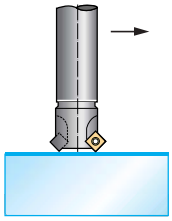
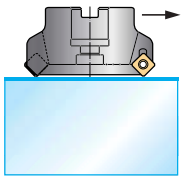
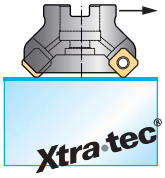
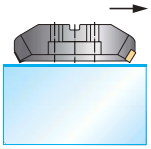
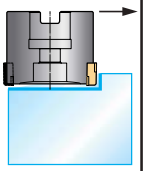
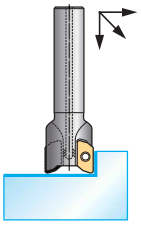
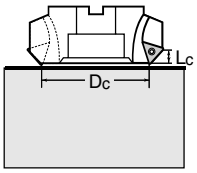
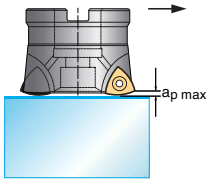
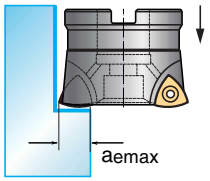
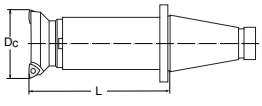
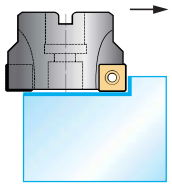
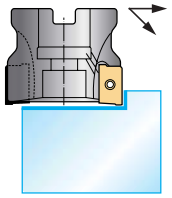
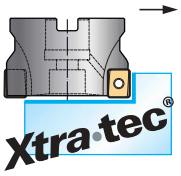
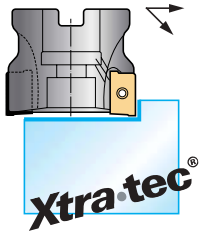
	F 2232			F 2010 / F 2233 / F 2250		F 4033	F 2260	F 2254	F 3040	
										
	45°			45°		45°	60°	89°	90°	
	454			434 / 456 / 460		474	466	464	480	
	f_{z0} [in]			f_{z0} [in]		f_{z0} [in]	f_{z0} [in]	f_{z0} [in]	f_{z0} [in]	
	0.500 – 0.625	0.500 – 1.250	1.250 – 1.500	0.750 – 3.150	0.984 – 8.000	1.500 – 8.000	4.000 – 12.000	2.000 – 6.000	1.000 – 2.500	1.250 – 3.000
	0.118	0.197	0.276	0.197	0.275	0.236	0.433 / 0.591	0.276	Z = 2...5	Z = 2...4
	0.006	0.008	0.010	0.008	0.010	0.010	0.024		—	—
	0.005	0.006	0.008	0.006	0.008	0.008	0.018		—	—
	0.005	0.006	0.008	0.006	0.008	0.008	—		—	—
	0.004	0.005	0.006	0.005	0.006	0.006	—		—	—
	0.003	0.004	0.005	0.004	0.005	0.005	—		0.004	0.004
	0.008	0.010	0.012	0.010	0.012	0.012	0.039	0.006	0.010	0.010
	0.006	0.008	0.010	0.008	0.010	0.010	0.031	0.006	0.008	0.008
	0.006	0.008	0.010	0.008	0.010	0.010	0.031	0.004	0.008	0.008
	0.004	0.005	0.006	0.005	0.006	0.006	—		0.006	0.006
	0.003	0.004	0.005	0.004	0.005	0.005	—		0.005	0.005
	0.003	0.004	0.005	0.004	0.005	0.005	—		0.005	0.005
				—	—		—		0.005	0.005
				—	—		—		0.005	0.005
				—	—		—		—	—
	SP . . 0603	SP . . 09T3	SP . . 1204	SD . . 09T3	SP . . 1204	SN . X 1205	LNMU . . .	SNHQ 1205	ZD . . 1504	ZD . . 2005
	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.4	1.1	1.1
	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.5	1.2	1.2
	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.8	1.3	1.3
	1.5	1.5	1.5					2.0		

Definition of Feed Rates (Starting Values)

Type of cutter		F 2330			F 2330			
Feed rate per tooth f_{z0} for $a_e = D_c$ $a_p = a_{pmax} = L_c$								
Approach angle κ		15°			15°			
Page		472			472			
		f_{z0} [in]			f_{z0} [in]			
Tool Ø [in]		0.750 – 1.000	1.250 – 1.500	2.000 – 3.000	0.750 – 1.000	1.250 – 1.500	2.000 – 3.000	
max. depths of cut $a_{pmax} = L_c$ [in]		^{a}p max = 0.039	^{a}p max = 0.059	^{a}p max = 0.078	^{a}e max = 0.275	^{a}e max = 0.394	^{a}e max = 0.591	
P	Unalloyed steel[1]	0.047	0.063	0.079	0.007	0.010	0.012	
	Low-alloyed steel[1]	0.039	0.055	0.071	0.006	0.009	0.010	
	High alloyed steel and tool steel[1]	0.028	0.039	0.047	0.005	0.006	0.009	
	Stainless steel[1] martensitic	0.020	0.024	0.031	0.004	0.005	0.006	
M	Stainless steel[1] austenitic[2]	0.020	0.024	0.031	0.004	0.005	0.006	
K	Grey cast iron	0.047	0.063	0.079	0.007	0.010	0.012	
	Cast iron with	0.039	0.055	0.071	0.006	0.009	0.011	
	Malleable cast iron	0.039	0.055	0.071	0.006	0.009	0.011	
N	Aluminum	—	—	—	—	—	—	
	Copper and copper alloys	—	—	—	—	—	—	
	Non-metallic materials	—	—	—	—	—	—	
S	Heat-resistant alloys	—	—	—	—	—	—	
	Titanium alloys	—	—	—	0.003	0.004	0.005	
H	Hardened steel	—	—	—	—	—	—	
Types of inserts		P 26335 – R 10	P 26335 – R 14	P 26325 – R 25 P 26335 – R 25	P 26335 – R 10	P 26335 – R 14	P 26325 – R 25 P 26335 – R 25	
Correction factor Ka_e for feed per tooth dependent on the ratio: width of cut a_e / diameter of cutter D_c	$a_e / D_c =$ 1/1–1/2	1.0	1.0	1.0				
	1/5	1.4	1.4	1.3				
	1/10	1.8	1.8	1.6				
	1/20							
	1/50							
Correction factor Ka_p for feed per tooth dependent on the depth of cut a_p	$a_p =$ .020	1.3	1.4	1.5				
	.039	1.0	1.2	1.4				
	.059		1.0	1.2				
	.078			1.0				
$f_z = f_{z0} \times Ka_e \times Ka_p$								
Correction factor K 	1<(L : D_c)≤2	1.4	1.4	1.4	1.0	1.0	1.0	
	2<(L : D_c)≤4	1.0	1.0	1.0	0.7	0.7	0.7	
	4<(L : D_c)≤6	0.7	0.7	0.7	0.5	0.5	0.5	

[1] and cast steel [2] and austenitic / ferritic

	F 2010 / F 2241			F 2010 / F 2250 / F 3042			F 4041	F 2010 / F 4042		
										
	89°45'			90°			90°	90°		
	438 / 478			446 / 462 / 482			492	444 / 494		
	f_{z0} [in]			f_{z0} [in]			f_{z0} [in]	f_{z0} [in]		
	0.630–1.575	0.984–6.300	1.260–12.400	0.375 – 2.500	0.750 – 6.000	2.500 –12.000	1.500 – 6.000	0.500 – 2.000	1.000 – 12.000	1.500 – 12.000
	0.236	0.354	0.472	0.354	0.591	0.787	0.512	0.276	0.433	0.591
	0.004	0.006	0.008	0.006	0.008	0.012	0.008	0.006	0.008	0.010
	0.003	0.005	0.006	0.004	0.006	0.008	0.006	0.004	0.006	0.007
	0.003	0.005	0.006	0.004	0.006	0.008	0.006	0.004	0.006	0.007
	0.002	0.004	0.005	0.003	0.005	0.006	0.005	0.003	0.005	0.006
	0.002	0.003	0.004	0.003	0.004	0.004	0.004	0.003	0.004	0.005
	0.005	0.008	0.010	0.006	0.011	0.012	0.010	0.006	0.010	0.012
	0.004	0.006	0.008	0.005	0.008	0.012	0.008	0.005	0.008	0.010
	0.004	0.006	0.008	0.005	0.008	0.012	0.008	0.005	0.008	0.010
	0.004	0.005	0.006	0.005	0.006	0.006	0.006	0.005	0.006	0.006
	0.003	0.004	0.005	0.004	0.005	0.006	0.005	0.004	0.005	0.006
	0.003	0.004	0.005	0.004	0.005	—	0.005	0.004	0.005	0.006
	0.002	0.004	0.004	0.003	0.005	0.006	0.005	0.003	0.005	0.006
	0.002	0.004	0.004	0.003	0.005	0.006	0.005	0.003	0.005	0.006
	—	—	—	—	—	—	—	—	—	—
	SP . . 0603	SD . . 09T3	SP . . 1204	AP . .0903	AP . .15T3	AD . . 2006	L . . X 1307	AD . . 0803	AD . . 1204	AD . . 1606
	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3

Machining Data for roughing Surface and Shoulder Milling Cutters

Material group	Workpiece material		Brinell-hardness HB	Machining group[5]	Starting value for v_C [ft/min] HC = coated grades							
					WKP 25		WKP 35		WSM 35		WSP 45	
					a_e/D_c* 1/1	a_e/D_c* 1/2 – 1/5	a_e/D_c* 1/1	a_e/D_c* 1/2 – 1/5	a_e/D_c* 1/1	a_e/D_c* 1/2 – 1/5	a_e/D_c* 1/1	a_e/D_c* 1/2 – 1/5
P	Unalloyed steel[1]	approx. 0.15% C annealed	125	1	950	1210	820	980			750	950
		approx. 0.45% C annealed	190	2	850	1080	720	850			620	820
		approx. 0.45% C tempered	250	3	790	980	640	720			510	660
		approx. 0.75% C annealed	270	4	750	980	590	660			480	560
		approx. 0.75% C tempered	300	5	720	850	520	590			430	480
	Low-alloyed steel[1]	annealed	180	6	850	1050	720	890			620	790
		tempered	275	7	720	890	590	690			480	560
		tempered	300	8	690	820	560	620			430	480
		tempered	350	9	560	620	430	490			330	360
	High-alloyed steel and high-alloyed tool steel[1]	annealed	200	10	460	560	430	520			380	460
		hardened by tempering	325	11	360	430	260	300			210	200
	Stainless steel[1]	ferritic / martensitic, annealed	200	12			460	520			510	620
		martensitic, tempered	240	13			330	390			360	430
M	Stainless steel[1]	austenitic[2], retained	180	14					430	510	340	410
K	Grey cast iron	pearlitic / ferritic	180	15	1050	1050	980	980				
		pearlitic (martensitic)	260	16	590	590	560	560				
	Cast iron with spheroidal graphite	ferritic	160	17	720	720	660	660				
		pearlitic	250	18	490	490	460	460				
	Malleable cast iron	ferritic	130	19	820	820	690	690				
		pearlitic	230	20	560	560	490	490				
N	Aluminum malleable alloys	non-age-hardenable	60	21								
		age-hardenable, age-hardened	100	22								
	Aluminum cast alloys	≤ 12% Si, non-age-hardenable	75	23								
		≤ 12% Si, age-hardenable,-hardened	90	24								
		> 12% Si, non-age-hardenable	130	25								
	Copper and copper alloys (Bronze/brass)	Free cutting alloys, Pb > 1%	110	26								
		Brass, red brass	90	27								
		Bronze unleaded copper and electrolytic copper	100	28								
	Non-metallic materials	Duroplasts, ber-reinforced plastics		29								
		Hard rubber		30								
S	Heat-resistant alloys	Fe basis annealed	200	31					260	300	210	230
		Fe basis age-hardened	280	32					200	210	150	160
		Ni or Co basis annealed	250	33				210	200	230	160	180
		Ni or Co basis age-hardened	350	34				110	130	150	100	110
		Ni or Co basis cast	320	35				150	160	180	130	150
	Titanium alloys	Pure titanium	400[3]	36					260	330	210	260
		Alpha + Beta alloys, age-hardened	1050[3]	37					160	180	130	150
H	Hardened steel	hardened by tempering	55[4]	38								
		hardened by tempering	60[4]	39								
	Chill cast iron	cast	400	40								
	Hardened cast iron	hardened by tempering	55[4]	41								

[1] and cast steel [2] and austenitic / ferritic [3] Rm: Tensile strength in MPa = N/mm^2 [4] HRC: Rockwell hardness C

[5] See page 712 etc. of the General Catalog North American Version for the assignment of machining group.

Roughing with Surface / Shoulder Milling Cutters

Starting value for cutting speed v_C [ft/min]																						
HC = coated grades											HF		HW = uncoated grades						CN (Si_3N_4)		DP	
WAK 15		WTP 35		WXP 45		WXM 35		WXN 15			WMG 40		WK 10		WKM		WPM		WSN 10		WCD 10 PKD	
a_e/D_c*		a_e/D_c*		a_e/D_c*		a_e/D_c*		a_e/D_c*			a_e/D_c*		a_e/D_c*		a_e/D_c*		a_e/D_c*		a_e/D_c*		a_e/D_c*	
1/1 1/2	1/5	1/1 1/2	1/5	1/1 1/2	1/5	1/1 1/2	1/5	1/1 1/2	1/5		1/1 1/2	1/1 1/2	1/1 1/2	1/5	1/1 1/2	1/5	1/1 1/2	1/5	1/1 1/2	1/5	1/1 1/2	1/5
		560	720	620	790	690	790										360	460				
		480	620	520	690	620	720										330	430				
		390	490	430	540	520	590										300	340				
		360	430	390	460	460	520										260	300				
		330	360	360	390	390	460										230	260				
		480	610	520	660	620	750										300	390				
		360	430	390	460	460	560										260	330				
		330	360	360	390	390	460										230	260				
		230	260	260	300	330	360										200	250				
		280	340	310	380	330	390										230	260				
		160	200	180	230	230	260										160	180				
		390	460	430	510	360	430															
		260	330	300	360	260	330															
		430	490			390	460															
1250	1250	330	430												260	300			3610	3970		
720	720	260	300												230	230			2170	2400		
850	850	330	440												230	230			2170	2400		
590	590	260	360												200	200			1310	1440		
980	980	430	540												260	260			2720	2990		
660	660	330	430												230	230			1640	1800		
		2300	2710					8660	8660		4920	4920	7220	7220	6560	6560					9840	1310
		1480	1840					6500	6500		3280	3280	5410	5410	4920	4920					6560	6560
		1800	2130					2170	2400				1800	1980	1640	1800					4920	4920
		1310	1310					1740	1740				1440	1440	1310	1310					3280	3280
		820	970					870	1020				720	850	660	770					1640	1640
		1310	1310					1510	1510				1260	1260	1150	1150						
		820	970					870	1020				720	850	660	770						
								660	720				540	590	490	540						
						260	300				250	260										
						200	210				150	160										
			160		160	200	230				180	200										
			160		160	130	150				80	100										
			110		110	160	180				110	130										
						260	330				230	260			260	300						
		150	160			160	180				150	160										
																100						

*a_e/D_c = 1/10, v_C = 10% higher than 1/5