e8	16	11,5	26	26	28	73	12	4	**120**			
12	k10	26	11,5	36	36	38	83	12	4			**120**	**120**
14	e8	16	11,5	26	26	28	73	12	4	**140**			
14	k10	26	11,5	36	36	38	83	12	4			**140**	**140**
15	k10	26	11,5	36	36	38	83	12	4			**150**	
16	e8	19	15,0	29	29	31	79	16	4	**160**			
16	k10	32	15,0	42	42	44	92	16	4			**160**	**160**
20	e8	22	19,0	36	36	38	88	20	4	**200**			
20	k10	38	19,0	52	52	54	104	20	4			**200**	**200**
P										○		○	○
M										●		●	●
K										○		○	○
N										●		●	●
S										●		●	●
H													
O										●		●	●

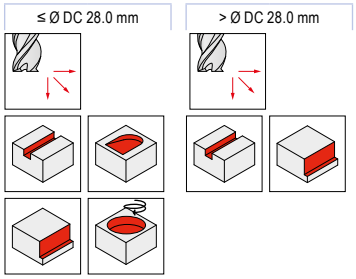
→ v_c/f_z Page 33–35

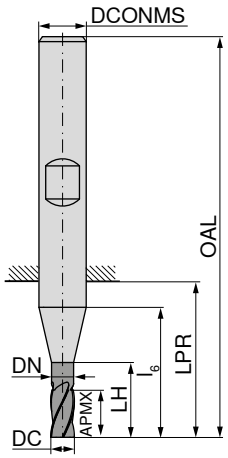
13

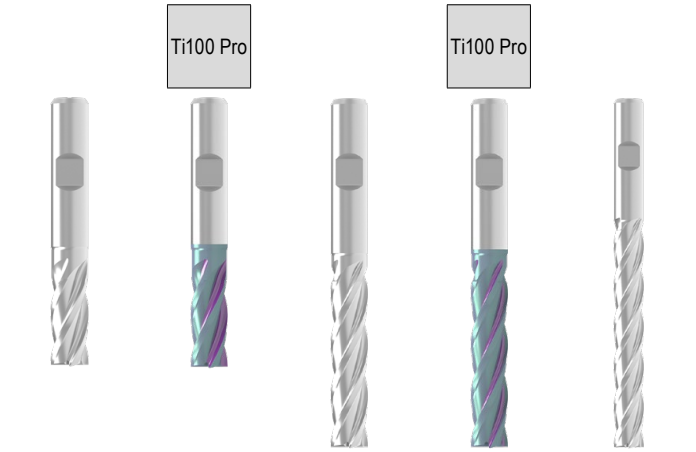
End milling cutter HSS-E Co 8

▲ > Ø 28,0 mm recessed centre









	DIN 69844	DIN 69844	DIN 844	DIN 844	Factory standard
	50 110 ...	54 018 ...	50 111 ...	54 019 ...	50 104 ...

DC mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS mm	ZEFP									
2,0	7		7	13	15	51	6	4	**020**		**020**						
2,5	8		8	14	16	52	6	4	**025**		**025**						
3,0	8		8	14	16	52	6	4	**030**		**030**						
3,0	12		12	18	20	56	6	4					**030**		**030**		
4,0	11		11	17	19	55	6	4	**040**		**040**						
4,0	19		19	25	27	63	6	4					**040**		**040**		
5,0	13		13	19	21	57	6	4	**050**		**050**						
5,0	24		24	30	32	68	6	4					**050**		**050**		
6,0	13	5,5	19	19	21	57	6	4	**060**		**060**						
6,0	24	5,5	30	30	32	68	6	4					**060**		**060**		
6,0	56	5,5	62	62	64	100	6	4									**060**
7,0	16	6,5	22	24	26	66	10	4	**070**		**070**						
8,0	19	7,5	25	27	29	69	10	4	**080**		**080**						
8,0	38	7,5	44	46	48	88	10	4					**080**		**080**		
8,0	70	7,5	73	73	75	115	10	4									**080**
9,0	19	8,5	26	27	29	69	10	4	**090**		**090**						
10,0	22	9,5	30	30	32	72	10	4	**100**		**100**						
10,0	45	9,5	53	53	55	95	10	4					**100**		**100**		
10,0	75	9,5	79	79	81	121	10	4									**100**
11,0	22	10,5	30	32	34	79	12	4	**110**		**110**						
12,0	26	11,5	36	36	38	83	12	4	**120**		**120**						
12,0	53	11,5	63	63	65	110	12	4					**120**		**120**		
12,0	85		85	85	85	130	12	4									**120**
13,0	26	11,5	36	36	38	83	12	4	**130**		**130**						
14,0	26	11,5	36	36	38	83	12	4	**140**		**140**						
14,0	53	11,5	63	63	65	110	12	4					**140**		**140**		
14,0	85		85	85	85	130	12	4									**140**
15,0	26	11,5	36	36	38	83	12	4	**150**		**150**						
15,0	53	11,5	63	63	65	110	12	4					**150**		**150**		
16,0	32	15,0	42	42	44	92	16	4	**160**		**160**						
16,0	63	15,0	73	73	75	123	16	4					**160**		**160**		
16,0	90	15,0	95	95	97	145	16	4									**160**
18,0	32	15,0	42	42	44	92	16	4	**180**		**180**						
18,0	63	15,0	73	73	75	123	16	4					**180**		**180**		
18,0	100	15,0	110	110	112	160	16	5									**180**
20,0	38	19,0	52	52	54	104	20	4	**200**		**200**						
20,0	75	19,0	89	89	91	141	20	4					**200**		**200**		
20,0	110	19,0	128	128	130	180	20	5									**200**

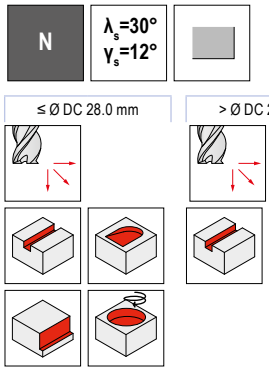
P	●	●	●	●	●
M	○	●	○	●	○
K	●	●	●	●	●
N	○	○	○	○	○
S	○	○	○	○	○
H					
O	○	○	○	○	○

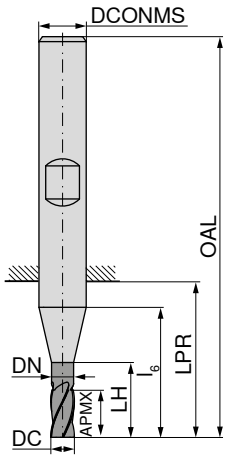
→ v_c/f_z Page 33–35

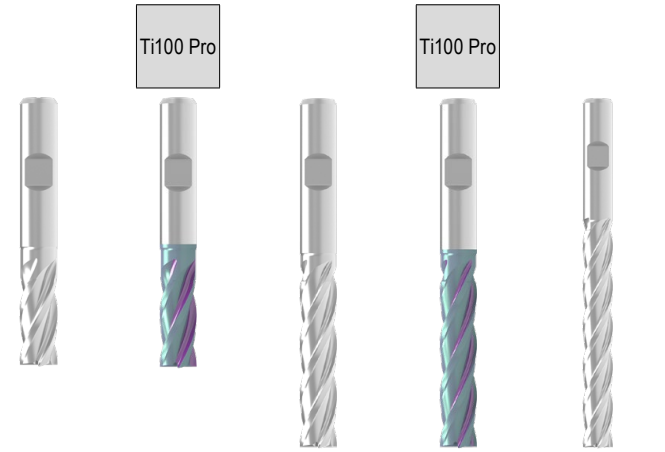
Continued on next page

End milling cutter HSS-E Co 8

▲ > Ø 28,0 mm recessed centre







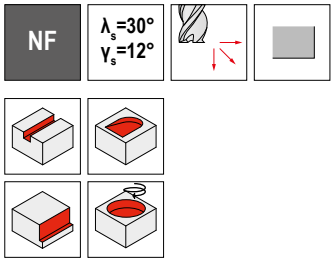
	DIN 69844	DIN 69844	DIN 844	DIN 844	Factory standard
	50 110 ...	54 018 ...	50 111 ...	54 019 ...	50 104 ...

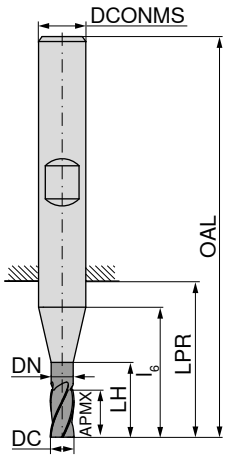
DC mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS mm	ZEFP						
22,0	38	19,0	52	52	54	104	20	5	**220**	**220**				
22,0	75	19,0	89	89	91	141	20	5			**220**	**220**		
22,0	110	19,0	128	128	130	180	20	5						**220**
25,0	45	24,0	63	63	65	121	25	5	**250**	**250**				
25,0	90	24,0	108	108	110	166	25	5			**250**	**250**		
25,0	125	24,0	142	142	144	200	25	6						**250**
28,0	45	24,0	63	63	65	121	25	5	**280**	**280**				
28,0	90	24,0	108	108	110	166	25	5			**280**	**280**		
28,0	140	24,0	147	147	149	205	25	6						**280**
30,0	45	24,0	63	63	65	121	25	5	**300**	**300**				
30,0	90	24,0	108	108	110	166	25	5			**300**	**300**		
32,0	53	31,0	70	70	73	133	32	5		**320**				
32,0	53	31,0	70	70	73	133	32	6	**320**					
32,0	106	31,0	123	123	126	186	32	6			**320**	**320**		
32,0	160	31,0	167	167	170	230	32	6						**320**
40,0	63	38,0	80	80	85	155	40	6	**400**	**400**				
40,0	125	38,0	142	142	147	217	40	6			**400**	**400**		
40,0	180	31,0	197	197	200	260	32	8						**400**
50,0	150	48,0	172	172	172	252	50	8			**500**	**500**		

P	●	●	●	●	●
M	○	●	○	●	○
K	●	●	●	●	●
N	○	○	○	○	○
S	○	○	○	○	○
H					
O	○	○	○	○	○

→ v_c/f_z Page 33–35

Roughing-finishing milling cutter HSS-E Co 5





DIN 69844 | DIN 844

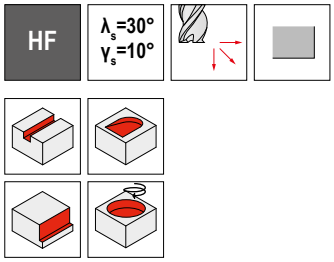
DC k12 mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS h6 mm	ZEFP	54 028 ...	54 029 ...
6	13	5,5	19	19	21	57	6	4	060	
6	24	5,5	30	30	32	68	6	4		060
7	16	6,5	22	24	26	66	10	4	070	
8	19	7,5	25	27	29	69	10	4	080	
8	38	7,5	44	46	48	88	10	4		080
9	19	8,5	26	27	29	69	10	4	090	
10	22	9,5	30	30	32	72	10	4	100	
10	45	9,5	53	53	55	95	10	4		100
11	22	10,5	30	32	32	79	12	4	110	
11	45	10,5	53	55	57	102	12	4		110
12	26	11,5	36	36	38	83	12	4	120	
12	53	11,5	63	63	65	110	12	4		120
13	26	11,5	36	36	38	83	12	4	130	
14	26	11,5	36	36	38	83	12	4	140	
16	32	15,0	42	42	44	92	16	4	160	
16	63	15,0	73	73	75	123	16	4		160
18	32	15,0	42	42	44	92	16	4	180	
20	38	19,0	52	52	54	104	20	4	200	
20	75	19,0	89	89	91	141	20	4		200
22	38	19,0	52	52	54	104	20	4	220	
22	75	19,0	89	89	91	141	20	4		220
25	45	24,0	63	63	65	121	25	4	250	
25	90	24,0	108	108	110	166	25	4		250

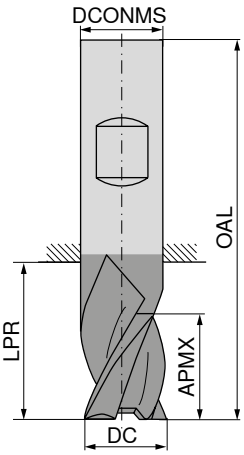
P	●	●
M	○	○
K	●	●
N	○	○
S	○	○
H		
O	○	○

→ v_c/f_z Page 33–35

Powdersteel roughing finishing cutter

HF | λ_s=30° γ_s=10°





Ti100 Pro

DIN 844

54 034 ...

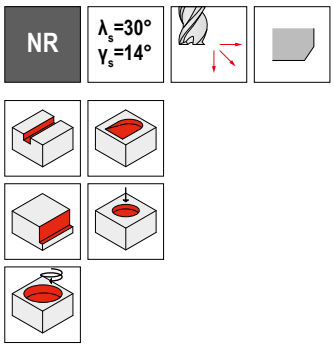
DC $_{k12}$ mm	APMX mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	ZEFP	
6	13	21	57	6	4	**060**
8	19	29	69	10	4	**080**
10	22	32	72	10	4	**100**
12	26	38	83	12	4	**120**
16	32	44	92	16	4	**160**
20	38	54	104	20	4	**200**

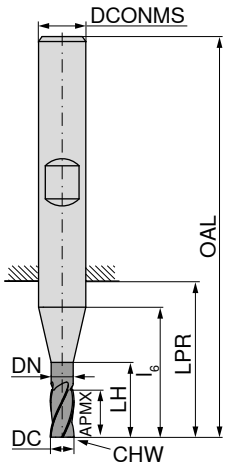
P	●
M	○
K	●
N	○
S	○
H	
O	○

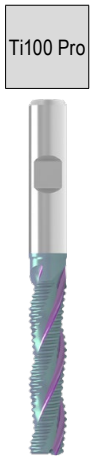
→ v_c/f_z Page 33–35

13

Rough milling cutter HSS-E Co 8







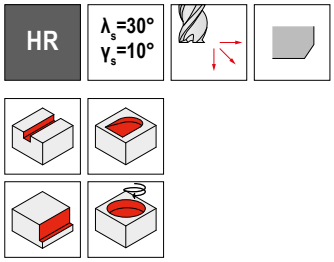
DIN 69844 | DIN 844

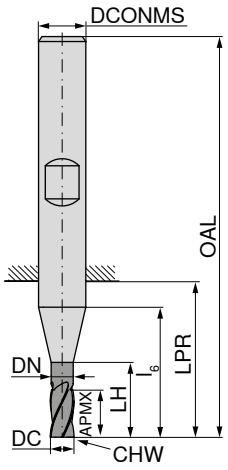
DC k12 mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS h6 mm	CHW mm	ZEFP	54 026 ...	54 027 ...
6	13	5,5	19	19	21	57	6	0,5	3	**060**	
6	24	5,5	30	30	32	68	6	0,5	3		**060**
8	19	7,5	25	27	29	69	10	0,7	3	**080**	
8	38	7,5	44	46	48	88	10	0,7	3		**080**
10	22	9,5	30	30	32	72	10	0,7	3	**100**	
10	45	9,5	53	53	55	95	10	0,7	3		**100**
12	26	11,5	36	36	38	83	12	0,7	3	**120**	
12	53	11,5	63	63	65	110	12	0,7	3		**120**
14	26	11,5	36	36	38	83	12	0,9	3	**140**	
14	53	11,5	63	63	65	110	12	0,9	3		**140**
16	32	15,0	42	42	44	92	16	0,9	3	**160**	
16	63	15,0	73	73	75	123	16	0,9	3		**160**
18	32	15,0	42	42	44	92	16	0,9	3	**180**	
18	63	15,0	73	73	75	123	16	0,9	3		**180**
20	38	19,0	52	52	54	104	20	0,9	3	**200**	
20	75	19,0	89	89	91	141	20	0,9	3		**200**
25	45	24,0	63	63	65	121	25	0,9	3	**250**	
25	90	24,0	108	108	110	166	25	0,9	3		**250**
P										●	●
M										○	○
K										●	●
N										○	○
S										○	○
H											
O										○	○

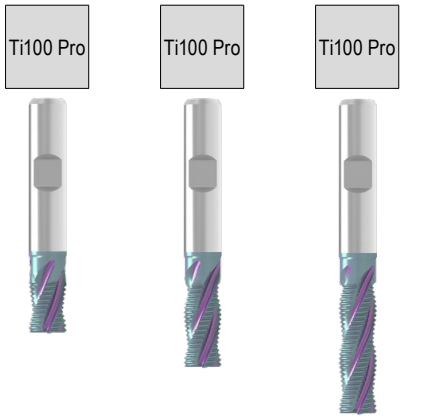
→ v_c/f_z Page 33–35

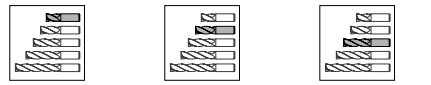
Powdersteel Fine rough milling cutter

HR | λ_s=30° γ_s=10°









	Factory standard	DIN 844	Factory standard
	54 031 ...	54 032 ...	54 033 ...

DC $_{k12}$ mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	CHW mm	ZEFP			
6	8	5,5	14	14	16	52	6	0,35	4	**060**		
6	13	5,5	19	19	21	57	6	0,35	4		**060**	
8	11	7,5	17	19	21	61	10	0,45	4	**080**		
8	19	7,5	25	27	29	69	10	0,45	4		**080**	
8	28	7,5	34	36	38	78	10	0,45	4			**080**
10	13	9,5	21	21	23	63	10	0,45	4	**100**		
10	22	9,5	30	30	32	72	10	0,45	4		**100**	
10	34	9,5	42	42	44	84	10	0,45	4			**100**
12	16	11,5	26	26	28	73	12	0,60	4	**120**		
12	26	11,5	36	36	38	83	12	0,60	4		**120**	
12	40	11,5	50	50	52	97	12	0,60	4			**120**
14	16	11,5	26	26	28	73	12	0,60	4	**140**		
14	26	11,5	36	36	38	83	12	0,60	4		**140**	
14	40	11,5	50	50	52	97	12	0,60	4			**140**
16	19	15,0	29	29	31	79	16	0,70	4	**160**		
16	32	15,0	42	42	44	92	16	0,70	4		**160**	
16	48	15,0	58	58	60	108	16	0,70	4			**160**
18	19	15,0	29	29	31	79	16	0,70	4	**180**		
18	32	15,0	42	42	44	92	16	0,70	4		**180**	
18	48	15,0	58	58	60	108	16	0,70	4			**180**
20	22	19,0	36	36	38	88	20	0,70	4	**200**		
20	38	19,0	52	52	54	104	20	0,70	4		**200**	
20	56	19,0	70	70	72	122	20	0,70	4			**200**
22	22	19,0	36	36	38	88	20	0,70	4	**220**		
22	38	19,0	52	52	54	104	20	0,70	4		**220**	
22	56	19,0	70	70	72	122	20	0,70	4			**220**
25	26	24,0	44	44	46	102	25	0,70	4	**250**		
25	45	24,0	63	63	65	121	25	0,70	4		**250**	
25	68	24,0	86	86	88	144	25	0,70	4			**250**
32	32	31,0	49	49	52	112	32	0,90	6	**320**		
32	53	31,0	70	70	73	133	32	0,90	6		**320**	

P	●	●	●
M	●	●	●
K	●	●	●
N	○	○	○
S	○	○	○
H			
O	○	○	○

→ v_c/f_z Page 33–35

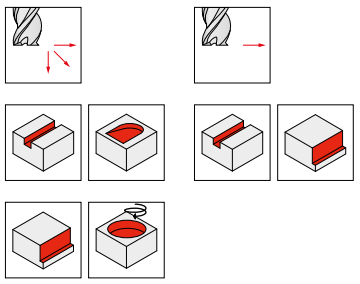
13

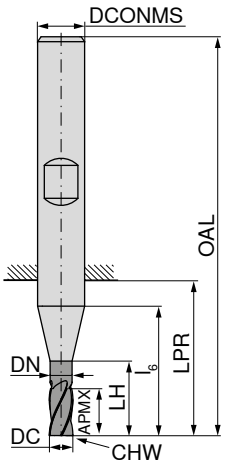
Fine profile milling cutter HSS-E Co 8

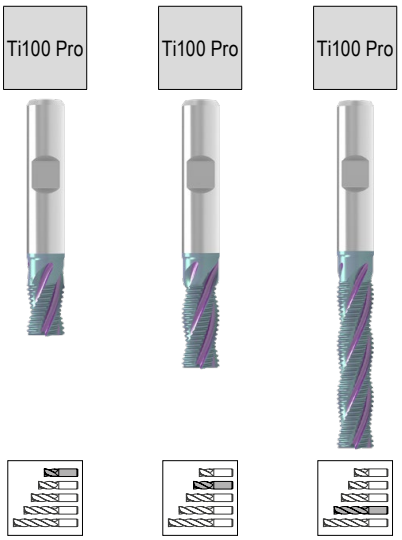
▲ > Ø 28,0 mm recessed centre

HR | λ_s=30° γ_s=10°

≤ Ø DC 28.0 mm | > Ø DC 28.0 mm



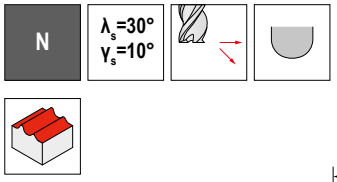


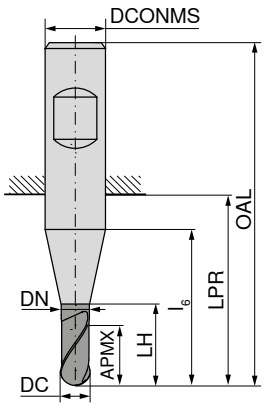


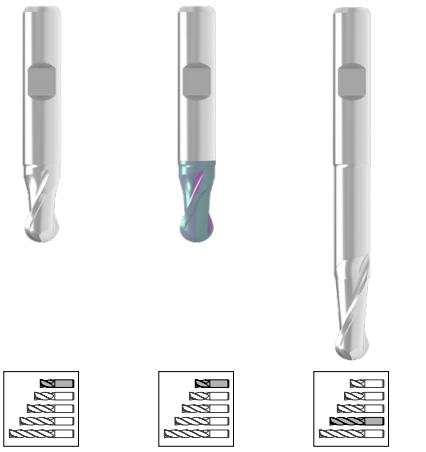
DC mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS mm	CHW mm	ZEFP	Factory standard 54 022 ...	DIN 69844 54 023 ...	DIN 844 54 024 ...
4	11		11	17	19	55	6	0,35	3		**040**	
5	13		13	19	21	57	6	0,35	3		**050**	
6	8	5,5	14	14	16	52	6	0,35	4	**060**		
6	13	5,5	19	19	21	57	6	0,35	4		**060**	
6	24	5,5	30	30	32	68	6	0,35	4			**060**
8	11	7,5	17	19	21	61	10	0,45	4	**080**		
8	19	7,5	25	27	29	69	10	0,45	4		**080**	
8	38	7,5	44	46	48	88	10	0,45	4			**080**
10	13	9,5	21	21	23	63	10	0,45	4	**100**		
10	22	9,5	30	30	32	72	10	0,45	4		**100**	
10	45	9,5	53	53	55	95	10	0,45	4			**100**
12	16	11,5	26	26	28	73	12	0,60	4	**120**		
12	26	11,5	36	36	38	83	12	0,60	4		**120**	
12	53	11,5	63	63	65	110	12	0,60	4			**120**
14	16	11,5	26	26	28	73	12	0,60	4	**140**		
14	26	11,5	36	36	38	83	12	0,60	4		**140**	
14	53	11,5	63	63	65	110	12	0,60	4			**140**
16	19	15,0	29	29	31	79	16	0,70	4	**160**		
16	32	15,0	42	42	44	92	16	0,70	4		**160**	
16	63	15,0	73	73	75	123	16	0,70	4			**160**
18	19	15,0	29	29	31	79	16	0,70	4	**180**		
18	32	15,0	42	42	44	92	16	0,70	4		**180**	
18	63	15,0	73	73	75	123	16	0,70	4			**180**
20	22	19,0	36	36	38	88	20	0,70	4	**200**		
20	38	19,0	52	52	54	104	20	0,70	4		**200**	
20	75	19,0	89	89	91	141	20	0,70	4			**200**
22	38	19,0	52	52	54	114	20	0,70	4		**220**	
22	75	19,0	89	89	91	141	20	0,70	4			**220**
25	45	24,0	63	63	65	121	25	0,70	4		**250**	
25	90	24,0	108	108	110	166	25	0,70	4			**250**
28	45	24,0	63	63	65	121	25	0,90	5		**280**	
28	90	24,0	108	108	110	166	25	0,90	5			**280**
30	45	24,0	63	63	65	121	25	0,90	5		**300**	
30	90	24,0	108	108	110	166	25	0,90	5			**300**
32	53	31,0	70	70	73	133	32	0,90	6		**320**	
32	106	31,0	123	123	126	186	32	0,90	6			**320**
P										●	●	●
M										●	●	●
K										●	●	●
N										○	○	○
S										○	○	○
H												
O										○	○	○

→ v_c/f_z Page 33–35

Ball nosed end milling cutter HSS-E Co 8







Factory standard | Factory standard | Factory standard

DC h10 mm	APMX mm	DN mm	LH mm	l_6 mm	LPR mm	OAL mm	DCONMS h6 mm	ZEFP	50 320 ...	54 041 ...	50 321 ...
2	4		4	10	12	48	6	2	020	020	
3	5		5	11	13	49	6	2	030	030	
3	8		8	18	20	56	6	2			030
4	7		7	13	15	51	6	2	040	040	
4	11		11	25	27	63	6	2			040
5	8		8	14	16	52	6	2	050	050	
5	13		13	30	32	68	6	2			050
6	8	5,50	14	14	16	52	6	2	060	060	
6	13	5,50	30	30	32	68	6	2			060
7	10	6,50	16	18	20	60	10	2	070	070	
7	16	6,35	36	38	40	80	10	2			070
8	11	7,50	17	19	21	61	10	2	080	080	
8	19	7,35	44	46	48	88	10	2			080
9	11	8,50	18	19	21	61	10	2	090	090	
9	19	8,35	45	46	48	88	10	2			090
10	13	9,50	21	21	23	63	10	2	100	100	
10	22	9,35	53	53	55	95	10	2			100
11	13	10,50	21	23	25	70	12	2	110		
11	22	10,50	53	55	57	102	12	2			110
12	16	11,50	26	26	28	73	12	2	120	120	
12	26	11,50	63	63	65	110	12	2			120
13	16	11,50	26	26	28	73	12	2	130	130	
14	16	11,50	26	26	28	73	12	2	140	140	
14	26	11,50	63	63	65	110	12	2			140
15	16	11,50	26	26	28	73	12	2	150	150	
15	26	11,50	63	63	65	110	12	2			150
16	19	15,50	29	29	31	79	16	2	160	160	
16	32	15,00	73	73	75	123	16	2			160
18	19	15,50	29	29	31	79	16	2	180	180	
18	32	15,00	73	73	75	123	16	2			180
20	22	19,00	36	36	38	88	20	2	201	201	
22	22	19,00	36	36	38	88	20	2	220		
24	26	23,00	42	44	46	102	25	2	240	240	
24	45	23,00	106	108	110	166	25	2			240
25	26	24,00	44	44	46	102	25	2	250		
25	45	24,00	108	108	110	166	25	2			250
26	26	24,00	44	44	46	102	25	2	260		
28	26	24,00	44	44	46	102	25	2	280		
30	26	24,00	44	44	46	102	25	2	300		
30	45	24,00	108	108	110	166	25	2			300
P									●	●	●
M									○	○	○
K									●	●	●
N									○	○	○
S									○	○	○
H											
O									○	○	○

→ v_c/f_z Page 33–35

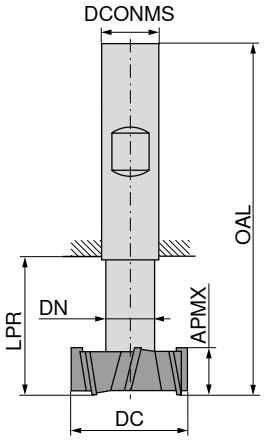
13

T-slot milling cutter HSS-E Co 5, cross pitched

▲ For slots according to DIN 650

N

λ_s=10°
γ_s=11°



DIN 851 A

50 240 ...

DC $_{d11}$ mm	APMX $_{d11}$ mm	DN $_{h12}$ mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	ZEFP	
11,0	4	4	13,5	53,5	10	6	**110**
12,5	6	5	17,0	57,0	10	6	**125**
16,0	8	7	22,0	62,0	10	6	**160**
18,0	8	8	25,0	70,0	12	6	**180**
19,0	9	8	26,0	71,0	12	6	**190** 1)
21,0	9	10	29,0	74,0	12	6	**210**
22,0	10	10	30,0	75,0	12	6	**220** 1)
25,0	11	12	34,0	82,0	16	8	**250**
28,0	12	13	37,0	85,0	16	8	**280** 1)
32,0	14	15	42,0	90,0	16	8	**320**
36,0	16	17	47,0	103,0	25	8	**360** 1)
40,0	18	19	52,0	108,0	25	10	**400**
45,0	20	21	57,0	113,0	25	10	**450** 1)
50,0	22	25	64,0	124,0	32	10	**500**
60,0	28	30	79,0	139,0	32	10	**600**

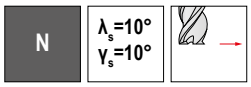
P	●
M	○
K	●
N	○
S	○
H	
O	○

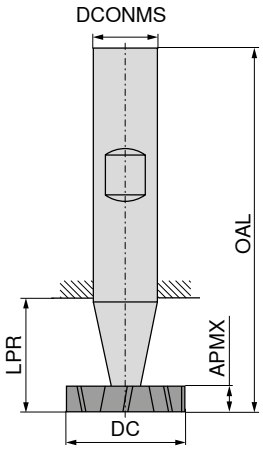
1) Factory standard

→ v_c/f_z Page 36

Slot milling cutter HSS-E Co 5, cross-pitched

▲ For slots according to DIN 6888
▲ CDX = $a_{p\ max.}$





DIN 850

50 234 ...

DC h12 mm	APMX e8 mm	LPR mm	OAL mm	DCONMS h6 mm	CDX mm	ZEFP	
10,5	2,0	14	50	6	3,25	6	**100**
10,5	2,5	14	50	6	3,15	6	**101**
10,5	3,0	14	50	6	3,15	6	**102**
13,5	2,0	16	56	10	4,45	6	**130** 1)
13,5	3,0	16	56	10	4,45	6	**132**
13,5	4,0	16	56	10	4,45	6	**133**
16,5	3,0	16	56	10	5,95	6	**161**
16,5	4,0	16	56	10	5,95	6	**162**
16,5	5,0	16	56	10	5,75	6	**163**
19,5	3,0	23	63	10	6,95	8	**190** 1)
19,5	4,0	23	63	10	6,95	8	**191**
19,5	5,0	23	63	10	6,75	8	**192**
22,5	4,0	23	63	10	8,25	8	**220** 1)
22,5	5,0	23	63	10	8,25	8	**221**
22,5	6,0	23	63	10	8,00	8	**222**
25,5	5,0	23	63	10	9,00	10	**250** 1)
25,5	6,0	23	63	10	9,00	10	**251**
28,5	6,0	23	63	10	10,00	10	**281**
28,5	8,0	23	63	10	10,00	10	**283**
32,5	6,0	26	71	12	12,00	10	**321** 1)
32,5	8,0	26	71	12	12,00	10	**322**
38,5	8,0	26	71	12	13,35	10	**381** 1)
45,5	10,0	26	71	12	16,85	12	**450**

P	●
M	○
K	●
N	○
S	○
H	
O	○

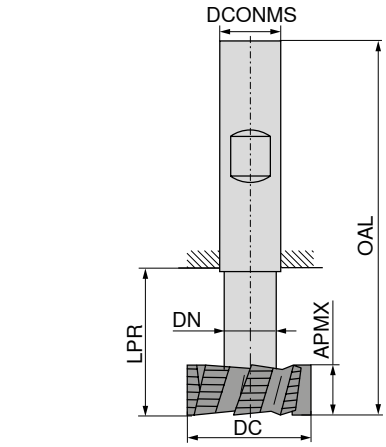
1) Factory standard

→ v_c/f_z Page 36

T-slot milling cutter HSS-E Co 5

▲ For slots according to DIN 650

NF | λ_s=20° γ_s=11°



DIN 851 A

50 241 ...

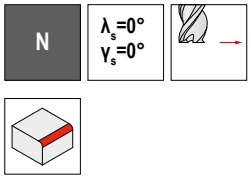
DC d11 mm	APMX mm	DN h12 mm	LPR mm	OAL mm	DCONMS h6 mm	ZEFP	
21	9	10	29	74	12	6	**210**
22	10	10	30	75	12	6	**220** 1)
25	11	12	34	82	16	6	**250**
28	12	13	37	85	16	6	**280** 1)
32	14	15	42	90	16	6	**320**
36	16	17	47	103	25	6	**360** 1)
40	18	19	52	108	25	8	**400**
45	20	21	57	113	25	8	**450** 1)

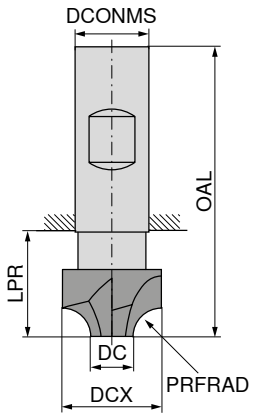
P	●
M	○
K	●
N	○
S	○
H	
O	○

1) Factory standard

→ v_c/f_z Page 36

Quarter-round profile milling cutter HSS-E Co 5, concave





DIN 6518

50 248 ...

PRFRAD $_{H11}$ mm	DCX mm	DC mm	LPR mm	OAL mm	DCONMS $_{h6}$ mm	ZEFP	
1,0	8	6	20	60	10	4	**010**
1,5	9	6	20	60	10	4	**015**
2,0	10	6	20	60	10	4	**020**
2,5	11	6	20	60	10	4	**025**
3,0	12	6	15	60	12	4	**030**
4,0	14	6	15	60	12	4	**040**
5,0	16	6	15	60	12	4	**050**
6,0	20	8	19	67	16	4	**060**
8,0	24	8	23	71	16	4	**080**
9,0	26	8	29	85	25	4	**090**
10,0	28	8	29	85	25	4	**100**
12,0	34	10	34	90	25	4	**120**
15,0	46	16	44	100	25	6	**150**
16,0	48	16	44	100	25	6	**160**

P	●
M	○
K	●
N	○
S	○
H	
O	○

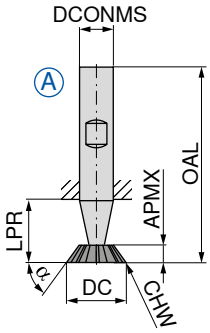
→ v_c/f_z Page 36

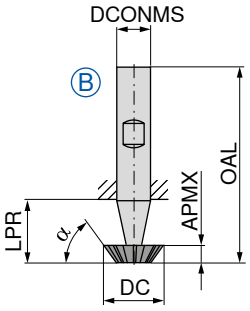
13

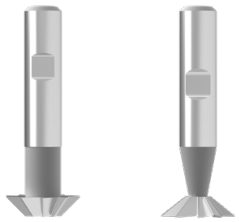
Single angle miling cutters HSS-E Co 5

H

λ_s=0°
γ_s=0°







α°	DC mm	APMX mm	LPR mm	OAL mm	DCONMS h6 mm	CHW mm	ZEFP	Fig.	DIN 1833 50 246 ...	DIN 1833 50 245 ...
45	16	4,0	15	60	12	0,3	10	A		016
	16	4,0	15	60	12		10	B	016	
	20	5,0	18	63	12	0,3	10	A		020
	20	5,0	18	63	12		10	B	020	
	25	6,3	22	67	12	0,3	10	A		025
	25	6,3	22	67	12		10	B	025	
60	16	6,3	15	60	12	0,3	10	A		116
	16	6,3	15	60	12		10	B	116	
	20	8,0	18	63	12	0,3	10	A		120
	20	8,0	18	63	12		10	B	120	
	25	10,0	22	67	12	0,3	10	A		125
	25	10,0	22	67	12		10	B	125	
70	16	7,0	15	60	12	0,3	10	A		216 1)
	20	9,0	18	63	12	0,3	10	A		220 1)
	25	11,0	19	67	16	0,3	10	A		225 1)
P									●	●
M									○	○
K									●	●
N									○	○
S									○	○
H										
O									○	○

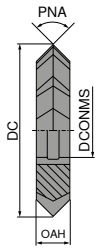
1) Factory standard

→ v_c/f_z Page 37

Double angle milling cutter HSS

▲ with keyway to DIN 138

N | λ_s=0° γ_s=0°



DIN 847

50 360 ...

PNA °	DC mm	OAH mm	DCONMS mm	ZEFP	
45	50	8	16	22	**045**
	63	10	22	24	**145**
	80	12	27	26	**245**
	100	18	32	28	**345**
60	50	10	16	18	**060**
	63	14	22	20	**160**
	80	18	27	22	**260**
	100	25	32	24	**360**
90	50	14	16	16	**090**
	63	20	22	18	**190**
	80	22	27	20	**290**
	100	32	32	24	**390**
120	50	14	16	16	**120** 1)
	63	20	22	16	**121** 1)

P	●
M	○
K	●
N	○
S	○
H	
O	○

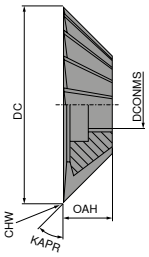
1) Factory standard

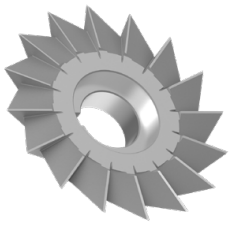
→ v_c/f_z Page 37

Shell type single angle milling cutter HSS

▲ with keyway to DIN 138

N | λ_s=0° γ_s=2°





DIN 842 A

50 362 ...

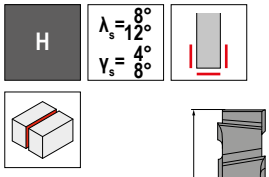
KAPR °	DC mm	OAH mm	DCONMS mm	CHW mm	ZEFP	
45	40	10	10	0,3	14	**045**
	50	13	13	0,3	16	**145**
	63	18	16	0,3	18	**245**
	80	22	22	0,3	20	**345**
	100	28	27	0,3	22	**445**
50	50	16	13	0,3	16	**150**
60	40	13	10	0,3	14	**060**
	50	16	13	0,3	16	**160**
	63	20	16	0,3	18	**260**
	80	25	22	0,3	20	**360**
	100	32	27	0,3	22	**460**
	125	40	32	0,3	28	**560**

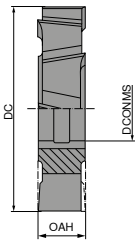
P	●
M	○
K	●
N	○
S	○
H	
O	○

→ v_c/f_z Page 37

Side and face milling cutter HSS-E Co 5

▲ Fine cross-pitched version
▲ with keyway to DIN 138





DIN 885 A

50 349 ...

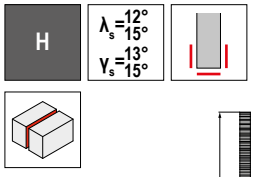
DC mm	OAH mm	DCONMS mm	ZEFP	
50	4	16	16	100
50	5	16	16	102
50	6	16	16	104
50	8	16	16	106
50	10	16	16	108
63	4	22	18	200
63	5	22	18	202
63	6	22	18	204
63	8	22	18	206
63	10	22	18	208
63	12	22	18	210
63	14	22	18	212
80	5	27	20	300
80	6	27	20	302
80	8	27	20	304
80	10	27	18	306
80	12	27	18	308
80	14	27	18	310
80	16	27	18	312
80	18	27	18	314
80	20	27	18	316
100	6	32	22	400
100	8	32	22	402
100	10	32	20	404
100	12	32	20	406
100	14	32	20	408
100	16	32	20	410
100	18	32	20	412
100	20	32	20	414
100	25	32	20	418
125	8	32	24	500
125	10	32	22	502
125	12	32	22	504
125	14	32	22	506
125	16	32	22	508
125	18	32	22	510
125	20	32	22	512
125	25	32	22	516
160	10	40	26	600
160	12	40	26	602
160	14	40	26	604
160	16	40	26	606
160	18	40	26	608
160	20	40	26	610
160	25	40	26	614
160	32	40	26	618

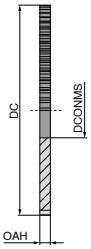
P	●
M	○
K	●
N	●
S	○
H	
O	●

→ v_c/f_z Page 38

Narrow side and face milling cutter HSS-E Co 5

▲ Fine cross-pitched version
▲ with keyway to DIN 138





DIN 1834 A

50 340 ...

DC mm	OAH mm	DCONMS mm	ZEFP	
63	1,6	22	28	200
63	2,0	22	28	202
63	2,5	22	28	204
63	3,0	22	28	206
80	1,6	27	32	300
80	2,0	27	32	302
80	2,5	27	32	304
80	3,0	27	32	306
80	4,0	27	32	310
100	1,6	32	36	400
100	2,0	32	36	402
100	2,5	32	36	404
100	3,0	32	36	406
100	4,0	32	36	410
100	5,0	32	36	414
125	1,6	32	40	500
125	2,0	32	40	502
125	2,5	32	40	504
125	3,0	32	40	506
125	4,0	32	40	510
125	5,0	32	40	514
125	6,0	32	40	516
160	2,0	40	48	600
160	2,5	40	48	602
160	3,0	40	48	604
160	4,0	40	48	606
160	5,0	40	48	608
160	6,0	40	48	610
160	8,0	40	36	612

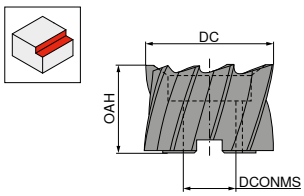
P	●
M	
K	●
N	●
S	●
H	
O	●

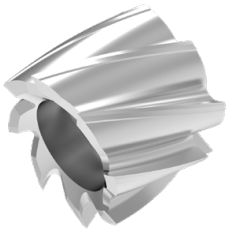
→ v_c/f_z Page 38

Face milling cutters HSS-E Co 5

▲ with keyway to DIN 138

N | λ_s=25° γ_s=10°





DIN 1880

50 250 ...

DC mm	OAH mm	DCONMS mm	ZEFP	
40	32	16	8	**040**
50	36	22	8	**050**
63	40	27	8	**063**
80	45	27	10	**080**

P	●
M	●
K	●
N	●
S	○
H	
O	●

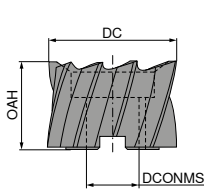
→ v_c/f_z Page 39+40

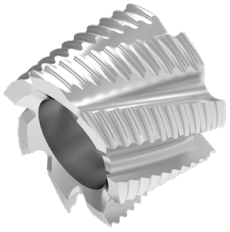
Roughing face milling cutters HSS-E Co 5

▲ with keyway to DIN 138

▲ Manufacturing tolerance lies on the plus range of the tolerance js14

NR | λ_s=25° γ_s=10°





DIN 1880

50 260 ...

DC mm	OAH mm	DCONMS mm	ZEFP	
40	32	16	7	**040**
50	36	22	8	**050**
63	40	27	8	**063**
80	45	27	10	**080**

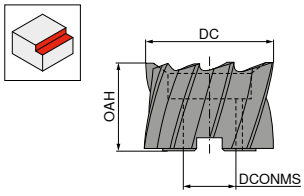
P	●
M	●
K	●
N	●
S	○
H	
O	●

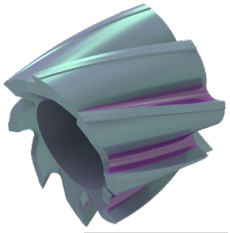
→ v_c/f_z Page 39+40

Face milling cutters HSS-E Co 5

▲ with keyway to DIN 138

N | λ_s=25° γ_s=10° | Ti100 Pro





DIN 1880

54 035 ...

DC mm	OAH mm	DCONMS mm	ZEFP	
40	32	16	8	**040**
50	36	22	8	**050**
63	40	27	8	**063**
80	45	27	10	**080**

P	●
M	●
K	●
N	●
S	○
H	
O	●

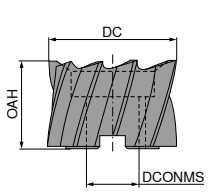
→ v_c/f_z Page 39+40

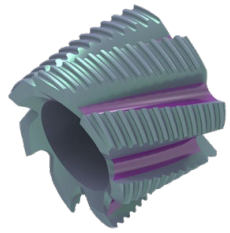
Roughing-finishing face milling cutters HSS-E Co 8

▲ with keyway to DIN 138

▲ Manufacturing tolerance lies on the plus range of the tolerance js14

HR | λ_s=25° γ_s=10° | Ti100 Pro





DIN 1880

54 037 ...

DC mm	OAH mm	DCONMS mm	ZEFP	
40	32	16	7	**040**
50	36	22	8	**050**
63	40	27	8	**063**
80	45	27	10	**080**

P	●
M	●
K	●
N	●
S	○
H	
O	●

→ v_c/f_z Page 39+40

13

Material examples for cutting data tables

	Material sub-group	Index	Composition / Structure / Heat treatment		Tensile strength N/mm²* / HB / HRC	Material number	Material designation	Material number	Material designation
P	Unalloyed steel	P.1.1	< 0,15 % C	Annealed	420 N/mm² / 125 HB	1.0401	C15	1.1141	Ck15
		P.1.2	< 0,45 % C	Annealed	640 N/mm² / 190 HB	1.1191	C45E	1.0718	9SMnPb28
		P.1.3		Tempered	840 N/mm² / 250 HB	1.1191	C45E	1.0535	C55
		P.1.4	< 0,75 % C	Annealed	910 N/mm² / 270 HB	1.1223	C60R	1.0535	C55
		P.1.5		Tempered	1010 N/mm² / 300 HB	1.1223	C60R	1.0727	45S20
	Low-alloy steel	P.2.1		Annealed	610 N/mm² / 180 HB	1.7131	16MnCr5	1.6587	17CrNiMo6
		P.2.2		Tempered	930 N/mm² / 275 HB	1.7131	16MnCr5	1.6587	17CrNiMo6
		P.2.3		Tempered	1010 N/mm² / 300 HB	1.7225	42CrMo4	1.3505	100Cr6
		P.2.4		Tempered	1200 N/mm² / 375 HB	1.7225	42CrMo4	1.3505	100Cr6
	High-alloy steel and high-alloy tool steel	P.3.1		Annealed	680 N/mm² / 200 HB	1.4021	X20Cr13	1.4034	X46Cr13
		P.3.2		Hardened and tempered	1100 N/mm² / 300 HB	1.2343	X38CrMoV5-1	1.4034	X46Cr13
		P.3.3		Hardened and tempered	1300 N/mm² / 400 HB	1.2343	X38CrMoV5-1	1.4034	X46Cr13
	Stainless steel	P.4.1	Ferritic / martensitic	Annealed	680 N/mm² / 200 HB	1.4016	X6Cr17	1.2316	X36CrMo16
		P.4.2	Martensitic	Tempered	1010 N/mm² / 300 HB	1.4112	X90CrMoV18	1.2316	X36CrMo16
M	Stainless steel	M.1.1	Austenitic / austenitic-ferritic	Quenched	610 N/mm² / 180 HB	1.4301	X5CrNi18-10	1.4571	X6CrNiMoTi17-12-2
		M.2.1	Austenitic	Tempered	300 HB	1.4841	X15CrNiSi25-21	1.4539	X1NiCrMoCu25-20-5
		M.3.1	Austenitic / ferritic (Duplex)		780 N/mm² / 230 HB	1.4462	X2CrNiMoN22-5-3	1.4501	X2CrNiMoCuWN25-7-4
K	Grey cast iron	K.1.1	Pearlitic / ferritic		350 N/mm² / 180 HB	0.6010	GG-10	0.6025	GG-25
		K.1.2	Pearlitic (martensitic)		500 N/mm² / 260 HB	0.6030	GG-30	0.6045	GG-45
	Spherulitic graphite cast iron	K.2.1	Ferritic		540 N/mm² / 160 HB	0.7040	GGG-40	0.7060	GGG-60
		K.2.2	Pearlitic		845 N/mm² / 250 HB	0.7070	GGG-70	0.7080	GGG-80
	Malleable iron	K.3.1	Ferritic		440 N/mm² / 130 HB	0.8035	GTW-35-04	0.8045	GTW-45
		K.3.2	Pearlitic		780 N/mm² / 230 HB	0.8165	GTS-65-02	0.8170	GTS-70-02
N	Aluminium wrought alloy	N.1.1	Non-hardenable		60 HB	3.0255	Al99,5	3.3315	AlMg1
		N.1.2	Hardenable	Age-hardened	340 N/mm² / 100 HB	3.1355	AlCuMg2	3.2315	AlMgSi1
	Cast aluminium alloy	N.2.1	≤ 12 % Si, non-hardenable		250 N/mm² / 75 HB	3.2581	G-AlSi12	3.2163	G-AlSi9Cu3
		N.2.2	≤ 12 % Si, hardenable	Age-hardened	300 N/mm² / 90 HB	3.2134	G-AlSi5Cu1Mg	3.2373	G-AlSi9Mg
		N.2.3	> 12 % Si, non-hardenable		440 N/mm² / 130 HB		G-AlSi17Cu4Mg		G-AlSi18CuNiMg
	Copper and copper alloys (bronze/brass)	N.3.1	Free-machining alloys, PB > 1 %		375 N/mm² / 110 HB	2.0380	CuZn39Pb2 (Ms58)	2.0410	CuZn44Pb2
		N.3.2	CuZn, CuSnZn		300 N/mm² / 90 HB	2.0331	CuZn15	2.4070	CuZn28Sn1As
		N.3.3	CuSn, lead-free copper and electrolytic copper		340 N/mm² / 100 HB	2.0060	E-Cu57	2.0590	CuZn40Fe
	Magnesium alloys	N.4.1	Magnesium and magnesium alloys		70 HB	3.5612	MgAl6Zn	3.5312	MgAl3Zn
S	Heat-resistant alloys	S.1.1	Fe - basis	Annealed	680 N/mm² / 200 HB	1.4864	X12NiCrSi 36-16	1.4865	G-X40NiCrSi38-18
		S.1.2		Age-hardened	950 N/mm² / 280 HB	1.4980	X6NiCrTiMoVB25-15-2	1.4876	X10NiCrAlTi32-20
		S.2.1	Ni or Co basis	Annealed	840 N/mm² / 250 HB	2.4631	NiCr20TiAl (Nimonic80A)	3.4856	NiCr22Mo9Nb
		S.2.2		Age-hardened	1180 N/mm² / 350 HB	2.4668	NiCr19Nb5Mo3 (Inconel 718)	2.4955	NiFe25Cr20NbTi
		S.2.3		Cast	1080 N/mm² / 320 HB	2.4765	CoCr20W15Ni	1.3401	G-X120Mn12
	Titanium alloys	S.3.1	Pure titanium		400 N/mm²	3.7025	Ti99,8	3.7034	Ti99,7
		S.3.2	Alpha + beta alloys	Age-hardened	1050 N/mm² / 320 HB	3.7165	TiAl6V4	Ti-6246	Ti-6Al-2Sn-4Zr-6Mo
		S.3.3	Beta alloys		1400 N/mm² / 410 HB	Ti555.3	Ti-5Al-5V-5Mo-3Cr	R56410	Ti-10V-2Fe-3Al
H	Hardened steel	H.1.1		Hardened and tempered	46–55 HRC				
		H.1.2		Hardened and tempered	56–60 HRC				
		H.1.3		Hardened and tempered	61–65 HRC				
		H.1.4		Hardened and tempered	66–70 HRC				
	Chilled iron	H.2.1		Cast	400 HB				
	Hardened cast iron	H.3.1		Hardened and tempered	55 HRC				
O	Non-metal materials	O.1.1	Plastics, duroplastic		≤ 150 N/mm²				
		O.1.2	Plastics, thermoplastic		≤ 100 N/mm²				
		O.2.1	Aramid fibre-reinforced		≤ 1000 N/mm²				
		O.2.2	Glass/carbon-fibre reinforced		≤ 1000 N/mm²				
		O.3.1	Graphite						

*** Tensile strength**

Cutting speeds – slot, end milling and ball-nosed end milling cutters

Index	Kf f_z	uncoated	Ti100 Pro	Ti100 Pro	● 1st choice ○ suitable		
				Powder steel	Emulsion	Compressed air	MMS
		v_c (m/min)					
P.1.1	1,2	20	45	50	●		
P.1.2	1,2	20	45	50	●		
P.1.3	1,2	20	45	50	●		
P.1.4	1,0	15	30	35	●		
P.1.5	1,0	15	30	35	●		
P.2.1	1,2	20	40	45	●		
P.2.2	1,0	15	40	45	●		
P.2.3	0,8	15	30	35	●		
P.2.4	0,8	15	30	35	●		
P.3.1	1,0	15	30	35	●		
P.3.2	0,8	12	25	30	●		
P.3.3	0,8	10	20	25	●		
P.4.1	1,0	10	20	25	●		
P.4.2	1,0	10	20	25	●		
M.1.1	1,0	10	20	25	●		
M.2.1	0,9	7	15	20	●		
M.3.1	1,0	5	10	15	●		
K.1.1	1,0	18	35	40	●		
K.1.2	1,0	18	25	30	●		
K.2.1	1,0	15	30	35	●		
K.2.2	1,0	15	30	35	●		
K.3.1	1,0	15	35	40	●		
K.3.2	0,8	12	25	30	●		
N.1.1	1,9	150	240	260	●		
N.1.2	1,9	100	130	150	●		
N.2.1	1,8		100	140	●		
N.2.2	1,7		60	80	●		
N.2.3							
N.3.1	1,1		100	130	●		
N.3.2	1,2	30	60	80	●		
N.3.3	1,2	30	60	80	●		
N.4.1	1,8	90	140	160		●	
S.1.1							
S.1.2							
S.2.1							
S.2.2							
S.2.3							
S.3.1	1,0	10	15	25	●		
S.3.2	1,1	10	15	25	●		
S.3.3							
H.1.1							
H.1.2							
H.1.3							
H.1.4							
H.2.1							
H.3.1							
O.1.1	2,0	30	50	70	●		
O.1.2	2,0	20	25	40	●		
O.2.1							
O.2.2							
O.3.1	1,0		30	40	○		

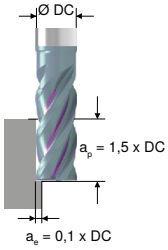
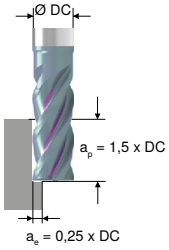
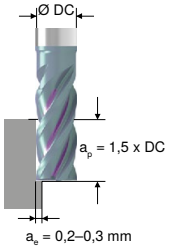
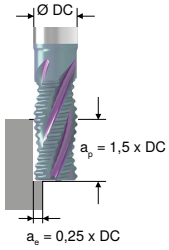
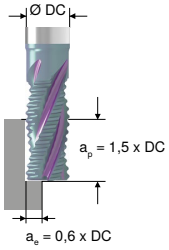
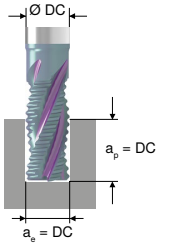
13

For full slot milling reduce the cutting speed (Vc), indicated in this table by approx. 15 - 20%!

Kf fz = Correction factor for feed per tooth

Feed per tooth for HSS end mills

Appoximate values (in mm) for the feed per tooth (f_z)

	Finish milling						Rough machining					
	Peripheral milling										Full slot milling	
												
	f_z in mm		f_z in mm		f_z in mm		f_z in mm		f_z in mm		f_z in mm	
Ø DC mm	uncoated	coated	uncoated	coated	uncoated	coated	uncoated	coated	uncoated	coated	uncoated	coated
2	0,008	0,009	0,008	0,009	0,008	0,009						
3	0,011	0,012	0,009	0,010	0,010	0,012						
4	0,017	0,018	0,013	0,014	0,014	0,015	0,015	0,016	0,013	0,014	0,011	0,012
5	0,024	0,026	0,014	0,015	0,018	0,020	0,019	0,021	0,016	0,018	0,014	0,016
6	0,032	0,035	0,015	0,017	0,022	0,024	0,024	0,027	0,020	0,022	0,018	0,019
8	0,047	0,051	0,020	0,022	0,029	0,032	0,032	0,036	0,027	0,030	0,024	0,026
10	0,065	0,072	0,026	0,028	0,037	0,041	0,042	0,047	0,035	0,039	0,031	0,034
12	0,084	0,091	0,031	0,034	0,044	0,049	0,051	0,057	0,043	0,047	0,037	0,041
14	0,100	0,106	0,037	0,041	0,054	0,059	0,063	0,069	0,053	0,058	0,045	0,050
16	0,111	0,121	0,042	0,046	0,061	0,067	0,072	0,079	0,060	0,066	0,052	0,057
18	0,126	0,136	0,048	0,053	0,070	0,077	0,084	0,093	0,071	0,078	0,061	0,067
20	0,141	0,151	0,052	0,057	0,076	0,083	0,092	0,101	0,077	0,084	0,066	0,073
22	0,160	0,166	0,059	0,065	0,085	0,094	0,104	0,114	0,087	0,096	0,075	0,082
25	0,170	0,188	0,065	0,072	0,095	0,104	0,117	0,129	0,098	0,108	0,084	0,093
28	0,196	0,210	0,075	0,083	0,109	0,120	0,136	0,150	0,114	0,125	0,098	0,108
32	0,212	0,240	0,086	0,094	0,124	0,137	0,157	0,173	0,131	0,145	0,113	0,125
36	0,224	0,240	0,099	0,109	0,144	0,159	0,170	0,194	0,142	0,162	0,126	0,140
40	0,240	0,240	0,108	0,119	0,157	0,173	0,184	0,202	0,154	0,169	0,132	0,146
45	0,240	0,240	0,108	0,119	0,157	0,173	0,200	0,220	0,170	0,180	0,140	0,160
50	0,240	0,240	0,108	0,119	0,157	0,173	0,200	0,220	0,170	0,180	0,140	0,160

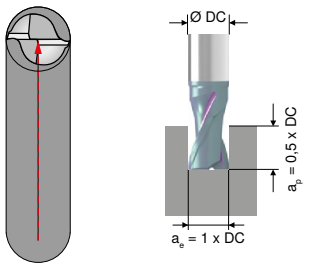
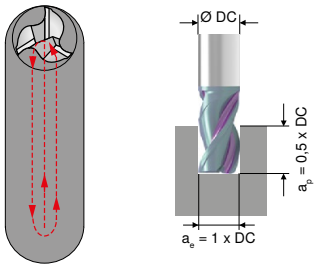
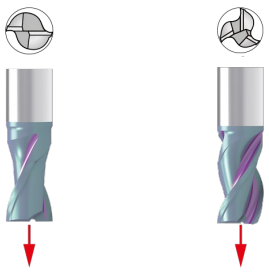
Attention:
In the case of uncoated milling cutters climb milling is preferred to conventional milling. When using coated milling cutters climb milling is necessary in order to achieve optimum results.

Feed rate correction:
Please multiply the f_z value in the table above with the corresponding **correction factor Kf f_z** from the table on → **page 33.**

In general the following is valid:
f_z (milling) = f_z x Kf f_z
f_z (drilling) = f_z (milling) ÷ no. of teeth

Feed per tooth when milling parallel key slots with HSS slot drills

Appoximate values (in mm) for the feed per tooth (f_z)

	Full slot milling (in one cut)		Profile slot milling (internal profile milling)				Circular ramping			
										
			Roughing cut		Finishing cut					
	f_z in mm		f_z in mm				f_z in mm			
Ø DC mm	uncoated	coated	uncoated	coated	uncoated	coated	uncoated	coated	uncoated	coated
2	0,005	0,006	0,005	0,006	0,008	0,009	0,003	0,003	0,002	0,002
3	0,009	0,010	0,009	0,010	0,015	0,016	0,004	0,005	0,003	0,003
4	0,012	0,013	0,012	0,013	0,022	0,024	0,006	0,007	0,004	0,004
5	0,016	0,017	0,016	0,017	0,030	0,033	0,008	0,009	0,005	0,006
6	0,020	0,022	0,020	0,022	0,039	0,043	0,010	0,011	0,007	0,007
8	0,026	0,029	0,026	0,029	0,055	0,061	0,013	0,014	0,009	0,010
10	0,034	0,037	0,034	0,037	0,075	0,082	0,017	0,019	0,011	0,012
12	0,040	0,044	0,040	0,044	0,093	0,101	0,020	0,022	0,013	0,015
14	0,049	0,054	0,049	0,054	0,117	0,118	0,024	0,027	0,016	0,018
16	0,056	0,062	0,056	0,062	0,135	0,135	0,028	0,031	0,019	0,021
18	0,065	0,072	0,065	0,072	0,151	0,151	0,033	0,036	0,022	0,024
20	0,071	0,078	0,071	0,078	0,167	0,167	0,035	0,039	0,024	0,026
22	0,080	0,088	0,080	0,088	0,184	0,184	0,040	0,044	0,027	0,029
25	0,089	0,098	0,089	0,098	0,208	0,208	0,044	0,049	0,030	0,033
28	0,103	0,113	0,103	0,113	0,233	0,233	0,051	0,056	0,034	0,037
32	0,118	0,130	0,118	0,130	0,260	0,260	0,060	0,065	0,040	0,043
36	0,130	0,143	0,130	0,143	0,260	0,260	0,060	0,065	0,040	0,043
40	0,130	0,143	0,130	0,143	0,260	0,260	0,060	0,065	0,040	0,043
45	0,130	0,143	0,130	0,143	0,260	0,260	0,060	0,065	0,040	0,043
50	0,130	0,143	0,130	0,143	0,260	0,260	0,060	0,065	0,040	0,043

Attention:
In the case of uncoated milling cutters climb milling is preferred to conventional milling. When using coated milling cutters climb milling is necessary in order to achieve optimum results.

Feed rate correction:
Please multiply the f_z value in the table above with the corresponding **correction factor Kf f_z** from the table on → **page 33.**

In general the following is valid:
f_z (milling) = f_z x Kf f_z
f_z (drilling) = f_z (milling) ÷ no. of teeth

Cutting data standard values – Form cutters

Index	v_c (m/min)	50 241 ... Ø DC (mm) = 21–25	28–36	40–45	50 240 ... Ø DC (mm) = 11–16	18–22	25–32	36–45	50–60	v_c (m/min)	50 234 ... Ø DC (mm) = 10–17	19–26	28–33	33–46	50 248 ... Ø DCX (mm) = 8–11	12–24	26–34	46–48	● 1st choice ○ suitable Emulsion	Compressed air	MMS
		f_z (mm)			f_z (mm)						f_z (mm)				f_z (mm)						
P.1.1	28	0,07	0,1	0,12	0,015	0,03	0,03	0,03	0,04	28	0,02	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
P.1.2	28	0,07	0,1	0,12	0,015	0,03	0,03	0,03	0,04	28	0,02	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
P.1.3	28	0,07	0,1	0,12	0,015	0,03	0,03	0,03	0,04	28	0,02	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
P.1.4	22	0,06	0,08	0,1	0,015	0,03	0,03	0,03	0,04	22	0,02	0,03	0,035	0,045	0,025	0,055	0,08	0,1	●		
P.1.5	22	0,06	0,08	0,1	0,015	0,03	0,03	0,03	0,04	22	0,02	0,03	0,035	0,045	0,025	0,055	0,08	0,1	●		
P.2.1	22	0,06	0,08	0,1	0,015	0,03	0,03	0,03	0,04	22	0,02	0,03	0,035	0,045	0,025	0,055	0,08	0,1	●		
P.2.2	28	0,07	0,1	0,12	0,015	0,03	0,03	0,03	0,04	28	0,02	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
P.2.3	20	0,06	0,08	0,1	0,015	0,03	0,03	0,03	0,04	20	0,02	0,03	0,035	0,045	0,025	0,055	0,08	0,1	●		
P.2.4	20	0,06	0,08	0,1	0,015	0,03	0,03	0,03	0,04	20	0,02	0,03	0,035	0,045	0,025	0,055	0,08	0,1	●		
P.3.1																					
P.3.2																					
P.3.3																					
P.4.1	10	0,06	0,08	0,1	0,01	0,025	0,025	0,025	0,03	10	0,02	0,025	0,03	0,04	0,02	0,045	0,08	0,09	●		
P.4.2	10	0,06	0,08	0,1	0,01	0,025	0,025	0,025	0,03	10	0,02	0,025	0,03	0,04	0,02	0,045	0,08	0,09	●		
M.1.1	10	0,06	0,08	0,1	0,01	0,025	0,025	0,025	0,03	10	0,02	0,025	0,03	0,04	0,02	0,045	0,08	0,09	●		
M.2.1																					
M.3.1																					
K.1.1	28	0,07	0,1	0,12	0,015	0,03	0,025	0,04	0,035	24	0,025	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
K.1.2																					
K.2.1	22	0,07	0,1	0,12	0,015	0,03	0,025	0,04	0,035	22	0,025	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
K.2.2	20	0,07	0,1	0,12	0,015	0,03	0,025	0,04	0,035	20	0,025	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
K.3.1	15	0,07	0,1	0,12	0,015	0,03	0,025	0,04	0,035	15	0,025	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
K.3.2	15	0,07	0,1	0,12	0,015	0,03	0,025	0,04	0,035	15	0,025	0,03	0,04	0,05	0,03	0,06	0,1	0,12	●		
N.1.1	100	0,1	0,12	0,15	0,02	0,045	0,045	0,045	0,055	90	0,03	0,04	0,06	0,07	0,035	0,07	0,14	0,15	●		
N.1.2	100	0,1	0,12	0,15	0,02	0,045	0,045	0,045	0,055	90	0,03	0,04	0,06	0,07	0,035	0,07	0,14	0,15	●		
N.2.1	80	0,09	0,11	0,13	0,015	0,04	0,035	0,04	0,045	80	0,03	0,035	0,045	0,055	0,03	0,06	0,12	0,12	●		
N.2.2	60	0,09	0,11	0,13	0,015	0,04	0,035	0,04	0,045	60	0,03	0,035	0,045	0,055	0,03	0,06	0,12	0,12	●		
N.2.3																					
N.3.1	25	0,08	0,1	0,12	0,015	0,04	0,035	0,03	0,035	25	0,02	0,035	0,045	0,055	0,03	0,06	0,12	0,12	●		
N.3.2	25	0,08	0,1	0,12	0,015	0,04	0,035	0,03		25	0,02	0,035	0,045	0,055	0,03	0,06	0,12	0,12	●		
N.3.3	25	0,08	0,1	0,12	0,015	0,04	0,035	0,03		25	0,02	0,035	0,045	0,055	0,03	0,06	0,12	0,12	●		
N.4.1	70	0,1	0,12	0,15	0,018	0,04	0,03	0,035	0,045	70	0,03	0,035	0,05	0,06	0,025	0,06	0,1	0,12	●		
S.1.1																					
S.1.2																					
S.2.1																					
S.2.2																					
S.2.3																					
S.3.1	20	0,06	0,08	0,1	0,012	0,025	0,025	0,025	0,035	20	0,015	0,025	0,035	0,045	0,02	0,05	0,07	0,09	●		
S.3.2																					
S.3.3																					
H.1.1																					
H.1.2																					
H.1.3																					
H.1.4																					
H.2.1																					
H.3.1																					
O.1.1	65	0,12	0,15	0,18		0,06	0,055	0,055	0,07	65	0,04	0,05	0,07	0,09	0,045	0,1	0,18	0,18	●		
O.1.2	80	0,12	0,15	0,18		0,06	0,055	0,055	0,07	80	0,04	0,05	0,07	0,09	0,045	0,1	0,18	0,18	●		
O.2.1																					
O.2.2																					
O.3.1																					

The cutting data depends largely on the external conditions, e.g. stability of the tools and tool clamping, material and machine type.
The indicated values are possible cutting data which have to be increased or reduced according to the application conditions.

Cutting data standard values – Form cutters

Index	v_c (m/min)	50 245 ... / 50 246 ... Ø DC (mm) = 16	20	25	v_c (m/min)	50 360 ... Ø DC (mm) = 50	63	80	100	50 362 ... Ø DC (mm) = 40–50	63	80	100	● 1st choice ○ suitable Emulsion	Compressed air	MMS
		a_e = 3,2	a_e = 4	a_e = 5		a_e = 5	a_e = 6,3	a_e = 8	a_e = 10							
		f_z (mm)				f_z (mm)				f_z (mm)						
P.1.1	28	0,01	0,015	0,018	22	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.1.2	28	0,01	0,015	0,018	22	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.1.3	28	0,01	0,015	0,018	22	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.1.4	22	0,01	0,015	0,018	20	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
P.1.5	22	0,01	0,015	0,018	20	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.2.1	22	0,01	0,015	0,018	20	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.2.2	28	0,01	0,015	0,018	22	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
P.2.3	20	0,01	0,015	0,018	20	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.2.4	20	0,01	0,015	0,018	20	0,01	0,01	0,015	0,02	0,005	0,008	0,01	0,012	●		
P.3.1																
P.3.2																
P.3.3																
P.4.1	10	0,007	0,01	0,012	10	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
P.4.2	10	0,007	0,01	0,012	10	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
M.1.1	10	0,007	0,01	0,012	10	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
M.2.1																
M.3.1																
K.1.1	24	0,01	0,012	0,015	19	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
K.1.2					12	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012			
K.2.1	22	0,01	0,012	0,015	15	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
K.2.2	20	0,01	0,012	0,015	12	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
K.3.1	15	0,01	0,012	0,015	16	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
K.3.2	15	0,01	0,012	0,015	13	0,008	0,01	0,012	0,018	0,005	0,008	0,01	0,012	●		
N.1.1	90	0,01	0,015	0,02										●		
N.1.2	90	0,01	0,015	0,02	70	0,012	0,015	0,02	0,024	0,008	0,012	0,014	0,018	●		
N.2.1	80	0,01	0,015	0,02	60	0,012	0,015	0,02	0,024	0,008	0,012	0,014	0,018	●		
N.2.2	60	0,01	0,015	0,02	60	0,012	0,015	0,02	0,024	0,008	0,012	0,014	0,018	●		
N.2.3																
N.3.1	25	0,01	0,015	0,02	20	0,01	0,012	0,015	0,018	0,005	0,008	0,01	0,012	●		
N.3.2	25	0,01	0,015	0,02	20	0,01	0,012	0,015	0,018	0,005	0,008	0,01	0,012	●		
N.3.3	25	0,01	0,015	0,02	20	0,01	0,012	0,015	0,018	0,005	0,008	0,01	0,012	●		
N.4.1	70	0,01	0,015	0,0175	45	0,01	0,012	0,015	0,018	0,005	0,008	0,01	0,01	●		
S.1.1																
S.1.2																
S.2.1																
S.2.2																
S.2.3																
S.3.1	20	0,008	0,01	0,015	20	0,008	0,01	0,012	0,016	0,005	0,007	0,009	0,012	●		
S.3.2																
S.3.3																
H.1.1																
H.1.2																
H.1.3																
H.1.4																
H.2.1																
H.3.1																
O.1.1	65	0,018	0,02	0,025	60	0,015	0,02	0,025	0,03	0,008	0,012	0,018	0,022	●		
O.1.2	80	0,018	0,02	0,025	65	0,015	0,02	0,025	0,03	0,008	0,012	0,018	0,022	●		
O.2.1																
O.2.2																
O.3.1																

The cutting data depends largely on the external conditions, e.g. stability of the tools and tool clamping, material and machine type.
The indicated values are possible cutting data which have to be increased or reduced according to the application conditions.

13

Cutting data – side and face cutters

Index	v_c (m/min)	50 340 ... / 50 349 ... Ø DC (mm) = 50	63	80	100	125	160	Emulsion	Compressed air	MMS
		f (mm)						● 1st choice ○ suitable		
P.1.1	30	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,047–0,055	0,050–0,060	●		
P.1.2	20	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,047–0,055	0,050–0,060	●		
P.1.3	20	0,025–0,035	0,030–0,040	0,035–0,045	0,040–0,050	0,047–0,060	0,050–0,065	●		
P.1.4	15	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
P.1.5	15	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
P.2.1	20	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
P.2.2	20	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
P.2.3	10	0,015–0,020	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	●		
P.2.4	10	0,015–0,020	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	●		
P.3.1	15	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
P.3.2	10	0,015–0,020	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	●		
P.3.3	10	0,015–0,020	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	●		
P.4.1	10	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
P.4.2	10	0,020–0,030	0,025–0,035	0,030–0,040	0,035–0,045	0,040–0,050	0,045–0,100	●		
M.1.1	10	0,015–0,020	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	●		
M.2.1	10	0,015–0,020	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	●		
M.3.1	8	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
K.1.1	20	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
K.1.2	18	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
K.2.1	18	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
K.2.2	15	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
K.3.1	18	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
K.3.2	18	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
N.1.1	150	0,030–0,037	0,037–0,045	0,045–0,050	0,050–0,060	0,060–0,067	0,067–0,075	●		
N.1.2	100	0,030–0,037	0,037–0,045	0,045–0,050	0,050–0,060	0,060–0,067	0,067–0,075	●		
N.2.1	80	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,047–0,055	0,050–0,060	●		
N.2.2	40	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,047–0,055	0,050–0,060	●		
N.2.3										
N.3.1	80	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
N.3.2	30	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,047–0,055	0,050–0,060	●		
N.3.3	30	0,025–0,035	0,030–0,040	0,035–0,045	0,040–0,050	0,047–0,060	0,050–0,065	●		
N.4.1	90	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,047–0,055	0,050–0,060		●	
S.1.1										
S.1.2										
S.2.1										
S.2.2										
S.2.3										
S.3.1	10	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
S.3.2	10	0,020–0,025	0,025–0,030	0,030–0,035	0,035–0,040	0,040–0,045	0,045–0,050	●		
S.3.3										
H.1.1										
H.1.2										
H.1.3										
H.1.4										
H.2.1										
H.3.1										
O.1.1	30	0,040–0,050	0,050–0,060	0,060–0,070	0,070–0,080	0,080–0,090	0,090–0,100	●		
O.1.2	20	0,040–0,050	0,050–0,060	0,060–0,070	0,070–0,080	0,080–0,090	0,090–0,100	●		
O.2.1										
O.2.2										
O.3.1										

Feed correction factor (Kf f_z) for side and face cutters in relation to the cutting depth (a_e)

a_e	Kf f_z
0,05 x DC	1,4
0,1 x DC	1,0
0,15 x DC	0,8
0,2 x DC	0,7
0,25 x DC	0,6

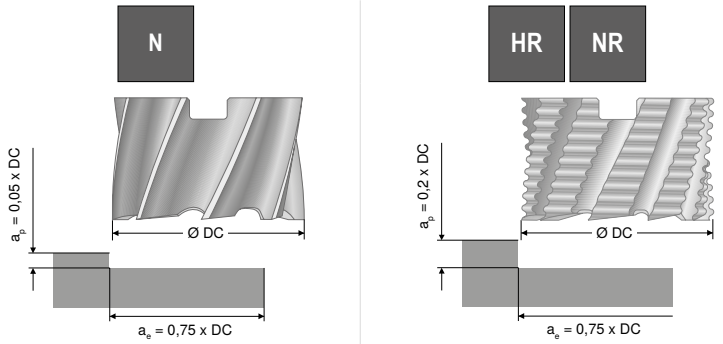
Cutting data – face mills

Index	Kf f_z	50 250 ... / 50 260 ... uncoated v_c (m/min)	54 035 ... / 54 037 ... Ti100 Pro v_c (m/min)	● 1st choice ○ suitable Emulsion	Compressed air	MMS
P.1.1	1,2	25	45	●		
P.1.2	1,2	20	40	●		
P.1.3	1,2	20	40	●		
P.1.4	1,0	15	30	●		
P.1.5	1,0	15	30	●		
P.2.1	1,2	20	40	●		
P.2.2	1,0	20	40	●		
P.2.3	0,8	10	20	●		
P.2.4	0,8	10	20	●		
P.3.1	1,0	15	30	●		
P.3.2	0,8	10	20	●		
P.3.3	0,8	10	20	●		
P.4.1	1,0	10	15	●		
P.4.2	1,0	10	15	●		
M.1.1	1,0	10	15	●		
M.2.1	0,9	7	15	●		
M.3.1	1,0	5	10	●		
K.1.1	1,0	20	30	●		
K.1.2	1,0	18	30	●		
K.2.1	1,0	18	30	●		
K.2.2	1,0	15	25	●		
K.3.1	1,0	18	30	●		
K.3.2	1,0	18	30	●		
N.1.1	1,5	150				
N.1.2	1,5	100				
N.2.1	1,3	80				
N.2.2	1,3	40				
N.2.3						
N.3.1	1,1	80	110	●		
N.3.2	1,2	30	60	●		
N.3.3	1,2	30	60	●		
N.4.1	1,3	90	120		●	
S.1.1						
S.1.2						
S.2.1						
S.2.2						
S.2.3						
S.3.1	1,0	10	15	●		
S.3.2	1,1	10	15	●		
S.3.3	0,8		10	●		
H.1.1						
H.1.2						
H.1.3						
H.1.4						
H.2.1						
H.3.1						
O.1.1	2,0	30	50	●		
O.1.2	2,0	20	25	●		
O.2.1						
O.2.2						
O.3.1						

13

Feed per tooth for HSS face mills

Appoximate values (in mm) for the feed per tooth (f_z)



	f_z in mm		f_z in mm	
Ø DC mm	uncoated	Ti100 Pro	uncoated	Ti100 Pro
40	0,049	0,054	0,064	0,070
50	0,055	0,060	0,071	0,078
63	0,061	0,067	0,079	0,087
80	0,065	0,071	0,084	0,092

Feed rate correction:
Please multiply the f_z value in the table above with the corresponding **correction factor Kf f_z** from the table on → **page 33.**

In general the following is valid:
f_z (milling) = f_z x Kf f_z
f_z (drilling) = f_z (milling) ÷ no. of teeth

Formula for cutting data calculation

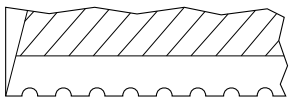
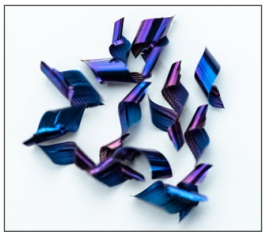
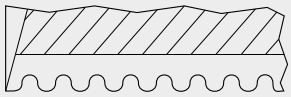
Designation	Abbreviation	Unit	Formula
Number of revolutions	n	min^{-1}	$n = \frac{v_C \times 1000}{DC \times \pi}$
Cutting speed	v_c	m/min	$v_c = \frac{DC \times \pi \times n}{1000}$
Feed per tooth	f_z	mm	$f_z = \frac{v_f}{ZEFP \times n}$ $f_z = h_m \times \sqrt{\frac{DC}{a_e}}$
Feed per revolution	f	mm	$f = f_z \times ZEFP$
Feed rate	v_f	mm/min.	$v_f = f_z \times ZEFP \times n$
Average chip thickness	h_m	mm	$h_m = f_z \times \sqrt{\frac{a_e}{DC}}$

ZEFP = Number of flutes
a_e = cutting width (for side milling cutter cutting depth)
DC = Cutting diameter

Version description

W	For soft materials and non-ferrous metals (aluminium, copper, brass)
N	For machining steel and cast materials, as well as stainless steels
H	For high-strength steels and tempered materials
NF	For machining steel and cast materials, as well as stainless steels – with roughing-finishing profile
HF	For high-strength steels and tempered materials – with roughing-finishing profile
NR	For machining steel and cast materials, as well as stainless steels – with roughing profile
HR	For high-strength steels and tempered materials – with roughing profile

Differences between the milling cutter types

Designation	Type	Shape of the chip breaker	Application description	Chip shape
Rough and finish milling cutters	NF HF	Chip breaker with flat profile 	▲ High chip volume, even on less powerful machines ▲ Surface quality mostly sufficient ▲ Lower cutting pressure compared to smooth-edged milling cutters ▲ Finish machining not needed	
Rough milling cutters	NR HR	Chip breaker with round profile 	▲ Produces very small and short chips ▲ Problem-solver in unstable conditions ▲ High chip volume, even on the weakest machines ▲ Exceptionally well suited to full slot milling ▲ Additional finish machining needed ▲ High feeds possible	

Coating

Ti100 Pro	▲ Ti multilayer coating ▲ $HV_{0.05}$ = 3500 ▲ Coefficient of friction (against steel) = 0.7 ▲ Maximum application temperature: 900°C

13