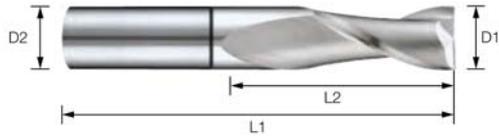


SOLID ENDMILLS





90° 2 Flutes

Product Designation	D1	D2	L1	L2	Catalog Nr.
E90 Z2 D01.0(03) L03.0(038) LT 4000	01.0	03	038	03.0	M5003520
E90 Z2 D01.5(03) L05.0(038) LT 4000	01.5	03	038	05.0	M5003537
E90 Z2 D02.0(03) L06.0(038) LT 4000	02.0	03	038	06.0	M5003538
E90 Z2 D02.5(03) L07.0(038) LT 4000	02.5	03	038	07.0	M5003539
E90 Z2 D03.0(03) L09.0(038) LT 4000	03.0	03	038	09.0	M5003540
E90 Z2 D04.0(04) L14.0(050) LT 4000	04.0	04	050	14.0	M5003541
E90 Z2 D05.0(05) L16.0(050) LT 4000	05.0	05	050	16.0	M5003542
E90 Z2 D06.0(06) L20.0(063) LT 4000	06.0	06	063	20.0	M5003543
E90 Z2 D08.0(08) L20.0(063) LT 4000	08.0	08	063	20.0	M5003544
E90 Z2 D10.0(10) L22.0(072) LT 4000	10.0	10	072	22.0	M5003545
E90 Z2 D12.0(12) L26.0(075) LT 4000	12.0	12	075	26.0	M5003546

E90° Z2 Ø 1 - 5

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]					V _c [m/min]	
					ap	ae	ap	Ø 1.0	Ø 2.0	Ø 3.0	Ø 4.0	Ø 5.0	min	max	
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.010	0.012	0.017	0.024	0.030	150	200	
		2		190 HB	1.5xØ	0.5xØ	1.0xØ	0.010	0.012	0.017	0.024	0.030	140	190	
		3		250 HB	1.5xØ	0.5xØ	1.0xØ	0.010	0.012	0.017	0.024	0.030	120	160	
	Low Aligned	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.010	0.011	0.016	0.025	0.030	120	180	
		4,6		230 HB	1.5xØ	0.5xØ	1.0xØ	0.010	0.011	0.016	0.025	0.030	90	130	
		5,7		280 HB	1.5xØ	0.5xØ	0.7xØ	0.007	0.009	0.014	0.020	0.024	80	120	
		8		350 HB	1.5xØ	0.5xØ	0.7xØ	0.007	0.009	0.014	0.020	0.024	60	90	
		High Aligned		3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.010	0.015	0.021	0.026	70
10	280 HB	1.5xØ	0.5xØ	1.0xØ		0.009	0.010	0.015	0.021	0.026	65	110			
11	320 HB	1.5xØ	0.5xØ	0.6xØ		0.007	0.008	0.011	0.016	0.020	60	90			
11	350 HB	1.5xØ	0.5xØ	0.6xØ		0.007	0.008	0.011	0.016	0.020	50	80			
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.007	0.008	0.012	0.017	0.022	80	120	
		14		240 HB	1.5xØ	0.5xØ	1.0xØ	0.007	0.008	0.012	0.017	0.022	70	115	
	Duplex	5	X2CrNiN23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.006	0.006	0.009	0.013	0.017	60	100	
		14		310 HB	1.5xØ	0.5xØ	1.0xØ	0.006	0.006	0.009	0.013	0.017	60	90	
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.006	0.006	0.009	0.013	0.017	50	90	
		13		42 HRc	1.5xØ	0.5xØ	1.0xØ	0.006	0.006	0.009	0.013	0.017	30	55	
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, Ne30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.014	0.020	0.029	0.036	140	200	
		15		200 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.014	0.020	0.029	0.036	150	190	
		16		250 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.014	0.020	0.029	0.036	120	160	
	Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	1.5xØ	0.5xØ	1.0xØ	0.010	0.012	0.017	0.025	0.031	130	180	
17,19		200 HB		1.5xØ	0.5xØ	1.0xØ	0.010	0.012	0.017	0.025	0.031	110	150		
18,20		250 HB		1.5xØ	0.5xØ	1.0xØ	0.010	0.012	0.017	0.025	0.031	90	130		
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800	240 HB	1.5xØ	0.3xØ	1.0xØ	0.006	0.007	0.010	0.014	0.018	30	50	
		33		Inconel 700	250 HB	1.5xØ	0.3xØ	1.0xØ	0.006	0.007	0.010	0.014	0.018	25	45
		34		Stellite 21	350 HB	1.5xØ	0.3xØ	1.0xØ	0.006	0.007	0.010	0.014	0.018	20	50
	Ti Based	10	TiAl6V4	-	1.5xØ	0.5xØ	1.0xØ	0.006	0.007	0.010	0.015	0.018	30	60	
37		T40		-	1.5xØ	0.5xØ	1.0xØ	0.006	0.007	0.010	0.015	0.018	40	70	
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	1.5xØ	0.3xØ	0.2xØ	0.004	0.005	0.007	0.011	0.013	40	60	
		38		50 HRc	1.5xØ	0.3xØ	0.2xØ	0.004	0.005	0.007	0.011	0.013	35	55	
		38		55 HRc	1.5xØ	0.2xØ	0.1xØ	0.003	0.004	0.005	0.008	0.010	30	50	
		40		Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.003	0.004	0.005	0.008	0.010	35	55
	Chilled Cast Iron	11	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.003	0.004	0.005	0.008	0.010	30	50	
White Cast Iron	11	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.003	0.004	0.005	0.008	0.010	30	50		
NF	Al (>8%Si)	12	AISI12	130 HB	1.5xØ	0.5xØ	0.1xØ	0.011	0.013	0.018	0.027	0.033	160	250	

E90° Z2 Ø 6, 8, 10, 12

Material Group	Gr. N°	VDI Group	Material Exemples	Hardness	profiling		slotting		fz[mm/tooth]				V _c [m/min]	
					ap	ae	ap	Ø 6.0	Ø 8.0	Ø10.0	Ø12.0	min	max	
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.065	0.077	150	200	
		2		190 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.065	0.077	140	190	
		3		250 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.065	0.077	120	160	
	Low Aligned	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.039	0.053	0.063	0.074	120	180	
		4,6		230 HB	1.5xØ	0.5xØ	1.0xØ	0.039	0.053	0.063	0.074	90	130	
		5,7		280 HB	1.5xØ	0.5xØ	0.7xØ	0.032	0.043	0.052	0.062	80	120	
		8		350 HB	1.5xØ	0.5xØ	0.7xØ	0.032	0.043	0.052	0.062	60	90	
		10		220 HB	1.5xØ	0.5xØ	1.0xØ	0.033	0.046	0.055	0.064	70	130	
	High Aligned	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	280 HB	1.5xØ	0.5xØ	1.0xØ	0.033	0.046	0.055	0.064	65	110	
		10		320 HB	1.5xØ	0.5xØ	0.6xØ	0.025	0.035	0.041	0.049	60	90	
		11		350 HB	1.5xØ	0.5xØ	0.6xØ	0.025	0.035	0.041	0.049	50	80	
14		180 HB		1.5xØ	0.5xØ	1.0xØ	0.028	0.038	0.045	0.053	80	120		
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	240 HB	1.5xØ	0.5xØ	1.0xØ	0.028	0.038	0.045	0.053	70	115	
		14		290 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	60	100	
	Duplex	5	X2CrNiN23-4, S31500	310 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	60	90	
		14		200 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	50	90	
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	42 HRc	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	30	55	
		13		150 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	140	200	
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	200 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	150	190	
		15		250 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	120	160	
		16		150 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	130	180	
Malleable & Nodular	8	GG40, GGG70, 50005	200 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	110	150		
	17,19		250 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	90	130		
	18,20		240 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	30	50		
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800 Inconel 700	250 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	25	45	
		31,32		350 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	20	50	
		33		-	1.5xØ	0.5xØ	1.0xØ	0.023	0.032	0.038	0.045	30	60	
	Ti Based	10	TiAl6V4	-	1.5xØ	0.5xØ	1.0xØ	0.023	0.032	0.038	0.045	40	70	
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	1.5xØ	0.3xØ	0.2xØ	0.017	0.023	0.028	0.032	40	60	
				38	50 HRc	1.5xØ	0.3xØ	0.2xØ	0.017	0.023	0.028	0.032	35	55
				38	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50
	Chilled Cast Iron	40	Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	35	55	
		41	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50	
	White Cast Iron	12	25	AlSi12	130 HB	1.5xØ	0.5xØ	0.1xØ	0.042	0.058	0.069	0.081	160	250



90° 3 Flutes

Product Designation	D1	D2	L1	L2	Catalog Nr.
E90 Z3 D03.0(06) L08.0(050) LT 4000	03.0	06	050	08.0	M5003548
E90 Z3 D04.0(06) L11.0(050) LT 4000	04.0	06	050	11.0	M5003549
E90 Z3 D05.0(06) L13.0(050) LT 4000	05.0	06	050	13.0	M5003550
E90 Z3 D06.0(06) L16.0(050) LT 4000	06.0	06	050	16.0	M5003551
E90 Z3 D08.0(08) L20.0(060) LT 4000	08.0	08	060	20.0	M5003552
E90 Z3 D10.0(10) L25.0(072) LT 4000	10.0	10	072	25.0	M5003553
E90 Z3 D12.0(12) L30.0(075) LT 4000	12.0	12	075	30.0	M5003554

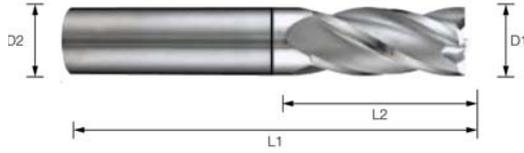
TOOLS & TOOLING

E90° Z3 Ø 3 - 5

Material Group	Gr. N°	VDI Group	Material Exemples	Hardness	profiling		slotting		fz[mm/tooth]			V _c [m/min]		
					ap	ae	ap	Ø 3.0	Ø 4.0	Ø 5.0	min	max		
Steel	Non Alloyed	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.018	0.027	0.033	150	200		
		2		190 HB	1.5xØ	0.5xØ	1.0xØ	0.018	0.027	0.033	140	190		
		3		250 HB	1.5xØ	0.5xØ	1.0xØ	0.018	0.027	0.033	120	160		
	Low Alloyed	2	42CrMo4, St50, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	120	180		
		4,6		230 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	90	130		
		5,7		280 HB	1.5xØ	0.5xØ	0.7xØ	0.015	0.021	0.026	80	120		
		8		350 HB	1.5xØ	0.5xØ	0.7xØ	0.015	0.021	0.026	60	90		
	High Alloyed	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.015	0.021	0.026	70	130		
		10		280 HB	1.5xØ	0.5xØ	1.0xØ	0.015	0.021	0.026	65	110		
11		320 HB		1.5xØ	0.5xØ	0.6xØ	0.011	0.016	0.020	60	90			
14		350 HB		1.5xØ	0.5xØ	0.6xØ	0.011	0.016	0.020	50	80			
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.017	0.022	80	120		
		14		240 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.017	0.022	70	115		
	Duplex	5	X2CrNiN23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.017	60	100		
		14		310 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.017	60	90		
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.016	50	90		
		13		42 HRc	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.016	30	55		
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.029	0.036	140	200		
		15		200 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.029	0.036	150	190		
		16		250 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.029	0.036	120	160		
Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	130	180			
	17,19		200 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	110	150			
	17,19		250 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	90	130			
	18,20		250 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	90	130			
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800, Inconel 700, Stellite 21	240 HB	1.5xØ	0.3xØ	1.0xØ	0.010	0.014	0.018	30	50		
		33		250 HB	1.5xØ	0.3xØ	1.0xØ	0.010	0.014	0.018	25	45		
		34		350 HB	1.5xØ	0.2xØ	1.0xØ	0.010	0.014	0.018	20	50		
Ti Based	10	TiAl6V4, T40	-	1.5xØ	0.5xØ	1.0xØ	0.007	0.011	0.013	30	60			
	37		-	1.5xØ	0.5xØ	1.0xØ	0.007	0.011	0.013	40	70			
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	1.5xØ	0.3xØ	0.2xØ	0.006	0.009	0.012	40	60		
				50 HRc	1.5xØ	0.3xØ	0.2xØ	0.006	0.009	0.012	35	55		
				55 HRc	1.5xØ	0.2xØ	0.1xØ	0.006	0.008	0.010	30	50		
				40	Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.006	0.008	0.010	35	55
				41	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.006	0.008	0.010	30	50
Chilled Cast Iron	White Cast Iron	12	AlSi12	130 HB	1.5xØ	0.5 x Ø	1.0 x Ø	0.018	0.027	0.033	160	250		
				12	25	AlSi12	130 HB	1.5xØ	0.5 x Ø	1.0 x Ø	0.018	0.027	0.033	160

E90° Z3 Ø 6, 8, 10, 12

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]				V _c [m/min]		
					ap	ae	ap	Ø 6.0	Ø 8.0	Ø10.0	Ø12.0	min	max		
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.042	0.058	0.069	0.081	150	200		
				190 HB	1.5xØ	0.5xØ	1.0xØ	0.042	0.058	0.069	0.081	140	190		
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.042	0.058	0.069	0.081	120	160		
	Low Aligned	2	42CrMo4, St50, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.054	0.065	0.076	120	180		
				230 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.054	0.065	0.076	90	130		
				280 HB	1.5xØ	0.5xØ	0.7xØ	0.034	0.046	0.055	0.065	80	120		
				350 HB	1.5xØ	0.5xØ	0.7xØ	0.034	0.046	0.055	0.065	60	90		
	High Aligned	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.033	0.046	0.055	0.064	70	130		
				280 HB	1.5xØ	0.5xØ	1.0xØ	0.033	0.046	0.055	0.064	65	110		
				320 HB	1.5xØ	0.5xØ	0.6xØ	0.025	0.035	0.041	0.049	60	90		
				350 HB	1.5xØ	0.5xØ	0.6xØ	0.025	0.035	0.041	0.049	50	80		
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.028	0.038	0.045	0.053	80	120		
				240 HB	1.5xØ	0.5xØ	1.0xØ	0.028	0.038	0.045	0.053	70	115		
	Duplex	5	X2CrNiN23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	60	100		
				310 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	60	90		
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.028	0.033	0.039	50	90		
				42 HRc	1.5xØ	0.5xØ	1.0xØ	0.020	0.028	0.033	0.039	30	55		
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	140	200		
				200 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	150	190		
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	120	160		
	Malleable & Nodular	8	GGG40, GGG70, 50005	17,19	150 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	130	180	
				17,19	200 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	110	150	
				18,20	250 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	90	130	
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800	31,32	240 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	30	50	
				33	Inconel 700	250 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	25	45
				34	Stellite 21	350 HB	1.5xØ	0.2xØ	1.0xØ	0.023	0.031	0.037	0.044	20	50
	Ti Based	10	TiAl6V4	-	1.5xØ	0.5xØ	1.0xØ	0.017	0.023	0.028	0.032	30	60		
				-	1.5xØ	0.5xØ	1.0xØ	0.017	0.023	0.028	0.032	40	70		
				-	1.5xØ	0.5xØ	1.0xØ	0.017	0.023	0.028	0.032	40	70		
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	1.5xØ	0.3xØ	0.2xØ	0.015	0.020	0.024	0.028	40	60		
				50 HRc	1.5xØ	0.3xØ	0.2xØ	0.015	0.020	0.024	0.028	35	55		
				55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50		
	Chilled Cast Iron	11	Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	35	55		
				41	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50
				40	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50
White Cast Iron	11	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50			
NF Al (>8%Si)	12	25	AlSi12	130 HB	1.5xØ	0.5 x Ø	1.0 x Ø	0.042	0.058	0.069	0.081	160	250		



90° 4 Flutes

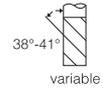
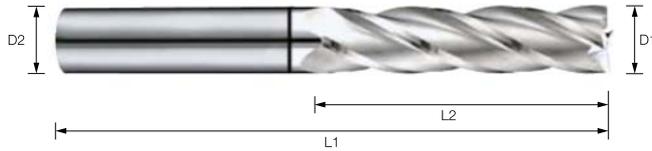
Product Designation	D1	D2	L1	L2	Catalog Nr.
E90 Z4 D01.0(04) L03.0(050) LT 4000	01.0	04	050	03.0	M5003568
E90 Z4 D01.5(04) L05.0(050) LT 4000	01.5	04	050	05.0	M5003569
E90 Z4 D02.0(04) L06.0(050) LT 4000	02.0	04	050	06.0	M5003570
E90 Z4 D02.5(04) L08.0(050) LT 4000	02.5	04	050	08.0	M5003571
E90 Z4 D03.0(06) L08.0(050) LT 4000	03.0	06	050	08.0	M5003572
E90 Z4 D04.0(06) L11.0(050) LT 4000	04.0	06	050	11.0	M5003573
E90 Z4 D05.0(06) L13.0(050) LT 4000	05.0	06	050	13.0	M5003574
E90 Z4 D06.0(06) L16.0(050) LT 4000	06.0	06	050	16.0	M5003575
E90 Z4 D08.0(08) L20.0(060) LT 4000	08.0	08	060	20.0	M5003576
E90 Z4 D10.0(10) L22.0(072) LT 4000	10.0	10	072	22.0	M5003577
E90 Z4 D12.0(12) L26.0(075) LT 4000	12.0	12	075	26.0	M5003578
E90 Z4 D16.0(16) L38.0(100) LT 4000	16.0	16	100	38.0	M5003579

E90° Z4 Ø 3 - 5

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]			V _c [m/min]	
					ap	ae	ap	Ø 3.0	Ø 4.0	Ø 5.0	min	max	
Steel	Non Alloyed	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.024	0.030	150	200	
				190 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.024	0.030	140	190	
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.024	0.030	120	160	
	Low Alloyed	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.016	0.025	0.030	120	180	
				230 HB	1.5xØ	0.5xØ	1.0xØ	0.016	0.025	0.030	90	130	
				280 HB	1.5xØ	0.5xØ	0.7xØ	0.014	0.020	0.024	80	120	
				350 HB	1.5xØ	0.5xØ	0.7xØ	0.014	0.020	0.024	60	90	
	High Alloyed	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.015	0.021	0.026	70	130	
				280 HB	1.5xØ	0.5xØ	1.0xØ	0.015	0.021	0.026	65	110	
				320 HB	1.5xØ	0.5xØ	0.6xØ	0.011	0.016	0.020	60	90	
				350 HB	1.5xØ	0.5xØ	0.6xØ	0.011	0.016	0.020	50	80	
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.017	0.022	80	120	
				240 HB	1.5xØ	0.5xØ	1.0xØ	0.012	0.017	0.022	70	115	
	Duplex	5	X2CrNiN23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.017	60	100	
				310 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.017	60	90	
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.017	50	90	
				42 HRC	1.5xØ	0.5xØ	1.0xØ	0.009	0.013	0.017	30	55	
	Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.029	0.036	140	200
					200 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.029	0.036	150	190
					250 HB	1.5xØ	0.5xØ	1.0xØ	0.020	0.029	0.036	120	160
		Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	130	180
200 HB					1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	110	150	
250 HB					1.5xØ	0.5xØ	1.0xØ	0.017	0.025	0.031	90	130	
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800, Inconel 700, Stellite 21	240 HB	1.5xØ	0.3xØ	1.0xØ	0.010	0.014	0.018	30	50	
				250 HB	1.5xØ	0.3xØ	1.0xØ	0.010	0.014	0.018	25	45	
				350 HB	1.5xØ	0.3xØ	1.0xØ	0.010	0.014	0.018	20	50	
	Ti Based	10	TiAl6V4, T40	-	1.5xØ	0.5xØ	1.0xØ	0.010	0.015	0.018	30	60	
				-	1.5xØ	0.5xØ	1.0xØ	0.010	0.015	0.018	40	70	
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRC	1.5xØ	0.3xØ	0.2xØ	0.007	0.011	0.013	40	60	
				50 HRC	1.5xØ	0.3xØ	0.2xØ	0.007	0.011	0.013	35	55	
				55 HRC	1.5xØ	0.2xØ	0.1xØ	0.005	0.008	0.010	30	50	
				400 HB	1.5xØ	0.2xØ	0.1xØ	0.005	0.008	0.010	35	55	
				41	G-X300CrMo15	55 HRC	1.5xØ	0.2xØ	0.1xØ	0.005	0.008	0.010	30
White Cast Iron													
Al (>8%Si)	12	25	AlSi12	130 HB	1.5xØ	0.5xØ	1.0xØ	0.018	0.027	0.033	160	250	

E90° Z4 Ø 6, 8, 10, 12

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]				V _c [m/min]	
					ap	ae	ap	Ø 6.0	Ø 8.0	Ø10.0	Ø12.0	min	max	
Steel	Non Alloyed	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.065	0.077	150	200	
				190 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.065	0.077	140	190	
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.065	0.077	120	160	
	Low Alloyed	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.039	0.053	0.063	0.074	120	180	
				230 HB	1.5xØ	0.5xØ	1.0xØ	0.039	0.053	0.063	0.074	90	130	
				280 HB	1.5xØ	0.5xØ	0.7xØ	0.032	0.043	0.052	0.062	80	120	
				350 HB	1.5xØ	0.5xØ	0.7xØ	0.032	0.043	0.052	0.062	60	90	
	High Alloyed	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.033	0.046	0.055	0.064	70	130	
				280 HB	1.5xØ	0.5xØ	1.0xØ	0.033	0.046	0.055	0.064	65	110	
				320 HB	1.5xØ	0.5xØ	0.6xØ	0.025	0.035	0.041	0.049	60	90	
				350 HB	1.5xØ	0.5xØ	0.6xØ	0.025	0.035	0.041	0.049	50	80	
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.028	0.038	0.045	0.053	80	120	
				240 HB	1.5xØ	0.5xØ	1.0xØ	0.028	0.038	0.045	0.053	70	115	
	Duplex	5	X2CrNi23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	60	100	
				310 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	60	90	
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	50	90	
				42 HRc	1.5xØ	0.5xØ	1.0xØ	0.021	0.029	0.035	0.040	30	55	
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	140	200	
				200 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	150	190	
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.047	0.064	0.076	0.089	120	160	
	Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	130	180	
				200 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	110	150	
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.040	0.055	0.066	0.077	90	130	
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800, Inconel 700	240 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	30	50	
				250 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	25	45	
	Ti Based	10	TiAl6V4, T40	350 HB	1.5xØ	0.3xØ	1.0xØ	0.023	0.031	0.037	0.044	20	50	
				-	1.5xØ	0.5xØ	1.0xØ	0.023	0.032	0.038	0.045	30	60	
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	1.5xØ	0.3xØ	0.2xØ	0.017	0.023	0.028	0.032	40	60	
				50 HRc	1.5xØ	0.3xØ	0.2xØ	0.017	0.023	0.028	0.032	35	55	
				55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50	
	Chilled Cast Iron	40	Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	35	55	
				400 HB	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50	
	White Cast Iron	41	G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.013	0.017	0.021	0.024	30	50	
NF	Al (>8%Si)	12	AlSi12	130 HB	1.5xØ	0.5xØ	1.0xØ	0.042	0.058	0.069	0.081	160	250	



90° 2 Flutes Long

Product Designation	D1	D2	L1	L2	Catalog Nr.
E90 Z4 D03.0(06) L12.0(050) LT 4000	03.0	06	050	12.0	M5003559
E90 Z4 D04.0(06) L16.0(055) LT 4000	04.0	06	055	16.0	M5003560
E90 Z4 D05.0(06) L20.0(060) LT 4000	05.0	06	060	20.0	M5003561
E90 Z4 D06.0(06) L24.0(065) LT 4000	06.0	06	065	24.0	M5003562
E90 Z4 D08.0(08) L32.0(090) LT 4000	08.0	08	090	32.0	M5003563
E90 Z4 D10.0(10) L40.0(100) LT 4000	10.0	10	100	40.0	M5003564
E90 Z4 D12.0(12) L48.0(110) LT 4000	12.0	12	110	48.0	M5003565
E90 Z4 D16.0(16) L64.0(160) LT 4000	16.0	16	160	64.0	M5003566

TOOLS & TOOLING

E90° Z4 L Ø 1 - 5

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]					V _c [m/min]	
					ap	ae	ap	Ø 1.0	Ø 2.0	Ø 3.0	Ø 4.0	Ø 5.0	min	max	
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	3.0xØ	0.25xØ	1.0xØ	0.010	0.011	0.016	0.023	0.029	150	200	
		2		190 HB	3.0xØ	0.25xØ	1.0xØ	0.010	0.011	0.016	0.023	0.029	140	190	
		3		250 HB	3.0xØ	0.25xØ	1.0xØ	0.010	0.011	0.016	0.023	0.029	120	160	
	Low Aligned	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	3.0xØ	0.25xØ	1.0xØ	0.008	0.010	0.014	0.020	0.025	120	180	
		4,6		230 HB	3.0xØ	0.25xØ	1.0xØ	0.008	0.010	0.014	0.020	0.025	90	130	
		5,7		280 HB	3.0xØ	0.25xØ	0.7xØ	0.007	0.008	0.011	0.016	0.020	80	120	
		8		350 HB	3.0xØ	0.25xØ	0.7xØ	0.007	0.008	0.011	0.016	0.020	60	90	
		High Aligned		3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	3.0xØ	0.25xØ	0.7xØ	0.007	0.008	0.011	0.016	0.020	70
10	280 HB		3.0xØ	0.25xØ		0.7xØ	0.007	0.008	0.011	0.016	0.020	65	110		
11	320 HB		3.0xØ	0.25xØ		0.5xØ	0.005	0.006	0.008	0.011	0.014	60	90		
11	350 HB		3.0xØ	0.25xØ		0.5xØ	0.005	0.006	0.008	0.011	0.014	50	80		
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	3.0xØ	0.25xØ	1.0xØ	0.006	0.007	0.010	0.015	0.019	80	120	
		14		240 HB	3.0xØ	0.25xØ	1.0xØ	0.005	0.007	0.010	0.015	0.019	70	115	
	Duplex Ferritic & Martensitic	5	X2CrNiN23-4, S31500	290 HB	3.0xØ	0.25xØ	1.0xØ	0.005	0.006	0.008	0.011	0.014	60	100	
		14		310 HB	3.0xØ	0.25xØ	1.0xØ	0.005	0.006	0.008	0.011	0.014	60	90	
		6		200 HB	3.0xØ	0.25xØ	1.0xØ	0.005	0.005	0.008	0.011	0.014	50	90	
		13		42 HRc	3.0xØ	0.25xØ	1.0xØ	0.005	0.005	0.008	0.011	0.014	30	55	
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	3.0xØ	0.25xØ	1.0xØ	0.009	0.011	0.015	0.022	0.027	140	200	
		15		200 HB	3.0xØ	0.25xØ	1.0xØ	0.009	0.011	0.015	0.022	0.027	150	190	
		16		250 HB	3.0xØ	0.25xØ	1.0xØ	0.009	0.011	0.015	0.022	0.027	120	160	
	Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	3.0xØ	0.25xØ	1.0xØ	0.009	0.010	0.014	0.021	0.026	130	180	
		17,19		200 HB	3.0xØ	0.25xØ	1.0xØ	0.009	0.010	0.014	0.021	0.026	110	150	
		18,20		250 HB	3.0xØ	0.25xØ	1.0xØ	0.009	0.010	0.014	0.021	0.026	90	130	
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800 Inconel 700 Stellite 21	240 HB	3.0xØ	0.10xØ	1.0xØ	0.004	0.004	0.006	0.009	0.011	30	50	
		33		250 HB	3.0xØ	0.10xØ	1.0xØ	0.004	0.004	0.006	0.009	0.011	25	45	
		34		350 HB	3.0xØ	0.10xØ	1.0xØ	0.004	0.004	0.006	0.009	0.011	20	50	
	Ti Based	10	TiAl6V4 T40	-	3.0xØ	0.25xØ	1.0xØ	0.004	0.004	0.006	0.009	0.011	30	60	
37		-		3.0xØ	0.25xØ	1.0xØ	0.004	0.004	0.006	0.009	0.011	40	70		
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	3.0xØ	0.10xØ	0.1xØ	0.003	0.004	0.006	0.008	0.010	40	60	
		38		50 HRc	3.0xØ	0.10xØ	0.1xØ	0.003	0.004	0.006	0.008	0.010	35	55	
		38		55 HRc	3.0xØ	0.10xØ	0.1xØ	0.003	0.003	0.005	0.007	0.009	30	50	
	Chilled Cast Iron White Cast Iron	40	Ni-Hard 2	400 HB	3.0xØ	0.10xØ	0.1xØ	0.003	0.003	0.005	0.007	0.009	35	55	
		41	G-X300CrMo15	55 HRc	3.0xØ	0.10xØ	0.1xØ	0.003	0.003	0.005	0.007	0.009	30	50	
MF	Al (>8%Si)	12	AlSi12	130 HB	3.0xØ	0.25xØ	1.0xØ	0.010	0.011	0.016	0.023	0.029	160	250	

E90° Z4 L Ø 6, 8, 10, 12

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz(mm/tooth)				V _c [m/min]	
					ap	ae	ap	Ø 6.0	Ø 8.0	Ø 10.0	Ø 12.0	min	max	
Steel	Non Alloyed	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	3.0xØ	0.25xØ	1.0xØ	0.036	0.050	0.059	0.070	150	200	
				190 HB	3.0xØ	0.25xØ	1.0xØ	0.036	0.050	0.059	0.070	140	190	
				250 HB	3.0xØ	0.25xØ	1.0xØ	0.036	0.050	0.059	0.070	120	160	
	Low Alloyed	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	3.0xØ	0.25xØ	1.0xØ	0.032	0.044	0.053	0.062	120	180	
				230 HB	3.0xØ	0.25xØ	1.0xØ	0.032	0.044	0.053	0.062	90	130	
				280 HB	3.0xØ	0.25xØ	0.7xØ	0.026	0.035	0.042	0.049	80	120	
				350 HB	3.0xØ	0.25xØ	0.7xØ	0.026	0.035	0.042	0.049	60	90	
	High Alloyed	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12N19	220 HB	3.0xØ	0.25xØ	0.7xØ	0.026	0.035	0.042	0.049	70	130	
				280 HB	3.0xØ	0.25xØ	0.7xØ	0.026	0.035	0.042	0.049	65	110	
				320 HB	3.0xØ	0.25xØ	0.5xØ	0.018	0.025	0.030	0.035	60	90	
				350 HB	3.0xØ	0.25xØ	0.5xØ	0.018	0.025	0.030	0.035	50	80	
	Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	3.0xØ	0.25xØ	1.0xØ	0.024	0.032	0.039	0.045	80	120
240 HB					3.0xØ	0.25xØ	1.0xØ	0.024	0.032	0.039	0.045	70	115	
Duplex		5	X2CrNiN23-4, S31500	290 HB	3.0xØ	0.25xØ	1.0xØ	0.018	0.025	0.030	0.035	60	100	
				310 HB	3.0xØ	0.25xØ	1.0xØ	0.018	0.025	0.030	0.035	60	90	
Ferritic & Martensitic		6	410, X6Cr17, 17-4 PH, 430	200 HB	3.0xØ	0.25xØ	1.0xØ	0.017	0.024	0.029	0.033	50	90	
				42 HRc	3.0xØ	0.25xØ	1.0xØ	0.017	0.024	0.029	0.033	30	55	
Cast Iron		Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	3.0xØ	0.25xØ	1.0xØ	0.035	0.047	0.056	0.066	140	200
					200 HB	3.0xØ	0.25xØ	1.0xØ	0.035	0.047	0.056	0.066	150	190
	250 HB				3.0xØ	0.25xØ	1.0xØ	0.035	0.047	0.056	0.066	120	160	
Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	3.0xØ	0.25xØ	1.0xØ	0.033	0.045	0.053	0.063	130	180		
			200 HB	3.0xØ	0.25xØ	1.0xØ	0.033	0.045	0.053	0.063	110	150		
			250 HB	3.0xØ	0.25xØ	1.0xØ	0.033	0.045	0.053	0.063	90	130		
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800	240 HB	3.0xØ	0.10xØ	1.0xØ	0.015	0.020	0.024	0.028	30	50	
				250 HB	3.0xØ	0.10xØ	1.0xØ	0.015	0.020	0.024	0.028	25	45	
	Ti Based	10	Stellite 21	350 HB	3.0xØ	0.10xØ	1.0xØ	0.015	0.020	0.024	0.028	20	50	
				-	3.0xØ	0.25xØ	1.0xØ	0.015	0.020	0.024	0.028	30	60	
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	3.0xØ	0.10xØ	0.1xØ	0.013	0.017	0.021	0.024	40	60	
				50 HRc	3.0xØ	0.10xØ	0.1xØ	0.013	0.017	0.021	0.024	35	55	
				55 HRc	3.0xØ	0.10xØ	0.1xØ	0.011	0.015	0.018	0.021	30	50	
	Chilled Cast Iron	40	Ni-Hard 2	400 HB	3.0xØ	0.10xØ	0.1xØ	0.011	0.015	0.018	0.021	35	55	
				55 HRc	3.0xØ	0.10xØ	0.1xØ	0.011	0.015	0.018	0.021	30	50	
	White Cast Iron	41	G-X300CrMo15	400 HB	3.0xØ	0.10xØ	0.1xØ	0.011	0.015	0.018	0.021	35	55	
				55 HRc	3.0xØ	0.10xØ	0.1xØ	0.011	0.015	0.018	0.021	30	50	
NF	Al (>8%Si)	12	25	AlSi12	130 HB	3.0xØ	0.25xØ	1.0xØ	0.036	0.050	0.059	0.070	160	250

SOLID END MILL



90° 3 Flutes, Rougher

Product Designation	D1	D2	L1	L2	Catalog Nr.
ERO Z3 D04.0(06) L11.0(057) LT 4000	04.0	06	057	11.0	M5003607

90° 4 Flutes, Rougher

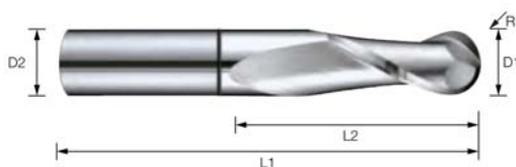
Product Designation	D1	D2	L1	L2	Catalog Nr.
ERO Z4 D05.0(06) L13.0(057) LT 4000	05.0	06	057	13.0	M5003608
ERO Z4 D06.0(06) L13.0(057) LT 4000	06.0	06	057	13.0	M5003609
ERO Z4 D08.0(08) L19.0(063) LT 4000	08.0	08	063	19.0	M5003610
ERO Z4 D10.0(10) L22.0(072) LT 4000	10.0	10	072	22.0	M5003611
ERO Z4 D12.0(12) L26.0(083) LT 4000	12.0	12	083	26.0	M5003612

ERO Z4 Ø 4, 5, 6

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]			V _c [m/min]	
					ap	ae	ap	Ø 4.0	Ø 5.0	Ø 6.0	min	max	
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.024	0.030	0.040	150	200	
				190 HB	1.5xØ	0.5xØ	1.0xØ	0.024	0.030	0.040	140	190	
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.024	0.030	0.040	120	160	
	Low Aligned	2	42CrMo4, St50, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.025	0.030	0.039	120	180	
				230 HB	1.5xØ	0.5xØ	1.0xØ	0.025	0.030	0.039	90	130	
				280 HB	1.5xØ	0.5xØ	0.7xØ	0.020	0.024	0.032	80	120	
				350 HB	1.5xØ	0.5xØ	0.7xØ	0.020	0.024	0.032	60	90	
	High Aligned	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.021	0.026	0.033	70	130	
280 HB				1.5xØ	0.5xØ	1.0xØ	0.021	0.026	0.033	65	110		
320 HB				1.5xØ	0.5xØ	0.6xØ	0.016	0.020	0.025	60	90		
350 HB				1.5xØ	0.5xØ	0.6xØ	0.016	0.020	0.025	50	80		
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.022	0.028	80	120	
				240 HB	1.5xØ	0.5xØ	1.0xØ	0.017	0.022	0.028	70	115	
	Duplex	5	X2CrNiN23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.013	0.017	0.021	60	100	
				310 HB	1.5xØ	0.5xØ	1.0xØ	0.013	0.017	0.021	60	90	
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.013	0.017	0.021	50	90	
				42 HRc	1.5xØ	0.5xØ	1.0xØ	0.013	0.017	0.021	30	55	
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.029	0.036	0.047	140	200	
				200 HB	1.5xØ	0.5xØ	1.0xØ	0.029	0.036	0.047	150	190	
				250 HB	1.5xØ	0.5xØ	1.0xØ	0.029	0.036	0.047	120	160	
Malleable & Nodular	8	GGG40, GGG70, 5000S	150 HB	1.5xØ	0.5xØ	1.0xØ	0.025	0.031	0.040	130	180		
			200 HB	1.5xØ	0.5xØ	1.0xØ	0.025	0.031	0.040	110	150		
			250 HB	1.5xØ	0.5xØ	1.0xØ	0.025	0.031	0.040	90	130		
High Temp. Alloys	Fe, Ni & Co Based	9	31,32 Incoloy 800	240 HB	1.5xØ	0.3xØ	1.0xØ	0.014	0.018	0.023	30	50	
			33 Inconel 700	250 HB	1.5xØ	0.3xØ	1.0xØ	0.014	0.018	0.023	25	45	
			34 Stellite 21	350 HB	1.5xØ	0.3xØ	1.0xØ	0.014	0.018	0.023	20	50	
	Ti Based	10	36 TiAl6V4	-	1.5xØ	0.5xØ	1.0xØ	0.015	0.018	0.023	30	60	
37 T40			-	1.5xØ	0.5xØ	1.0xØ	0.015	0.018	0.023	40	70		
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	1.5xØ	0.3xØ	0.2xØ	0.011	0.013	0.017	40	60	
				50 HRc	1.5xØ	0.3xØ	0.2xØ	0.011	0.013	0.017	35	55	
				55 HRc	1.5xØ	0.2xØ	0.1xØ	0.008	0.010	0.013	30	50	
				40 Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.008	0.010	0.013	35	55
				41 G-X300CrMo15	55 HRc	1.5xØ	0.2xØ	0.1xØ	0.008	0.010	0.013	30	50
Chilled Cast Iron													
White Cast Iron													
MF	Al (>8%Si)	12	25	AlSi12	130 HB	1.5xØ	0.5xØ	1.0xØ	0.027	0.033	0.042	160	250

ERO Z4 Ø 8, 10, 12

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	profiling		slotting		fz[mm/tooth]			V _c [m/min]	
					ap	ae	ap	Ø 8.0	Ø 10.0	Ø 12.0	min	max	
Steel	1	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	1.5xØ	0.5xØ	1.0xØ	0.055	0.065	0.077	150	200	
		2		190 HB	1.5xØ	0.5xØ	1.0xØ	0.055	0.065	0.077	140	190	
		3		250 HB	1.5xØ	0.5xØ	1.0xØ	0.055	0.065	0.077	120	160	
	2	6	42CrMo4, St50, Ck60, 4140, 4340, 100Cr6	180 HB	1.5xØ	0.5xØ	1.0xØ	0.053	0.063	0.074	120	180	
		4,6		230 HB	1.5xØ	0.5xØ	1.0xØ	0.053	0.063	0.074	90	130	
		5,7		280 HB	1.5xØ	0.5xØ	0.7xØ	0.043	0.052	0.062	80	120	
		8		350 HB	1.5xØ	0.5xØ	0.7xØ	0.043	0.052	0.062	60	90	
	3	10	X40CrMoV5, H13, M42, D3, S6-5-2, 12N19	220 HB	1.5xØ	0.5xØ	1.0xØ	0.046	0.055	0.064	70	130	
		10		280 HB	1.5xØ	0.5xØ	1.0xØ	0.046	0.055	0.064	65	110	
		11		320 HB	1.5xØ	0.5xØ	0.6xØ	0.035	0.041	0.049	60	90	
		11		350 HB	1.5xØ	0.5xØ	0.6xØ	0.035	0.041	0.049	50	80	
Stainless Steel	4	14	304, 316, X5CrNi18-9	180 HB	1.5xØ	0.5xØ	1.0xØ	0.038	0.045	0.053	80	120	
		14		240 HB	1.5xØ	0.5xØ	1.0xØ	0.038	0.045	0.053	70	115	
	5	14	X2CrNi23-4, S31500	290 HB	1.5xØ	0.5xØ	1.0xØ	0.029	0.035	0.040	60	100	
		14		310 HB	1.5xØ	0.5xØ	1.0xØ	0.029	0.035	0.040	60	90	
	6	12	410, X6Cr17, 17-4 PH, 430	200 HB	1.5xØ	0.5xØ	1.0xØ	0.029	0.035	0.040	50	90	
		13		42 HRC	1.5xØ	0.5xØ	1.0xØ	0.029	0.035	0.040	30	55	
Cast Iron	7	15	GG20, GG40, EN-GJL-250, No30B	150 HB	1.5xØ	0.5xØ	1.0xØ	0.064	0.076	0.089	140	200	
		15		200 HB	1.5xØ	0.5xØ	1.0xØ	0.064	0.076	0.089	150	190	
		16		250 HB	1.5xØ	0.5xØ	1.0xØ	0.064	0.076	0.089	120	160	
	8	17,19	GGG40, GGG70, 50005	150 HB	1.5xØ	0.5xØ	1.0xØ	0.055	0.066	0.077	130	180	
17,19		200 HB		1.5xØ	0.5xØ	1.0xØ	0.055	0.066	0.077	110	150		
18,20		250 HB		1.5xØ	0.5xØ	1.0xØ	0.055	0.066	0.077	90	130		
High Temp. Alloys	9	31,32	Incoloy 800	240 HB	1.5xØ	0.3xØ	1.0xØ	0.031	0.037	0.044	30	50	
		33	Inconel 700	250 HB	1.5xØ	0.3xØ	1.0xØ	0.031	0.037	0.044	25	45	
		34	Stellite 21	350 HB	1.5xØ	0.3xØ	1.0xØ	0.031	0.037	0.044	20	50	
	10	36	TiAl6V4	-	1.5xØ	0.5xØ	1.0xØ	0.032	0.038	0.045	30	60	
37		T40	-	1.5xØ	0.5xØ	1.0xØ	0.032	0.038	0.045	40	70		
Hardened Mat.	11	38	X100CrMo13, 440C, G-X260NiCr42	45 HRC	1.5xØ	0.3xØ	0.2xØ	0.023	0.028	0.032	40	60	
		38		50 HRC	1.5xØ	0.3xØ	0.2xØ	0.023	0.028	0.032	35	55	
		38		55 HRC	1.5xØ	0.2xØ	0.1xØ	0.017	0.021	0.024	30	50	
		40	Ni-Hard 2	400 HB	1.5xØ	0.2xØ	0.1xØ	0.017	0.021	0.024	35	55	
		41	G-X300CrMo15	55 HRC	1.5xØ	0.2xØ	0.1xØ	0.017	0.021	0.024	30	50	
MF	Al (>8%Si)	12	25	AlSi12	130 HB	1.5xØ	0.5xØ	1.0xØ	0.058	0.069	0.081	160	250



Ball Nose 2 Flutes

Product Designation	D1	D2	L1	L2	Catalog Nr.
EBN Z2 D01.0(03) L03.0(038) R0.50 LT 4000	01.0	03	038	03.0	M5003587
EBN Z2 D01.5(03) L05.0(038) R0.75 LT 4000	01.5	03	038	05.0	M5003588
EBN Z2 D02.0(03) L06.0(038) R1.00 LT 4000	02.0	03	038	06.0	M5003589
EBN Z2 D02.5(03) L07.0(038) R1.25 LT 4000	02.5	03	038	07.0	M5003590
EBN Z2 D03.0(03) L09.0(038) R1.50 LT 4000	03.0	03	038	09.0	M5003591
EBN Z2 D04.0(04) L14.0(050) R2.00 LT 4000	04.0	04	050	14.0	M5003592
EBN Z2 D05.0(05) L16.0(050) R2.50 LT 4000	05.0	05	050	16.0	M5003593
EBN Z2 D06.0(06) L20.0(063) R3.00 LT 4000	06.0	06	063	20.0	M5003594
EBN Z2 D08.0(08) L20.0(063) R4.00 LT 4000	08.0	08	063	20.0	M5003595
EBN Z2 D10.0(10) L22.0(072) R5.00 LT 4000	10.0	10	072	22.0	M5003596
EBN Z2 D12.0(12) L26.0(075) R6.00 LT 4000	12.0	12	075	26.0	M5003597

EBN Z2 Ø 1 - 5

Material Group	Gr. N°	VDI Group	Material Exemples	Hardness	contouring		fz[mm/tooth]					V _c [m/min]	
					ap	ae	Ø1.0	Ø2.0	Ø3.0	Ø4.0	Ø5.0	min	max
Steel	Non Alloyed	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.25xØ	0.7xØ	0.035	0.045	0.065	0.080	0.105	150	200
				190 HB	0.25xØ	0.7xØ	0.035	0.045	0.065	0.080	0.105	140	190
				250 HB	0.25xØ	0.7xØ	0.035	0.045	0.065	0.080	0.105	120	160
	Low Alloyed	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	0.25xØ	0.7xØ	0.033	0.042	0.061	0.075	0.099	120	180
				230 HB	0.25xØ	0.7xØ	0.033	0.042	0.061	0.075	0.099	90	130
				280 HB	0.25xØ	0.7xØ	0.028	0.036	0.052	0.064	0.084	80	120
				350 HB	0.25xØ	0.7xØ	0.028	0.036	0.052	0.064	0.084	60	90
				350 HB	0.25xØ	0.7xØ	0.028	0.036	0.052	0.064	0.084	60	90
	High Alloyed	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.25xØ	0.7xØ	0.028	0.036	0.051	0.063	0.083	70	130
				280 HB	0.25xØ	0.7xØ	0.028	0.036	0.051	0.063	0.083	65	110
				320 HB	0.25xØ	0.7xØ	0.021	0.027	0.039	0.048	0.063	60	90
				350 HB	0.25xØ	0.7xØ	0.021	0.027	0.039	0.048	0.063	50	80
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	0.25xØ	0.7xØ	0.023	0.029	0.042	0.052	0.068	80	120
				240 HB	0.25xØ	0.7xØ	0.023	0.029	0.042	0.052	0.068	70	115
	Duplex	5	X2CrNi23-4, S31500	290 HB	0.25xØ	0.7xØ	0.018	0.023	0.033	0.040	0.053	60	100
				310 HB	0.25xØ	0.7xØ	0.018	0.023	0.033	0.040	0.053	60	90
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	0.25xØ	0.7xØ	0.024	0.031	0.044	0.054	0.071	50	90
				42 HRc	0.25xØ	0.7xØ	0.024	0.031	0.044	0.054	0.071	30	55
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	0.25xØ	0.7xØ	0.039	0.050	0.072	0.088	0.116	140	200
				200 HB	0.25xØ	0.7xØ	0.039	0.050	0.072	0.088	0.116	150	190
				250 HB	0.25xØ	0.7xØ	0.039	0.050	0.072	0.088	0.116	120	160
	Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	0.25xØ	0.7xØ	0.033	0.043	0.062	0.076	0.100	130	180
				200 HB	0.25xØ	0.7xØ	0.033	0.043	0.062	0.076	0.100	110	150
				250 HB	0.25xØ	0.7xØ	0.033	0.043	0.062	0.076	0.100	90	130
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800 Inconel 700 Stellite 21	240 HB	0.25xØ	0.6xØ	0.022	0.029	0.042	0.051	0.067	30	50
				250 HB	0.25xØ	0.6xØ	0.022	0.029	0.042	0.051	0.067	25	45
				350 HB	0.25xØ	0.6xØ	0.022	0.029	0.042	0.051	0.067	20	50
	Ti Based	10	TiAl6V4 T40	-	0.25xØ	0.7xØ	0.019	0.025	0.036	0.044	0.058	30	60
				-	0.25xØ	0.7xØ	0.019	0.025	0.036	0.044	0.058	40	70
				-	0.25xØ	0.7xØ	0.019	0.025	0.036	0.044	0.058	40	70
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	0.25xØ	0.6xØ	0.014	0.018	0.026	0.032	0.042	40	60
				50 HRc	0.25xØ	0.6xØ	0.014	0.018	0.026	0.032	0.042	35	55
				55 HRc	0.25xØ	0.3xØ	0.011	0.014	0.020	0.024	0.032	30	50
				400 HB	0.25xØ	0.3xØ	0.011	0.014	0.020	0.024	0.032	35	55
				55 HRc	0.25xØ	0.3xØ	0.011	0.014	0.020	0.024	0.032	30	50
Chilled Cast Iron	White Cast Iron	41	G-X300CrMo15	400 HB	0.25xØ	0.3xØ	0.011	0.014	0.020	0.024	0.032	30	50
				55 HRc	0.25xØ	0.3xØ	0.011	0.014	0.020	0.024	0.032	30	50
NF	Al (>8%Si)	12	AlSi12	130 HB	0.25xØ	0.7xØ	0.035	0.045	0.065	0.080	0.105	160	250

EBN Z2 Ø 6, 8, 10, 12

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	contouring		fz[mm/tooth]				V _c [m/min]	
					ap	ae	Ø 6.0	Ø 8.0	Ø 10.0	Ø 12.0	min	max
Steel	Non Alloyed	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.25xØ	0.7xØ	0.100	0.115	0.125	0.140	150	200
				190 HB	0.25xØ	0.7xØ	0.100	0.115	0.125	0.140	140	190
				250 HB	0.25xØ	0.7xØ	0.100	0.115	0.125	0.140	120	160
	Low Alloyed	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	0.25xØ	0.7xØ	0.094	0.108	0.118	0.132	120	180
				230 HB	0.25xØ	0.7xØ	0.094	0.108	0.118	0.132	90	130
				280 HB	0.25xØ	0.7xØ	0.080	0.092	0.100	0.112	80	120
				350 HB	0.25xØ	0.7xØ	0.080	0.092	0.100	0.112	60	90
	High Alloyed	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.25xØ	0.7xØ	0.079	0.091	0.099	0.111	70	130
				280 HB	0.25xØ	0.7xØ	0.079	0.091	0.099	0.111	65	110
				320 HB	0.25xØ	0.7xØ	0.060	0.069	0.075	0.084	60	90
				350 HB	0.25xØ	0.7xØ	0.060	0.069	0.075	0.084	50	80
Stainless Steel	Austenitic	4	304, 316, X5CrNi18-9	180 HB	0.25xØ	0.7xØ	0.065	0.075	0.081	0.091	80	120
				240 HB	0.25xØ	0.7xØ	0.065	0.075	0.081	0.091	70	115
	Duplex	5	X2CrNiN23-4, S31500	290 HB	0.25xØ	0.7xØ	0.050	0.058	0.063	0.070	60	100
				310 HB	0.25xØ	0.7xØ	0.050	0.058	0.063	0.070	60	90
	Ferritic & Martensitic	6	410, X6Cr17, 17-4 PH, 430	200 HB	0.25xØ	0.7xØ	0.068	0.078	0.085	0.095	50	90
				42 HRc	0.25xØ	0.7xØ	0.068	0.078	0.085	0.095	30	55
Cast Iron	Grey	7	GG20, GG40, EN-GJL-250, No30B	150 HB	0.25xØ	0.7xØ	0.110	0.127	0.138	0.154	140	200
				200 HB	0.25xØ	0.7xØ	0.110	0.127	0.138	0.154	150	190
				250 HB	0.25xØ	0.7xØ	0.110	0.127	0.138	0.154	120	160
	Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	0.25xØ	0.7xØ	0.095	0.109	0.119	0.133	130	180
				200 HB	0.25xØ	0.7xØ	0.095	0.109	0.119	0.133	110	150
				250 HB	0.25xØ	0.7xØ	0.095	0.109	0.119	0.133	90	130
High Temp. Alloys	Fe, Ni & Co Based	9	Incoloy 800, Inconel 700, Stellite 21	240 HB	0.25xØ	0.6xØ	0.064	0.074	0.080	0.090	30	50
				250 HB	0.25xØ	0.6xØ	0.064	0.074	0.080	0.090	25	45
				350 HB	0.25xØ	0.6xØ	0.064	0.074	0.080	0.090	20	50
	Ti Based	10	TiAl6V4, T40	-	0.25xØ	0.7xØ	0.055	0.063	0.069	0.077	30	60
				-	0.25xØ	0.7xØ	0.055	0.063	0.069	0.077	40	70
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRc	0.25xØ	0.6xØ	0.040	0.046	0.050	0.056	40	60
				50 HRc	0.25xØ	0.6xØ	0.040	0.046	0.050	0.056	35	55
	Chilled Cast Iron	11	Ni-Hard 2	55 HRc	0.25xØ	0.3xØ	0.030	0.035	0.038	0.042	30	50
				400 HB	0.25xØ	0.3xØ	0.030	0.035	0.038	0.042	35	55
	White Cast Iron	11	G-X300CrMo15	55 HRc	0.25xØ	0.3xØ	0.030	0.035	0.038	0.042	30	50
NF Al (>8%Si)	12	25	AISI12	130 HB	0.25xØ	0.7xØ	0.100	0.115	0.125	0.140	160	250

SOLID END MILL



High Feed 4 Flutes					
Product Designation	D1	D2	L1	L2	Catalog Nr.
EHF Z4 D03.0(06) L02.0(070) R0.37 LT 4000	03.0	06	070	02.0	M5003600
EHF Z4 D04.0(06) L02.0(070) R0.47 LT 4000	04.0	06	070	02.0	M5003601
EHF Z4 D05.0(06) L02.5(070) R0.60 LT 4000	05.0	06	070	02.5	M5003602
EHF Z4 D06.0(06) L03.0(070) R0.73 LT 4000	06.0	06	070	03.0	M5003603
EHF Z4 D08.0(08) L04.0(080) R0.98 LT 4000	08.0	08	080	04.0	M5003604
EHF Z4 D10.0(10) L05.0(090) R1.23 LT 4000	10.0	10	090	05.0	M5003605
EHF Z4 D12.0(12) L06.0(100) R1.65 LT 4000	12.0	12	100	06.0	M5003606

EHF Z4 Ø 3 - 5

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	contouring		fz(mm/tooth)			V _c [m/min]				
					ap	ae	Ø 3.0	Ø 4.0	Ø 5.0	min	max			
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.025xØ	0.5xØ	0.140	0.200	0.240	150	200			
				190 HB	0.025xØ	0.5xØ	0.140	0.200	0.240	140	190			
				250 HB	0.025xØ	0.5xØ	0.140	0.200	0.240	120	160			
	Low Aligned	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	0.025xØ	0.5xØ	0.132	0.188	0.226	120	180			
				230 HB	0.025xØ	0.5xØ	0.132	0.188	0.226	90	130			
				280 HB	0.025xØ	0.5xØ	0.132	0.188	0.226	80	120			
				350 HB	0.025xØ	0.5xØ	0.132	0.188	0.226	60	90			
	High Aligned	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.025xØ	0.5xØ	0.111	0.158	0.190	70	130			
				280 HB	0.025xØ	0.5xØ	0.111	0.158	0.190	65	110			
				320 HB	0.025xØ	0.5xØ	0.084	0.120	0.144	60	90			
				350 HB	0.025xØ	0.5xØ	0.084	0.120	0.144	50	80			
Cast Iron				7	GG20, GG40, EN-GJL-250, No30B	150 HB	0.025xØ	0.5xØ	0.154	0.220	0.264	140	200	
						200 HB	0.025xØ	0.5xØ	0.154	0.220	0.264	150	190	
	250 HB	0.025xØ	0.5xØ			0.154	0.220	0.264	120	160				
Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	0.025xØ	0.5xØ	0.133	0.190	0.228	130	180				
			200 HB	0.025xØ	0.5xØ	0.133	0.190	0.228	110	150				
			250 HB	0.025xØ	0.5xØ	0.133	0.190	0.228	90	130				
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRC	0.025xØ	0.5xØ	0.070	0.100	0.120	40	60			
				50 HRC	0.025xØ	0.5xØ	0.070	0.100	0.120	35	55			
				55 HRC	0.025xØ	0.3xØ	0.056	0.080	0.096	30	50			
				Chilled Cast Iron	40	Ni-Hard 2	400 HB	0.025xØ	0.3xØ	0.056	0.080	0.096	35	55
							55 HRC	0.025xØ	0.3xØ	0.056	0.080	0.096	30	50
White Cast Iron	41	G-X300CrMo15	400 HB	0.025xØ	0.3xØ	0.056	0.080	0.096	35	55				
			55 HRC	0.025xØ	0.3xØ	0.056	0.080	0.096	30	50				

EHF Z4 Ø 6, 8,10,12

Material Group	Gr. N°	VDI Group	Material Examples	Hardness	contouring		fz(mm/tooth)				V _c [m/min]				
					ap	ae	Ø 6.0	Ø 8.0	Ø10.0	Ø12.0	min	max			
Steel	Non Aligned	1	C35, Ck45, 1020, 1045, 1060, 28Mn6	125 HB	0.025xØ	0.5xØ	0.260	0.340	0.400	0.450	150	200			
				190 HB	0.025xØ	0.5xØ	0.260	0.340	0.400	0.450	140	190			
				250 HB	0.025xØ	0.5xØ	0.260	0.340	0.400	0.450	120	160			
	Low Aligned	2	42CrMo4, S150, Ck60, 4140, 4340, 100Cr6	180 HB	0.025xØ	0.5xØ	0.244	0.320	0.376	0.423	120	180			
				230 HB	0.025xØ	0.5xØ	0.244	0.320	0.376	0.423	90	130			
				280 HB	0.025xØ	0.5xØ	0.244	0.320	0.376	0.423	80	120			
				350 HB	0.025xØ	0.5xØ	0.244	0.320	0.376	0.423	60	90			
	High Aligned	3	X40CrMoV5, H13, M42, D3, S6-5-2, 12Ni19	220 HB	0.025xØ	0.5xØ	0.205	0.269	0.316	0.356	70	130			
				280 HB	0.025xØ	0.5xØ	0.205	0.269	0.316	0.356	65	110			
				320 HB	0.025xØ	0.5xØ	0.156	0.204	0.240	0.270	60	90			
				350 HB	0.025xØ	0.5xØ	0.156	0.204	0.240	0.270	50	80			
Cast Iron	7	GG20, GG40, EN-GJL-250, No30B	150 HB	0.025xØ	0.5xØ	0.286	0.374	0.440	0.495	140	200				
			200 HB	0.025xØ	0.5xØ	0.286	0.374	0.440	0.495	150	190				
			250 HB	0.025xØ	0.5xØ	0.286	0.374	0.440	0.495	120	160				
Malleable & Nodular	8	GGG40, GGG70, 50005	150 HB	0.025xØ	0.5xØ	0.247	0.323	0.380	0.428	130	180				
			200 HB	0.025xØ	0.5xØ	0.247	0.323	0.380	0.428	110	150				
			250 HB	0.025xØ	0.5xØ	0.247	0.323	0.380	0.428	90	130				
Hardened Mat.	Steel	11	X100CrMo13, 440C, G-X260NiCr42	45 HRC	0.025xØ	0.5xØ	0.130	0.170	0.200	0.225	40	60			
				50 HRC	0.025xØ	0.5xØ	0.130	0.170	0.200	0.225	35	55			
				55 HRC	0.025xØ	0.3xØ	0.104	0.136	0.160	0.180	30	50			
				Chilled Cast Iron	40	Ni-Hard 2	400 HB	0.025xØ	0.3xØ	0.104	0.136	0.160	0.180	35	55
							55 HRC	0.025xØ	0.3xØ	0.104	0.136	0.160	0.180	30	50
White Cast Iron	41	G-X300CrMo15	400 HB	0.025xØ	0.3xØ	0.104	0.136	0.160	0.180	35	55				
			55 HRC	0.025xØ	0.3xØ	0.104	0.136	0.160	0.180	30	50				