Being the best through innovation

HSSCo8 & HSS

COBALT & HSS END MILLS

- General Purpose / Coating Available

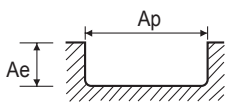
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2030, E1030, E2080, E1080, E2033, E1033, E2050, E1050, E2163, E1163 SERIES

2FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)												
						1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	1-3/4	2
P	1	Non-alloy steel	1.0D	0.5D	SFM	115	120	110	120	115	125	115	120	120	110	120	130	130
					IPT	.0003	.0010	.0018	.0024	.0031	.0032	.0040	.0039	.0039	.0039	.0039	.0043	.0040
					RPM	3500	1800	1100	900	700	630	500	450	400	310	310	280	250
					IPM	2	4	4	4	4	4	4	4	3	2	2	2	2
	2		1.0D	0.5D	SFM	105	105	90	105	90	100	105	105	105	90	100	100	100
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0039	.0039	.0040	.0040	.0040	.0045	.0047
					RPM	3200	1600	900	800	560	500	450	400	350	250	250	220	190
					IPM	2	3	4	4	4	4	4	3	3	2	2	2	2
	3-4		1.0D	0.5D	SFM	80	80	80	80	75	80	80	80	80	70	80	80	60
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0040	.0039	.0039	.0040	.0040	.0044	.0045
					RPM	2500	1200	800	630	450	400	350	310	280	200	200	180	110
					IPM	2	2	3	3	3	3	3	2	2	2	2	2	1
	5		1.0D	0.5D	SFM	50	50	45	50	45	50	50	45	45	45	45	50	40
					IPT	.0003	.0010	.0020	.0025	.0032	.0036	.0041	.0039	.0038	.0042	.0042	.0045	.0050
					RPM	1600	800	450	400	280	250	220	180	160	120	120	110	80
					IPM	1	2	2	2	2	2	2	1	1	1	1	1	1
	6	Low alloy steel	1.0D	0.5D	SFM	105	105	90	105	90	100	105	105	105	90	100	100	100
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0039	.0039	.0040	.0040	.0040	.0045	.0047
					RPM	3200	1600	900	800	560	500	450	400	350	250	250	220	190
					IPM	2	3	4	4	4	4	4	3	3	2	2	2	2
	7		1.0D	0.5D	SFM	80	80	80	80	75	80	80	80	80	70	80	80	60
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0040	.0039	.0039	.0040	.0040	.0044	.0045
					RPM	2500	1200	800	630	450	400	350	310	280	200	200	180	110
					IPM	2	2	3	3	3	3	3	2	2	2	2	2	1
	8-9		1.0D	0.5D	SFM	50	50	45	50	45	50	50	45	45	45	45	50	40
					IPT	.0003	.0010	.0020	.0025	.0032	.0036	.0041	.0039	.0038	.0042	.0042	.0045	.0050
					RPM	1600	800	450	400	280	250	220	180	160	120	120	110	80
					IPM	1	2	2	2	2	2	2	1	1	1	1	1	1
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	105	105	90	105	90	100	105	105	105	90	100	100	100
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0039	.0039	.0040	.0040	.0040	.0045	.0047
					RPM	3200	1600	900	800	560	500	450	400	350	250	250	220	190
					IPM	2	3	4	4	4	4	4	3	3	2	2	2	2
	11.1		1.0D	0.5D	SFM	50	50	45	50	45	50	50	45	45	45	45	50	40
					IPT	.0003	.0010	.0020	.0025	.0032	.0036	.0041	.0039	.0038	.0042	.0042	.0045	.0050
					RPM	1600	800	450	400	280	250	220	180	160	120	120	110	80
					IPM	1	2	2	2	2	2	2	1	1	1	1	1	1
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	360	365	305	325	325	355	320	315	325	325	355	365	330
					IPT	.0004	.0011	.0025	.0030	.0035	.0038	.0042	.0046	.0048	.0048	.0048	.0049	.0050
					RPM	11000	5600	3100	2500	2000	1800	1400	1200	1100	900	900	800	630
					IPM	10	12	16	15	14	14	12	11	11	9	9	8	6
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	360	365	305	325	325	355	320	315	325	325	355	365	330
					IPT	.0004	.0011	.0025	.0030	.0035	.0038	.0042	.0046	.0048	.0048	.0048	.0049	.0050
					RPM	11000	5600	3100	2500	2000	1800	1400	1200	1100	900	900	800	630
					IPM	10	12	16	15	14	14	12	11	11	9	9	8	6



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

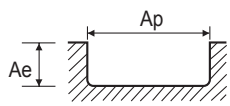
RECOMMENDED CUTTING CONDITIONS

E2030, E1030, E2080, E1080, E2033, E1033, E2050, E1050, E2163, E1163 SERIES

TiN Coated

2FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	1-3/4	2
P	1	Non-alloy steel	1.0D	0.5D	SFM	135	140	130	145	135	150	135	140	140	135	145	155	155
					IPT	.0003	.0010	.0018	.0024	.0031	.0032	.0040	.0039	.0039	.0039	.0039	.0043	.0040
					RPM	4200	2160	1320	1090	840	760	600	540	480	370	370	340	300
					IPM	3	4	5	5	5	5	5	4	4	3	3	3	2
	2		1.0D	0.5D	SFM	125	125	105	125	110	120	125	125	125	110	120	120	120
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0039	.0039	.0040	.0040	.0040	.0045	.0048
					RPM	3840	1920	1080	960	670	600	540	480	420	300	300	260	230
					IPM	2	4	4	5	4	4	4	4	3	2	2	2	2
	3-4		1.0D	0.5D	SFM	100	95	95	100	90	95	95	95	100	85	95	100	70
					IPT	.0003	.0010	.0019	.0024	.0034	.0035	.0040	.0039	.0039	.0040	.0040	.0044	.0045
					RPM	3000	1440	960	760	540	480	420	370	340	240	240	220	130
					IPM	2	3	4	4	4	3	3	3	3	2	2	2	1
	5		1.0D	0.5D	SFM	65	65	55	65	55	60	60	70	125	50	55	60	50
					IPT	.0003	.0010	.0020	.0025	.0033	.0037	.0042	.0042	.0020	.0042	.0042	.0045	.0052
					RPM	1920	960	540	480	340	300	260	260	430	140	140	130	100
					IPM	1	2	2	2	2	2	2	2	2	1	1	1	1
	6	Low alloy steel	1.0D	0.5D	SFM	125	125	105	125	110	120	125	125	125	110	120	120	120
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0039	.0039	.0040	.0040	.0040	.0045	.0048
					RPM	3840	1920	1080	960	670	600	540	480	420	300	300	260	230
					IPM	2	4	4	5	4	4	4	4	3	2	2	2	2
	7		1.0D	0.5D	SFM	100	95	95	100	90	95	95	95	100	85	95	100	70
					IPT	.0003	.0010	.0019	.0024	.0034	.0035	.0040	.0039	.0039	.0040	.0040	.0044	.0045
					RPM	3000	1440	960	760	540	480	420	370	340	240	240	220	130
					IPM	2	3	4	4	4	3	3	3	3	2	2	2	1
	8-9		1.0D	0.5D	SFM	65	65	55	65	55	60	60	70	125	50	55	60	50
					IPT	.0003	.0010	.0020	.0025	.0033	.0037	.0042	.0042	.0020	.0042	.0042	.0045	.0052
					RPM	1920	960	540	480	340	300	260	260	430	140	140	130	100
					IPM	1	2	2	2	2	2	2	2	2	1	1	1	1
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	125	125	105	125	110	120	125	125	125	110	120	120	120
					IPT	.0003	.0010	.0019	.0025	.0031	.0035	.0039	.0039	.0040	.0040	.0040	.0045	.0048
					RPM	3840	1920	1080	960	670	600	540	480	420	300	300	260	230
					IPM	2	4	4	5	4	4	4	4	3	2	2	2	2
	11.1		1.0D	0.5D	SFM	65	65	55	65	55	60	60	70	125	50	55	60	50
					IPT	.0003	.0010	.0020	.0025	.0033	.0037	.0042	.0042	.0020	.0042	.0042	.0045	.0052
					RPM	1920	960	540	480	340	300	260	260	430	140	140	130	100
					IPM	1	2	2	2	2	2	2	2	2	1	1	1	1
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	430	440	365	395	395	425	385	375	390	390	425	440	395
					IPT	.0004	.0011	.0026	.0030	.0035	.0038	.0042	.0046	.0048	.0048	.0048	.0049	.0050
					RPM	13200	6720	3720	3000	2400	2160	1680	1440	1320	1080	1080	960	760
					IPM	12	15	19	18	17	17	14	13	13	10	10	10	8
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	430	440	365	395	395	425	385	375	390	390	425	440	395
					IPT	.0004	.0011	.0026	.0030	.0035	.0038	.0042	.0046	.0048	.0048	.0048	.0049	.0050
					RPM	13200	6720	3720	3000	2400	2160	1680	1440	1320	1080	1080	960	760
					IPM	12	15	19	18	17	17	14	13	13	10	10	10	8



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

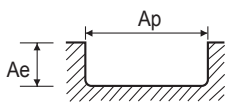
RECOMMENDED CUTTING CONDITIONS

E2030, E1030, E2080, E1080, E2033, E1033, E2050, E1050, E2163, E1163 SERIES

TiCN Coated

2FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)												
						1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	1-3/4	2
P	1	Non-alloy steel	1.0D	0.5D	SFM	150	155	140	155	150	160	150	155	155	145	160	165	170
					IPT	.0003	.0010	.0018	.0024	.0031	.0032	.0040	.0039	.0038	.0038	.0038	.0043	.0040
					RPM	4550	2340	1430	1170	910	820	650	590	520	400	400	360	330
					IPM	3	5	5	6	6	5	5	5	4	3	3	3	3
	2		1.0D	0.5D	SFM	125	135	115	135	120	130	135	135	135	115	130	130	120
					IPT	.0003	.0010	.0020	.0025	.0032	.0035	.0039	.0038	.0040	.0040	.0040	.0045	.0050
					RPM	3840	2080	1170	1040	730	650	590	520	460	330	330	290	230
					IPM	2	4	5	5	5	5	5	4	4	3	3	3	2
	3-4		1.0D	0.5D	SFM	105	100	100	105	95	100	105	105	105	95	100	105	75
					IPT	.0003	.0010	.0019	.0024	.0031	.0035	.0040	.0038	.0040	.0040	.0040	.0045	.0045
					RPM	3250	1560	1040	820	590	520	460	400	360	260	260	230	140
					IPM	2	3	4	4	4	4	4	3	3	2	2	2	1
	5		1.0D	0.5D	SFM	65	70	55	70	60	65	65	60	60	55	60	65	55
					IPT	.0002	.0015	.0027	.0027	.0032	.0035	.0040	.0038	.0038	.0042	.0042	.0045	.0048
					RPM	2050	1040	590	520	360	330	290	230	210	160	160	140	100
					IPM	1	3	3	3	2	2	2	2	2	1	1	1	1
	6	Low alloy steel	1.0D	0.5D	SFM	125	135	115	135	120	130	135	135	135	115	130	130	120
					IPT	.0003	.0010	.0020	.0025	.0032	.0035	.0039	.0038	.0040	.0040	.0040	.0045	.0050
					RPM	3840	2080	1170	1040	730	650	590	520	460	330	330	290	230
					IPM	2	4	5	5	5	5	5	4	4	3	3	3	2
	7		1.0D	0.5D	SFM	105	100	100	105	95	100	105	105	105	95	100	105	75
					IPT	.0003	.0010	.0019	.0024	.0031	.0035	.0040	.0038	.0040	.0040	.0040	.0045	.0045
					RPM	3250	1560	1040	820	590	520	460	400	360	260	260	230	140
					IPM	2	3	4	4	4	4	4	3	3	2	2	2	1
	8-9		1.0D	0.5D	SFM	65	70	55	70	60	65	65	60	60	55	60	65	55
					IPT	.0002	.0015	.0027	.0027	.0032	.0035	.0040	.0038	.0038	.0042	.0042	.0045	.0048
					RPM	2050	1040	590	520	360	330	290	230	210	160	160	140	100
					IPM	1	3	3	3	2	2	2	2	2	1	1	1	1
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	125	135	115	135	120	130	135	135	135	115	130	130	120
					IPT	.0003	.0010	.0020	.0025	.0032	.0035	.0039	.0038	.0040	.0040	.0040	.0045	.0050
					RPM	3840	2080	1170	1040	730	650	590	520	460	330	330	290	230
					IPM	2	4	5	5	5	5	5	4	4	3	3	3	2
	11.1		1.0D	0.5D	SFM	65	70	55	70	60	65	65	60	60	55	60	65	55
					IPT	.0002	.0015	.0027	.0027	.0032	.0035	.0040	.0038	.0038	.0042	.0042	.0045	.0048
					RPM	2050	1040	590	520	360	330	290	230	210	160	160	140	100
					IPM	1	3	3	3	2	2	2	2	2	1	1	1	1
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	470	475	395	425	425	460	415	410	420	420	460	475	430
					IPT	.0004	.0011	.0025	.0030	.0034	.0038	.0042	.0046	.0048	.0048	.0048	.0050	.0050
					RPM	14300	7280	4030	3250	2600	2340	1820	1560	1430	1170	1170	1040	820
					IPM	13	16	21	20	18	18	15	14	14	11	11	10	8
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	470	475	395	425	425	460	415	410	420	420	460	475	430
					IPT	.0004	.0011	.0025	.0030	.0034	.0038	.0042	.0046	.0048	.0048	.0048	.0050	.0050
					RPM	14300	7280	4030	3250	2600	2340	1820	1560	1430	1170	1170	1040	820
					IPM	13	16	21	20	18	18	15	14	14	11	11	10	8



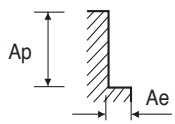
※ The Feed, in long & extra long types, should be reduced by around 50%.

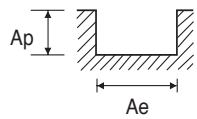
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E1070, E1071, E1072 SERIES — 2FLUTE for ALUMINIUM - SIDE CUTTING & SLOTTING

ISO	VDI 3323	Material Description	SIDE CUTTING Ae	SIDE CUTTING Ap	SLOTTING Ae	SLOTTING Ap	Parameter	Diameter (Ø) 1/8	3/16	1/4	5/16	7/16	1/2	9/16	5/8	3/4	13/16
K	15-16	Grey cast iron	ø1/8~ø5/16 = 0.25D ø7/16~ø13/16 = 0.5D	1.0D	1.0D	0.5D	SFM	260	365	445	425	575	590	515	575	450	425
							IPT	.0018	.0022	.0027	.0053	.0047	.0068	.0090	.0090	.0146	.0168
							RPM	8000	7400	6800	5200	5000	4500	3500	3500	2300	2000
							IPM	29	33	37	55	47	61	63	63	67	67
	17-18	Nodular cast iron	ø1/8~ø5/16 = 0.25D ø7/16~ø13/16 = 0.5D	1.0D	1.0D	0.5D	SFM	260	365	445	425	575	590	515	575	450	425
							IPT	.0018	.0022	.0027	.0053	.0047	.0068	.0090	.0090	.0146	.0168
							RPM	8000	7400	6800	5200	5000	4500	3500	3500	2300	2000
							IPM	29	33	37	55	47	61	63	63	67	67
	19-20	Low alloy steel	ø1/8~ø5/16 = 0.25D ø7/16~ø13/16 = 0.5D	1.0D	1.0D	0.5D	SFM	260	365	445	425	575	590	515	575	450	425
							IPT	.0018	.0022	.0027	.0053	.0047	.0068	.0090	.0090	.0146	.0168
							RPM	8000	7400	6800	5200	5000	4500	3500	3500	2300	2000
							IPM	29	33	37	55	47	61	63	63	67	67
N	21-22	Aluminum-wrought alloy			1.0D	0.5D	SFM	260	365	445	425	575	590	515	575	450	425
							IPT	.0014	.0017	.0021	.0042	.0047	.0052	.0070	.0070	.0111	.0128
							RPM	8000	7400	6800	5200	5000	4500	3500	3500	2300	2000
							IPM	23	25	29	44	47	47	49	49	51	51
	23-25	Aluminum-cast, alloyed			1.0D	0.5D	SFM	170	235	290	275	370	385	335	370	295	275
							IPT	.0014	.0017	.0021	.0042	.0047	.0052	.0070	.0070	.0111	.0128
							RPM	5200	4810	4420	3380	3250	2930	2280	2280	1500	1300
							IPM	15	16	19	28	31	31	32	32	33	33





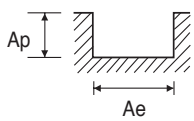
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2160, E2161 SERIES — 3 FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 3/32	1/8	1/4	3/8	1/2	9/16	5/8	7/8	1	1-1/8
P	1	Non-alloy steel	1.0D	0.5D	SFM	135	115	120	110	120	120	115	115	120	120
					IPT	.0001	.0003	.0010	.0018	.0024	.0027	.0031	.0040	.0039	.0039
					RPM	5600	3500	1800	1100	900	800	700	500	450	400
					IPM	2	3	5	6	7	7	7	6	5	5
	2		1.0D	0.5D	SFM	110	105	105	90	105	105	90	105	105	105
					IPT	.0001	.0003	.0010	.0020	.0025	.0025	.0032	.0039	.0039	.0039
					RPM	4500	3200	1600	900	800	700	560	450	400	350
					IPM	2	3	5	5	6	5	5	5	5	4
	3-4		1.0D	0.5D	SFM	100	80	80	80	80	80	75	80	80	80
					IPT	.0002	.0003	.0010	.0020	.0025	.0028	.0030	.0039	.0038	.0037
					RPM	4000	2500	1200	800	630	560	450	350	310	280
					IPM	2	2	4	5	5	5	4	4	4	3
	5		1.0D	0.5D	SFM	55	50	50	45	50	50	45	50	45	45
					IPT	.0001	.0003	.0010	.0019	.0025	.0029	.0031	.0039	.0037	.0038
					RPM	2200	1600	800	450	400	350	280	220	180	160
					IPM	1	1	2	3	3	3	3	3	2	2
	6	Low alloy steel	1.0D	0.5D	SFM	110	105	105	90	105	105	90	105	105	105
					IPT	.0001	.0003	.0010	.0020	.0025	.0025	.0032	.0039	.0039	.0039
					RPM	4500	3200	1600	900	800	700	560	450	400	350
					IPM	2	3	5	5	6	5	5	5	5	4
	7		1.0D	0.5D	SFM	100	80	80	80	80	80	75	80	80	80
					IPT	.0002	.0003	.0010	.0020	.0025	.0028	.0030	.0039	.0038	.0037
					RPM	4000	2500	1200	800	630	560	450	350	310	280
					IPM	2	2	4	5	5	5	4	4	4	3
	8-9		1.0D	0.5D	SFM	55	50	50	45	50	50	45	50	45	45
					IPT	.0001	.0003	.0010	.0019	.0025	.0029	.0031	.0039	.0037	.0038
					RPM	2200	1600	800	450	400	350	280	220	180	160
					IPM	1	1	2	3	3	3	3	3	2	2
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	110	105	105	90	105	105	90	105	105	105
					IPT	.0001	.0003	.0010	.0020	.0025	.0025	.0032	.0039	.0039	.0039
					RPM	4500	3200	1600	900	800	700	560	450	400	350
					IPM	2	3	5	5	6	5	5	5	5	4
	11.1		1.0D	0.5D	SFM	55	50	50	45	50	50	45	50	45	45
					IPT	.0001	.0003	.0010	.0019	.0025	.0029	.0031	.0039	.0037	.0038
					RPM	2200	1600	800	450	400	350	280	220	180	160
					IPM	1	1	2	3	3	3	3	3	2	2
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	295	360	365	305	325	325	325	320	315	325
					IPT	.0003	.0005	.0011	.0025	.0030	.0032	.0035	.0042	.0046	.0048
					RPM	12000	11000	5600	3100	2500	2200	2000	1400	1200	1100
					IPM	9	15	19	24	22	21	21	18	17	16
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	295	360	365	305	325	325	325	320	315	325
					IPT	.0003	.0005	.0011	.0025	.0030	.0032	.0035	.0042	.0046	.0048
					RPM	12000	11000	5600	3100	2500	2200	2000	1400	1200	1100
					IPM	9	15	19	24	22	21	21	18	17	16



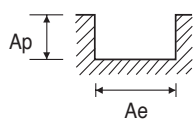
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2160, E2161 SERIES TiN Coated 3 FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)										
						3/32	1/8	1/4	3/8	1/2	9/16	5/8	7/8	1	1-1/8	1-3/16
P	1	Non-alloy steel	1.0D	0.5D	SFM	165	135	140	130	140	125	125	135	140	125	130
					IPT	.0001	.0003	.0010	.0018	.0024	.0031	.0032	.0040	.0040	.0043	.0039
					RPM	6720	4200	2160	1320	1080	840	760	600	540	430	420
					IPM	3	4	6	7	8	8	7	7	6	6	5
	2		1.0D	0.5D	SFM	135	125	125	105	125	100	100	125	125	125	110
					IPT	.0001	.0003	.0010	.0020	.0025	.0032	.0036	.0040	.0039	.0039	.0038
					RPM	5400	3840	1920	1080	960	670	600	540	480	420	370
					IPM	2	3	6	6	7	6	6	6	6	5	4
	3-4		1.0D	0.5D	SFM	120	100	95	95	100	80	80	95	95	100	90
					IPT	.0002	.0003	.0010	.0019	.0025	.0030	.0034	.0039	.0038	.0037	.0040
					RPM	4800	3000	1440	960	760	540	480	420	370	340	300
					IPM	2	3	4	6	6	5	5	5	4	4	4
	5		1.0D	0.5D	SFM	65	65	65	55	65	50	50	60	55	55	55
					IPT	.0001	.0002	.0010	.0019	.0025	.0031	.0034	.0039	.0037	.0038	.0038
					RPM	2640	1920	960	540	480	340	300	260	220	190	190
					IPM	1	1	3	3	4	3	3	3	2	2	2
	6	Low alloy steel	1.0D	0.5D	SFM	135	125	125	105	125	100	100	125	125	125	110
					IPT	.0001	.0003	.0010	.0020	.0025	.0032	.0036	.0040	.0039	.0039	.0038
					RPM	5400	3840	1920	1080	960	670	600	540	480	420	370
					IPM	2	3	6	6	7	6	6	6	6	5	4
	7		1.0D	0.5D	SFM	120	100	95	95	100	80	80	95	95	100	90
					IPT	.0002	.0003	.0010	.0019	.0025	.0030	.0034	.0039	.0038	.0037	.0040
					RPM	4800	3000	1440	960	760	540	480	420	370	340	300
					IPM	2	3	4	6	6	5	5	5	4	4	4
	8-9		1.0D	0.5D	SFM	65	65	65	55	65	50	50	60	55	55	55
					IPT	.0001	.0002	.0010	.0019	.0025	.0031	.0034	.0039	.0037	.0038	.0038
					RPM	2640	1920	960	540	480	340	300	260	220	190	190
					IPM	1	1	3	3	4	3	3	3	2	2	2
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	135	125	125	105	125	100	100	125	125	125	110
					IPT	.0001	.0003	.0010	.0020	.0025	.0032	.0036	.0040	.0039	.0039	.0038
					RPM	5400	3840	1920	1080	960	670	600	540	480	420	370
					IPM	2	3	6	6	7	6	6	6	6	5	4
	11.1		1.0D	0.5D	SFM	65	65	65	55	65	50	50	60	55	55	55
					IPT	.0001	.0002	.0010	.0019	.0025	.0031	.0034	.0039	.0037	.0038	.0038
					RPM	2640	1920	960	540	480	340	300	260	220	190	190
					IPM	1	1	3	3	4	3	3	3	2	2	2
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	355	430	440	365	395	355	355	385	375	390	390
					IPT	.0003	.0005	.0011	.0025	.0030	.0035	.0039	.0042	.0046	.0048	.0048
					RPM	14400	13200	6720	3720	3000	2400	2160	1680	1440	1320	1320
					IPM	11	18	22	28	27	25	25	21	20	19	19
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	355	430	440	365	395	355	355	385	375	390	390
					IPT	.0003	.0005	.0011	.0025	.0030	.0035	.0039	.0042	.0046	.0048	.0048
					RPM	14400	13200	6720	3720	3000	2400	2160	1680	1440	1320	1320
					IPM	11	18	22	28	27	25	25	21	20	19	19



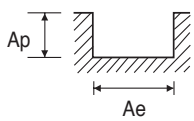
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2160, E2161 SERIES TiCN Coated 3 FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)									
						3/32	1/8	1/4	3/8	1/2	9/16	5/8	7/8	1	1-1/8
P	1	Non-alloy steel	1.0D	0.5D	SFM	180	150	155	140	155	155	150	150	155	155
					IPT	.0001	.0003	.0010	.0018	.0024	.0027	.0031	.0040	.0039	.0044
					RPM	7280	4550	2340	1430	1170	1040	910	650	590	520
					IPM	3	4	7	8	9	9	9	8	7	7
	2		1.0D	0.5D	SFM	145	75	135	115	135	135	120	135	135	135
					IPT	.0001	.0005	.0010	.0020	.0025	.0025	.0032	.0039	.0039	.0039
					RPM	5850	2340	2080	1170	1040	910	730	590	520	460
					IPM	2	3	6	7	8	7	7	7	6	5
	3-4		1.0D	0.5D	SFM	130	105	100	100	105	105	95	105	105	105
					IPT	.0001	.0003	.0010	.0020	.0025	.0028	.0030	.0039	.0038	.0039
					RPM	5200	3250	1560	1040	820	730	590	460	400	360
					IPM	2	3	5	6	6	6	5	5	5	4
	5		1.0D	0.5D	SFM	70	70	70	55	70	65	60	65	60	60
					IPT	.0001	.0003	.0010	.0019	.0024	.0028	.0031	.0040	.0037	.0037
					RPM	2860	2080	1040	590	520	460	360	290	230	210
					IPM	1	2	3	3	4	4	3	3	3	2
	6	Low alloy steel	1.0D	0.5D	SFM	145	75	135	115	135	135	120	135	135	135
					IPT	.0001	.0005	.0010	.0020	.0025	.0025	.0032	.0039	.0039	.0039
					RPM	5850	2340	2080	1170	1040	910	730	590	520	460
					IPM	2	3	6	7	8	7	7	7	6	5
	7		1.0D	0.5D	SFM	130	105	100	100	105	105	95	105	105	105
					IPT	.0001	.0003	.0010	.0020	.0025	.0028	.0030	.0039	.0038	.0039
					RPM	5200	3250	1560	1040	820	730	590	460	400	360
					IPM	2	3	5	6	6	6	5	5	5	4
	8-9		1.0D	0.5D	SFM	70	70	70	55	70	65	60	65	60	60
					IPT	.0001	.0003	.0010	.0019	.0024	.0028	.0031	.0040	.0037	.0037
					RPM	2860	2080	1040	590	520	460	360	290	230	210
					IPM	1	2	3	3	4	4	3	3	3	2
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	145	75	135	115	135	135	120	135	135	135
					IPT	.0001	.0005	.0010	.0020	.0025	.0025	.0032	.0039	.0039	.0039
					RPM	5850	2340	2080	1170	1040	910	730	590	520	460
					IPM	2	3	6	7	8	7	7	7	6	5
	11.1		1.0D	0.5D	SFM	70	70	70	55	70	65	60	65	60	60
					IPT	.0001	.0003	.0010	.0019	.0024	.0028	.0031	.0040	.0037	.0037
					RPM	2860	2080	1040	590	520	460	360	290	230	210
					IPM	1	2	3	3	4	4	3	3	3	2
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	385	470	475	395	425	420	425	415	410	420
					IPT	.0003	.0005	.0011	.0025	.0030	.0032	.0035	.0042	.0046	.0048
					RPM	15600	14300	7280	4030	3250	2860	2600	1820	1560	1430
					IPM	12	20	24	31	29	27	27	23	22	21
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	385	470	475	395	425	420	425	415	410	420
					IPT	.0003	.0005	.0011	.0025	.0030	.0032	.0035	.0042	.0046	.0048
					RPM	15600	14300	7280	4030	3250	2860	2600	1820	1560	1430
					IPM	12	20	24	31	29	27	27	23	22	21



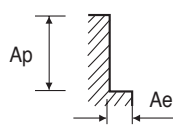
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2160, E2161 SERIES — 3 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)														
						3/32	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	11/16	13/16	7/8	1	1-1/8	1-3/16
P	1	Non-alloy steel	0.1D	1.5D	SFM	135	115	115	110	120	115	110	120	120	115	115	120	115	120	120	110
					IPT	.0001	.0003	.0005	.0008	.0010	.0014	.0018	.0024	.0027	.0031	.0032	.0036	.0040	.0039	.0039	.0039
					RPM	5600	3500	2800	2200	1800	1400	1100	900	800	700	630	560	500	450	400	350
					IPM	2	3	4	5	5	6	6	7	7	7	6	6	6	5	5	4
	2		0.1D	1.5D	SFM	110	105	90	90	105	90	90	105	105	90	90	95	105	105	105	95
					IPT	.0001	.0003	.0005	.0007	.0009	.0014	.0017	.0022	.0022	.0028	.0031	.0035	.0035	.0036	.0035	.0033
					RPM	4500	3200	2200	1800	1600	1100	900	800	700	560	500	450	450	400	350	310
					IPM	2	2	3	4	4	5	5	5	5	5	5	5	5	4	4	3
	3-4		0.1D	1.5D	SFM	100	80	75	80	80	75	80	80	80	75	70	85	80	80	80	80
					IPT	.0001	.0002	.0004	.0005	.0007	.0011	.0016	.0020	.0023	.0023	.0026	.0026	.0030	.0028	.0029	.0029
					RPM	4000	2500	1800	1600	1200	900	800	630	560	450	400	400	350	310	280	250
					IPM	1	2	2	3	3	3	4	4	4	3	3	3	3	3	2	2
	5		0.1D	1.5D	SFM	55	50	45	45	50	45	45	50	50	45	45	45	50	45	45	50
					IPT	.0001	.0002	.0004	.0005	.0008	.0012	.0015	.0018	.0021	.0024	.0027	.0030	.0030	.0026	.0025	.0025
					RPM	2200	1600	1100	900	800	560	450	400	350	280	250	220	220	180	160	160
					IPM	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1
	6	Low alloy steel	0.1D	1.5D	SFM	110	105	90	90	105	90	90	105	105	90	90	95	105	105	105	95
					IPT	.0001	.0003	.0005	.0007	.0009	.0014	.0017	.0022	.0022	.0028	.0031	.0035	.0035	.0036	.0035	.0033
					RPM	4500	3200	2200	1800	1600	1100	900	800	700	560	500	450	450	400	350	310
					IPM	2	2	3	4	4	5	5	5	5	5	5	5	5	4	4	3
	7		0.1D	1.5D	SFM	100	80	75	80	80	75	80	80	80	75	70	85	80	80	80	80
					IPT	.0001	.0002	.0004	.0005	.0007	.0011	.0016	.0020	.0023	.0023	.0026	.0026	.0030	.0028	.0029	.0029
					RPM	4000	2500	1800	1600	1200	900	800	630	560	450	400	400	350	310	280	250
					IPM	1	2	2	3	3	3	4	4	4	3	3	3	3	3	2	2
	8-9		0.1D	1.5D	SFM	55	50	45	45	50	45	45	50	50	45	45	45	50	45	45	50
					IPT	.0001	.0002	.0004	.0005	.0008	.0012	.0015	.0018	.0021	.0024	.0027	.0030	.0030	.0026	.0025	.0025
					RPM	2200	1600	1100	900	800	560	450	400	350	280	250	220	220	180	160	160
					IPM	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	110	105	90	90	105	90	90	105	105	90	90	95	105	105	105	95
					IPT	.0001	.0003	.0005	.0007	.0009	.0014	.0017	.0022	.0022	.0028	.0031	.0035	.0035	.0036	.0035	.0033
					RPM	4500	3200	2200	1800	1600	1100	900	800	700	560	500	450	450	400	350	310
					IPM	2	2	3	4	4	5	5	5	5	5	5	5	5	4	4	3
	11.1		0.1D	1.5D	SFM	55	50	45	45	50	45	45	50	50	45	45	45	50	45	45	50
					IPT	.0001	.0002	.0004	.0005	.0008	.0012	.0015	.0018	.0021	.0024	.0027	.0030	.0030	.0026	.0025	.0025
					RPM	2200	1600	1100	900	800	560	450	400	350	280	250	220	220	180	160	160
					IPM	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	295	360	325	310	365	325	305	325	325	325	325	340	320	315	325	340
					IPT	.0002	.0003	.0005	.0007	.0008	.0014	.0019	.0023	.0024	.0026	.0029	.0030	.0032	.0035	.0036	.0036
					RPM	12000	11000	8000	6300	5600	4000	3100	2500	2200	2000	1800	1600	1400	1200	1100	1100
					IPM	7	11	13	14	14	17	18	17	16	16	16	14	13	13	12	12
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	295	360	325	310	365	325	305	325	325	325	325	340	320	315	325	340
					IPT	.0002	.0003	.0005	.0007	.0008	.0014	.0019	.0023	.0024	.0026	.0029	.0030	.0032	.0035	.0036	.0036
					RPM	12000	11000	8000	6300	5600	4000	3100	2500	2200	2000	1800	1600	1400	1200	1100	1100
					IPM	7	11	13	14	14	17	18	17	16	16	16	14	13	13	12	12



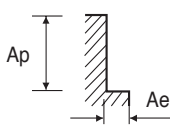
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2160, E2161 SERIES TiN Coated 3 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 3/32	1/8	1/4	3/8	1/2	9/16	5/8	11/16	7/8	1	1-1/8
P	1	Non-alloy steel	0.1D	1.5D	SFM	165	135	140	130	140	140	135	135	135	140	125
					IPT	.0001	.0003	.0010	.0018	.0024	.0027	.0031	.0032	.0040	.0040	.0043
					RPM	6720	4200	2160	1320	1080	960	840	760	600	540	430
					IPM	3	4	6	7	8	8	8	7	7	6	6
	2		0.1D	1.5D	SFM	135	125	125	105	125	125	110	110	125	125	125
					IPT	.0001	.0003	.0009	.0017	.0022	.0022	.0028	.0031	.0035	.0036	.0035
					RPM	5400	3840	1920	1080	960	840	670	600	540	480	420
					IPM	2	3	5	6	6	6	6	6	6	5	4
	3-4		0.1D	1.5D	SFM	120	100	95	95	100	100	90	85	95	95	100
					IPT	.0001	.0002	.0007	.0015	.0019	.0021	.0023	.0026	.0029	.0028	.0029
					RPM	4800	3000	1440	960	760	670	540	480	420	370	340
					IPM	2	2	3	4	4	4	4	4	4	3	3
	5		0.1D	1.5D	SFM	65	65	65	55	65	60	55	55	60	55	55
					IPT	.0001	.0002	.0008	.0015	.0018	.0021	.0024	.0027	.0030	.0026	.0024
					RPM	2640	1920	960	540	480	420	340	300	260	220	190
					IPM	1	1	2	2	3	3	2	2	2	2	1
	6	Low alloy steel	0.1D	1.5D	SFM	135	125	125	105	125	125	110	110	125	125	125
					IPT	.0001	.0003	.0009	.0017	.0022	.0022	.0028	.0031	.0035	.0036	.0035
					RPM	5400	3840	1920	1080	960	840	670	600	540	480	420
					IPM	2	3	5	6	6	6	6	6	6	5	4
	7		0.1D	1.5D	SFM	120	100	95	95	100	100	90	85	95	95	100
					IPT	.0001	.0002	.0007	.0015	.0019	.0021	.0023	.0026	.0029	.0028	.0029
					RPM	4800	3000	1440	960	760	670	540	480	420	370	340
					IPM	2	2	3	4	4	4	4	4	4	3	3
	8-9		0.1D	1.5D	SFM	65	65	65	55	65	60	55	55	60	55	55
					IPT	.0001	.0002	.0008	.0015	.0018	.0021	.0024	.0027	.0030	.0026	.0024
					RPM	2640	1920	960	540	480	420	340	300	260	220	190
					IPM	1	1	2	2	3	3	2	2	2	2	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	135	125	125	105	125	125	110	110	125	125	125
					IPT	.0001	.0003	.0009	.0017	.0022	.0022	.0028	.0031	.0035	.0036	.0035
					RPM	5400	3840	1920	1080	960	840	670	600	540	480	420
					IPM	2	3	5	6	6	6	6	6	6	5	4
	11.1		0.1D	1.5D	SFM	65	65	65	55	65	60	55	55	60	55	55
					IPT	.0001	.0002	.0008	.0015	.0018	.0021	.0024	.0027	.0030	.0026	.0024
					RPM	2640	1920	960	540	480	420	340	300	260	220	190
					IPM	1	1	2	2	3	3	2	2	2	2	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	355	430	440	365	395	390	395	390	385	375	390
					IPT	.0002	.0003	.0008	.0019	.0023	.0024	.0026	.0029	.0032	.0035	.0036
					RPM	14400	13200	6720	3720	3000	2640	2400	2160	1680	1440	1320
					IPM	9	13	17	21	20	19	19	19	16	15	14
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	355	430	440	365	395	390	395	390	385	375	390
					IPT	.0002	.0003	.0008	.0019	.0023	.0024	.0026	.0029	.0032	.0035	.0036
					RPM	14400	13200	6720	3720	3000	2640	2400	2160	1680	1440	1320
					IPM	9	13	17	21	20	19	19	19	16	15	14



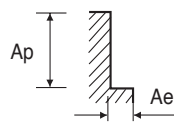
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2160, E2161 SERIES TiCN Coated 3 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)										
						3/32	1/8	1/4	5/16	1/2	9/16	5/8	11/16	7/8	1	1-1/8
P	1	Non-alloy steel	0.1D	1.5D	SFM	180	150	145	150	155	155	150	145	150	155	155
					IPT	.0001	.0003	.0010	.0014	.0024	.0027	.0031	.0032	.0040	.0039	.0039
					RPM	7280	4550	2240	1820	1170	1040	910	820	650	590	520
					IPM	3	4	7	8	9	9	9	8	8	7	6
	2		0.1D	1.5D	SFM	145	135	135	115	135	135	120	115	135	135	135
					IPT	.0001	.0002	.0009	.0012	.0022	.0022	.0028	.0031	.0035	.0036	.0035
					RPM	5850	4160	2080	1430	1040	910	730	650	590	520	460
					IPM	2	3	6	5	7	6	6	6	6	6	5
	3-4		0.1D	1.5D	SFM	130	105	100	95	105	105	95	95	105	105	105
					IPT	.0001	.0002	.0007	.0011	.0019	.0021	.0026	.0026	.0029	.0028	.0029
					RPM	5200	3250	1560	1170	820	730	590	520	460	400	360
					IPM	2	2	3	4	5	5	5	4	4	3	3
	5		0.1D	1.5D	SFM	70	70	70	60	70	65	60	60	65	60	60
					IPT	.0001	.0002	.0007	.0012	.0019	.0021	.0024	.0027	.0030	.0026	.0026
					RPM	2860	2080	1040	730	520	460	360	330	290	230	210
					IPM	1	1	2	3	3	3	3	3	3	2	2
	6	Low alloy steel	0.1D	1.5D	SFM	145	135	135	115	135	135	120	115	135	135	135
					IPT	.0001	.0002	.0009	.0012	.0022	.0022	.0028	.0031	.0035	.0036	.0035
					RPM	5850	4160	2080	1430	1040	910	730	650	590	520	460
					IPM	2	3	6	5	7	6	6	6	6	6	5
	7		0.1D	1.5D	SFM	130	105	100	95	105	105	95	95	105	105	105
					IPT	.0001	.0002	.0007	.0011	.0019	.0021	.0026	.0026	.0029	.0028	.0029
					RPM	5200	3250	1560	1170	820	730	590	520	460	400	360
					IPM	2	2	3	4	5	5	5	4	4	3	3
	8-9		0.1D	1.5D	SFM	70	70	70	60	70	65	60	60	65	60	60
					IPT	.0001	.0002	.0007	.0012	.0019	.0021	.0024	.0027	.0030	.0026	.0026
					RPM	2860	2080	1040	730	520	460	360	330	290	230	210
					IPM	1	1	2	3	3	3	3	3	3	2	2
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	145	135	135	115	135	135	120	115	135	135	135
					IPT	.0001	.0002	.0009	.0012	.0022	.0022	.0028	.0031	.0035	.0036	.0035
					RPM	5850	4160	2080	1430	1040	910	730	650	590	520	460
					IPM	2	3	6	5	7	6	6	6	6	6	5
	11.1		0.1D	1.5D	SFM	70	70	70	60	70	65	60	60	65	60	60
					IPT	.0001	.0002	.0007	.0012	.0019	.0021	.0024	.0027	.0030	.0026	.0026
					RPM	2860	2080	1040	730	520	460	360	330	290	230	210
					IPM	1	1	2	3	3	3	3	3	3	2	2
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	385	470	475	425	425	420	425	420	415	410	420
					IPT	.0002	.0003	.0008	.0014	.0023	.0024	.0026	.0029	.0032	.0035	.0036
					RPM	15600	14300	7280	5200	3250	2860	2600	2340	1820	1560	1430
					IPM	9	14	18	23	22	21	21	21	17	16	15
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	385	470	475	425	425	420	425	420	415	410	420
					IPT	.0002	.0003	.0008	.0014	.0023	.0024	.0026	.0029	.0032	.0035	.0036
					RPM	15600	14300	7280	5200	3250	2860	2600	2340	1820	1560	1430
					IPM	9	14	18	23	22	21	21	21	17	16	15



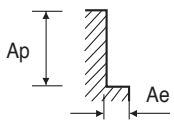
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2120, E2121 SERIES — MULTI FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Parameter	Diameter (Ø)											
				1/4	1/4	5/8	5/8	3/4	3/4	1	1	1-1/2	1-1/2	2	2
			Ae	0.08D	0.32D	0.03D	0.3D	0.03D	0.35D	0.02D	0.3D	0.13D	0.05D	0.01D	0.8D
			Ap	1.4D	1.4D	1.6D	1.6D	1.6D	1.6D	1.6D	1.6D	1.05D	1.05D	1.0D	1.0D
P	1-5	Non-alloy steel	SFM	120	105	125	105	100	90	120	105	110	95	115	100
			IPT	.0007	.0008	.0013	.0015	.0016	.0019	.0016	.0018	.0022	.0026	.0025	.0029
			RPM	1840	1600	750	650	520	450	460	400	280	240	220	190
			IPM	4	4	3	3	3	3	3	3	3	3	2	2
	6-9	Low alloy steel	SFM	120	105	125	105	100	90	120	105	110	95	115	100
			IPT	.0007	.0008	.0013	.0015	.0016	.0019	.0016	.0018	.0022	.0026	.0025	.0029
			RPM	1840	1600	750	650	520	450	460	400	280	240	220	190
			IPM	4	4	3	3	3	3	3	3	3	3	2	2
	10-11	High alloyed steel, and tool steel	SFM	80	45	75	65	75	65	75	65	65	60	75	65
			IPT	.0006	.0011	.0014	.0017	.0016	.0019	.0016	.0018	.0021	.0023	.0023	.0027
			RPM	1250	650	460	400	370	320	290	250	170	150	140	120
			IPM	2	2	2	2	2	2	2	2	1	1	1	1
M	12-14	Stainless steel	SFM	65	35	65	55	60	50	65	55	60	50	60	50
			IPT	.0006	.0010	.0012	.0014	.0016	.0018	.0015	.0017	.0022	.0025	.0024	.0028
			RPM	980	510	390	340	300	260	240	210	150	130	120	100
			IPM	2	2	1	1	1	1	1	1	1	1	1	1
K	15-16	Grey cast iron	SFM	135	70	135	120	125	110	135	115	125	110	135	120
			IPT	.0008	.0014	.0016	.0019	.0022	.0025	.0021	.0024	.0028	.0032	.0028	.0032
			RPM	2050	1100	840	730	630	550	510	440	320	280	260	230
			IPM	5	5	4	4	4	4	4	4	4	4	3	3
	17-18	Nodular cast iron	SFM	135	70	135	120	125	110	135	115	125	110	135	120
			IPT	.0008	.0014	.0016	.0019	.0022	.0025	.0021	.0024	.0028	.0032	.0028	.0032
			RPM	2050	1100	840	730	630	550	510	440	320	280	260	230
			IPM	5	5	4	4	4	4	4	4	4	4	3	3
	19-20	Low alloy steel	SFM	135	70	135	120	125	110	135	115	125	110	135	120
			IPT	.0008	.0014	.0016	.0019	.0022	.0025	.0021	.0024	.0028	.0032	.0028	.0032
			RPM	2050	1100	840	730	630	550	510	440	320	280	260	230
			IPM	5	5	4	4	4	4	4	4	4	4	3	3



※ The Feed, in long & extra long types, should be reduced by around 50%.

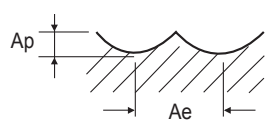
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2110, E1110, E2111, E1111, E2112, E1112 SERIES

2 FLUTE BALL NOSE- PROFILE MILLING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/8	5/32	1/4	5/6	3/8	1/2	5/8	3/4	1
P	1	Non-alloy steel	0.7D	0.3D	SFM	145	130	145	350	130	130	130	120	130
					IPT	.0004	.0007	.0012	.0020	.0027	.0034	.0038	.0046	.0051
					RPM	4500	3200	2200	1600	1300	1000	800	600	500
					IPM	4	5	5	6	7	7	6	6	5
	2		0.7D	0.3D	SFM	110	100	110	260	100	105	100	100	105
					IPT	.0004	.0006	.0010	.0017	.0024	.0026	.0033	.0034	.0035
					RPM	3400	2400	1700	1200	1000	800	600	500	400
					IPM	3	3	4	4	5	4	4	3	3
	3-4		0.7D	0.3D	SFM	65	55	65	155	55	60	55	60	60
					IPT	.0003	.0005	.0009	.0014	.0021	.0024	.0031	.0033	.0036
					RPM	2000	1400	1000	700	560	450	350	300	220
					IPM	1	1	2	2	2	2	2	2	2
	5		0.7D	0.3D	SFM	45	40	45	110	40	40	40	40	40
					IPT	.0003	.0005	.0007	.0012	.0018	.0022	.0028	.0035	.0038
					RPM	1400	1000	700	500	400	320	250	200	160
					IPM	1	1	1	1	1	1	1	1	1
	6	Low alloy steel	0.7D	0.3D	SFM	110	100	110	260	100	105	100	100	105
					IPT	.0004	.0006	.0010	.0017	.0024	.0026	.0033	.0034	.0035
					RPM	3400	2400	1700	1200	1000	800	600	500	400
					IPM	3	3	4	4	5	4	4	3	3
	7		0.7D	0.3D	SFM	65	55	65	155	55	60	55	60	60
					IPT	.0003	.0005	.0009	.0014	.0021	.0024	.0031	.0033	.0036
					RPM	2000	1400	1000	700	560	450	350	300	220
					IPM	1	1	2	2	2	2	2	2	2
	8-9		0.7D	0.3D	SFM	45	40	45	110	40	40	40	40	40
					IPT	.0003	.0005	.0007	.0012	.0018	.0022	.0028	.0035	.0038
					RPM	1400	1000	700	500	400	320	250	200	160
					IPM	1	1	1	1	1	1	1	1	1
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM	110	100	110	260	100	105	100	100	105
					IPT	.0004	.0006	.0010	.0017	.0024	.0026	.0033	.0034	.0035
					RPM	3400	2400	1700	1200	1000	800	600	500	400
					IPM	3	3	4	4	5	4	4	3	3
	11.1		0.7D	0.3D	SFM	45	40	45	110	40	40	40	40	40
					IPT	.0003	.0005	.0007	.0012	.0018	.0022	.0028	.0035	.0038
					RPM	1400	1000	700	500	400	320	250	200	160
					IPM	1	1	1	1	1	1	1	1	1
N	21-22	Aluminum-wrought alloy	0.7D	0.3D	SFM	360	325	365	875	315	325	325	315	340
					IPT	.0004	.0006	.0010	.0017	.0022	.0027	.0030	.0034	.0038
					RPM	11000	8000	5600	4000	3200	2500	2000	1600	1300
					IPM	9	10	11	14	14	13	12	11	10
	23-25	Aluminum-cast, alloyed	0.7D	0.3D	SFM	360	325	365	875	315	325	325	315	340
					IPT	.0004	.0006	.0010	.0017	.0022	.0027	.0030	.0034	.0038
					RPM	11000	8000	5600	4000	3200	2500	2000	1600	1300
					IPM	9	10	11	14	14	13	12	11	10



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

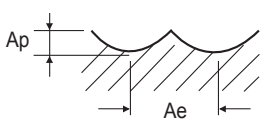
RECOMMENDED CUTTING CONDITIONS

E2110, E1110, E2111, E1111, E2112, E1112 SERIES

TiN Coated

2 FLUTE BALL NOSE- PROFILE MILLING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						1/8	5/32	1/4	5/6	3/8	1/2	5/8	3/4	1
P	1	Non-alloy steel	0.7D	0.3D	SFM	175	155	175	420	155	155	190	165	155
					IPT	.0004	.0007	.0012	.0020	.0027	.0034	.0038	.0046	.0051
					RPM	5400	3840	2640	1920	1560	1200	960	720	600
					IPM	4	5	6	8	9	8	7	7	6
	2		0.7D	0.3D	SFM	135	120	135	315	120	125	140	135	125
					IPT	.0004	.0006	.0010	.0017	.0023	.0026	.0033	.0034	.0035
					RPM	4080	2880	2040	1440	1200	960	720	600	480
					IPM	3	4	4	5	6	5	5	4	3
	3-4		0.7D	0.3D	SFM	80	70	80	185	65	70	80	80	70
					IPT	.0003	.0005	.0009	.0014	.0022	.0024	.0031	.0033	.0036
					RPM	2400	1680	1200	840	672	540	420	360	264
					IPM	1	2	2	2	3	3	3	2	2
	5		0.7D	0.3D	SFM	55	50	55	130	45	50	60	55	50
					IPT	.0003	.0005	.0007	.0012	.0018	.0022	.0028	.0035	.0036
					RPM	1680	1200	840	600	480	384	300	240	192
					IPM	1	1	1	1	2	2	2	2	1
	6	Low alloy steel	0.7D	0.3D	SFM	135	120	135	315	120	125	140	135	125
					IPT	.0004	.0006	.0010	.0017	.0023	.0026	.0033	.0034	.0035
					RPM	4080	2880	2040	1440	1200	960	720	600	480
					IPM	3	4	4	5	6	5	5	4	3
	7		0.7D	0.3D	SFM	80	70	80	185	65	70	80	80	70
					IPT	.0003	.0005	.0009	.0014	.0022	.0024	.0031	.0033	.0036
					RPM	2400	1680	1200	840	672	540	420	360	264
					IPM	1	2	2	2	3	3	3	2	2
	8-9		0.7D	0.3D	SFM	55	50	55	130	45	50	60	55	50
					IPT	.0003	.0005	.0007	.0012	.0018	.0022	.0028	.0035	.0036
					RPM	1680	1200	840	600	480	384	300	240	192
					IPM	1	1	1	1	2	2	2	2	1
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM	135	120	135	315	120	125	140	135	125
					IPT	.0004	.0006	.0010	.0017	.0023	.0026	.0033	.0034	.0035
					RPM	4080	2880	2040	1440	1200	960	720	600	480
					IPM	3	4	4	5	6	5	5	4	3
	11.1		0.7D	0.3D	SFM	55	50	55	130	45	50	60	55	50
					IPT	.0003	.0005	.0007	.0012	.0018	.0022	.0028	.0035	.0036
					RPM	1680	1200	840	600	480	384	300	240	192
					IPM	1	1	1	1	2	2	2	2	1
N	21-22	Aluminum-wrought alloy	0.7D	0.3D	SFM	430	395	440	1045	375	395	470	440	410
					IPT	.0004	9600	6720	4800	3840	3000	2400	1920	1560
					RPM	13200	9600	6720	4800	3840	3000	2400	1920	1560
					IPM	11	12	13	17	17	16	14	13	12
	23-25	Aluminum-cast, alloyed	0.7D	0.3D	SFM	430	395	440	1045	375	395	470	440	410
					IPT	.0004	9600	6720	4800	3840	3000	2400	1920	1560
					RPM	13200	9600	6720	4800	3840	3000	2400	1920	1560
					IPM	11	12	13	17	17	16	14	13	12



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

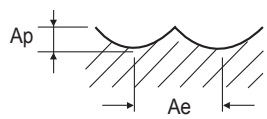
RECOMMENDED CUTTING CONDITIONS

E2110, E1110, E2111, E1111, E2112, E1112 SERIES

TiCN Coated

2 FLUTE BALL NOSE - PROFILE MILLING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)								
						1/8	5/32	1/4	5/6	3/8	1/2	5/8	3/4	1
P	1	Non-alloy steel	0.7D	0.3D	SFM	190	170	185	455	165	170	170	155	170
					IPT	.0004	.0007	.0012	.0020	.0027	.0034	.0038	.0046	.0051
					RPM	5850	4160	2860	2080	1690	1300	1040	780	650
					IPM	5	6	7	8	9	9	8	7	7
	2		0.7D	0.3D	SFM	145	130	145	340	130	135	130	130	135
					IPT	.0004	.0006	.0010	.0017	.0023	.0025	.0033	.0034	.0035
					RPM	4420	3120	2210	1560	1300	1040	780	650	520
					IPM	4	4	5	5	6	5	5	4	4
	3-4		0.7D	0.3D	SFM	85	75	85	200	70	75	75	75	75
					IPT	.0003	.0005	.0009	.0014	.0021	.0025	.0032	.0033	.0037
					RPM	2600	1820	1300	910	730	590	460	390	290
					IPM	2	2	2	3	3	3	3	3	2
	5		0.7D	0.3D	SFM	60	55	60	140	50	55	55	50	55
					IPT	.0003	.0005	.0007	.0012	.0017	.0022	.0028	.0034	.0038
					RPM	1820	1300	910	650	520	420	330	260	210
					IPM	1	1	1	2	2	2	2	2	2
	6	Low alloy steel	0.7D	0.3D	SFM	145	130	145	340	130	135	130	130	135
					IPT	.0004	.0006	.0010	.0017	.0023	.0025	.0033	.0034	.0035
					RPM	4420	3120	2210	1560	1300	1040	780	650	520
					IPM	4	4	5	5	6	5	5	4	4
	7		0.7D	0.3D	SFM	85	75	85	200	70	75	75	75	75
					IPT	.0003	.0005	.0009	.0014	.0021	.0025	.0032	.0033	.0037
					RPM	2600	1820	1300	910	730	590	460	390	290
					IPM	2	2	2	3	3	3	3	3	2
	8-9		0.7D	0.3D	SFM	60	55	60	140	50	55	55	50	55
					IPT	.0003	.0005	.0007	.0012	.0017	.0022	.0028	.0034	.0038
					RPM	1820	1300	910	650	520	420	330	260	210
					IPM	1	1	1	2	2	2	2	2	2
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM	145	130	145	340	130	135	130	130	135
					IPT	.0004	.0006	.0010	.0017	.0023	.0025	.0033	.0034	.0035
					RPM	4420	3120	2210	1560	1300	1040	780	650	520
					IPM	4	4	5	5	6	5	5	4	4
	11.1		0.7D	0.3D	SFM	60	55	60	140	50	55	55	50	55
					IPT	.0003	.0005	.0007	.0012	.0017	.0022	.0028	.0034	.0038
					RPM	1820	1300	910	650	520	420	330	260	210
					IPM	1	1	1	2	2	2	2	2	2
N	21-22	Aluminum-wrought alloy	0.7D	0.3D	SFM	470	425	475	1135	410	425	425	410	440
					IPT	.0004	.0006	.0008	.0017	.0022	.0027	.0029	.0036	.0038
					RPM	14300	10400	7280	5200	4160	3250	2600	2080	1690
					IPM	12	13	12	18	19	17	15	15	13
	23-25	Aluminum-cast, alloyed	0.7D	0.3D	SFM	470	425	475	1135	410	425	425	410	440
					IPT	.0004	.0006	.0008	.0017	.0022	.0027	.0029	.0036	.0038
					RPM	14300	10400	7280	5200	4160	3250	2600	2080	1690
					IPM	12	13	12	18	19	17	15	15	13



※ The Feed, in long & extra long types, should be reduced by around 50%.

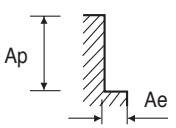
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2031, E1031, E2034, E1034, E2036, E1036, E2051, E1051, E2039, E1039, E2040, E1040, E2041, E1041, E2053, E1053 SERIES

4 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/8	1/4	3/8	1/2	5/8	3/4	13/16	15/16	1	1 1/2	1 3/4	2
P	1	Non-alloy steel	0.1D	1.5D	SFM	115	120	110	120	115	125	105	125	120	120	130	145
					IPT	.0003	.0010	.0018	.0025	.0032	.0032	.0040	.0040	.0039	.0040	.0045	.0045
					RPM	3500	1800	1100	900	700	630	500	500	450	310	280	280
					IPM	4	7	8	9	9	8	8	8	7	5	5	5
	2		0.1D	1.5D	SFM	105	105	90	105	90	100	95	110	105	100	100	100
					IPT	.0002	.0009	.0017	.0022	.0027	.0030	.0033	.0033	.0038	.0040	.0045	.0053
					RPM	3200	1600	900	800	560	500	450	450	400	250	220	190
					IPM	3	6	6	7	6	6	6	6	6	4	4	4
	3-4		0.1D	1.5D	SFM	80	80	80	80	75	80	75	85	80	80	70	60
					IPT	.0002	.0008	.0016	.0020	.0022	.0025	.0029	.0029	.0032	.0025	.0033	.0045
					RPM	2500	1200	800	630	450	400	350	350	310	200	150	110
					IPM	2	4	5	5	4	4	4	4	4	2	2	2
	5		0.1D	1.5D	SFM	50	50	45	50	45	50	45	55	45	45	50	40
					IPT	.0002	.0006	.0017	.0019	.0027	.0030	.0034	.0034	.0028	.0021	.0023	.0031
					RPM	1600	800	450	400	280	250	220	220	180	120	110	80
					IPM	1	2	3	3	3	3	3	3	2	1	1	1
	6	Low alloy steel	0.1D	1.5D	SFM	105	105	90	105	90	100	95	110	105	100	100	100
					IPT	.0002	.0009	.0017	.0022	.0027	.0030	.0033	.0033	.0038	.0040	.0045	.0053
					RPM	3200	1600	900	800	560	500	450	450	400	250	220	190
					IPM	3	6	6	7	6	6	6	6	6	4	4	4
	7		0.1D	1.5D	SFM	80	80	80	80	75	80	75	85	80	80	70	60
					IPT	.0002	.0008	.0016	.0020	.0022	.0025	.0029	.0029	.0032	.0025	.0033	.0045
					RPM	2500	1200	800	630	450	400	350	350	310	200	150	110
					IPM	2	4	5	5	4	4	4	4	4	2	2	2
	8-9		0.1D	1.5D	SFM	50	50	45	50	45	50	45	55	45	45	50	40
					IPT	.0002	.0006	.0017	.0019	.0027	.0030	.0034	.0034	.0028	.0021	.0023	.0031
					RPM	1600	800	450	400	280	250	220	220	180	120	110	80
					IPM	1	2	3	3	3	3	3	3	2	1	1	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	105	105	90	105	90	100	95	110	105	100	100	100
					IPT	.0002	.0009	.0017	.0022	.0027	.0030	.0033	.0033	.0038	.0040	.0045	.0053
					RPM	3200	1600	900	800	560	500	450	450	400	250	220	190
					IPM	3	6	6	7	6	6	6	6	6	4	4	4
	11.1		0.1D	1.5D	SFM	50	50	45	50	45	50	45	55	45	45	50	40
					IPT	.0002	.0006	.0017	.0019	.0027	.0030	.0034	.0034	.0028	.0021	.0023	.0031
					RPM	1600	800	450	400	280	250	220	220	180	120	110	80
					IPM	1	2	3	3	3	3	3	3	2	1	1	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	360	365	305	325	325	355	300	345	315	355	365	330
					IPT	.0003	.0008	.0019	.0022	.0026	.0029	.0032	.0032	.0035	.0036	.0038	.0048
					RPM	11000	5600	3100	2500	2000	1800	1400	1400	1200	900	800	630
					IPM	15	19	24	22	21	21	18	18	17	13	12	12
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	360	365	305	325	325	355	300	345	315	355	365	330
					IPT	.0003	.0008	.0019	.0022	.0026	.0029	.0032	.0032	.0035	.0036	.0038	.0048
					RPM	11000	5600	3100	2500	2000	1800	1400	1400	1200	900	800	630
					IPM	15	19	24	22	21	21	18	18	17	13	12	12



※ The Feed, in long & extra long types, should be reduced by around 50%.

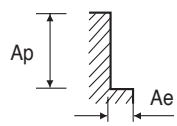
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2031, E1031, E2034, E1034, E2036, E1036, E2051, E1051, E2039, E1039, E2040, E1040, E2041, E1041, E2053, E1053 SERIES

TiN Coated 4 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	1/4	3/8	1/2	5/8	3/4	13/16	15/16	1	1 1/2	1 3/4	2
P	1	Non-alloy steel	0.1D	1.5D	SFM	135	140	130	140	135	150	130	145	140	145	155	175
					IPT	.0003	.0010	.0019	.0023	.0030	.0033	.0042	.0042	.0042	.0041	.0044	.0044
					RPM	4200	2160	1320	1080	840	760	600	600	540	370	340	340
					IPM	5	9	10	10	10	10	10	10	9	6	6	6
	2		0.1D	1.5D	SFM	125	125	105	125	110	120	115	135	125	120	120	120
					IPT	.0003	.0009	.0019	.0023	.0030	.0033	.0037	.0037	.0036	.0033	.0038	.0043
					RPM	3840	1920	1080	960	670	600	540	540	480	300	260	230
					IPM	4	7	8	9	8	8	8	8	7	4	4	4
	3-4		0.1D	1.5D	SFM	100	95	95	100	90	95	90	105	95	95	80	70
					IPT	.0003	.0007	.0016	.0020	.0023	.0026	.0030	.0030	.0027	.0031	.0042	.0038
					RPM	3000	1440	960	760	540	480	420	420	370	240	180	130
					IPM	3	4	6	6	5	5	5	5	4	3	3	2
	5		0.1D	1.5D	SFM	65	65	55	65	55	60	55	65	55	55	60	50
					IPT	.0001	.0008	.0014	.0021	.0022	.0025	.0029	.0029	.0023	.0036	.0038	.0025
					RPM	1920	960	540	480	340	300	260	260	220	140	130	100
					IPM	1	3	3	4	3	3	3	3	2	2	2	1
	6	Low alloy steel	0.1D	1.5D	SFM	125	125	105	125	110	120	115	135	125	120	120	120
					IPT	.0003	.0009	.0019	.0023	.0030	.0033	.0037	.0037	.0036	.0033	.0038	.0043
					RPM	3840	1920	1080	960	670	600	540	540	480	300	260	230
					IPM	4	7	8	9	8	8	8	8	7	4	4	4
	7		0.1D	1.5D	SFM	100	95	95	100	90	95	90	105	95	95	80	70
					IPT	.0003	.0007	.0016	.0020	.0023	.0026	.0030	.0030	.0027	.0031	.0042	.0038
					RPM	3000	1440	960	760	540	480	420	420	370	240	180	130
					IPM	3	4	6	6	5	5	5	5	4	3	3	2
	8-9		0.1D	1.5D	SFM	65	65	55	65	55	60	55	65	55	55	60	50
					IPT	.0001	.0008	.0014	.0021	.0022	.0025	.0029	.0029	.0023	.0036	.0038	.0025
					RPM	1920	960	540	480	340	300	260	260	220	140	130	100
					IPM	1	3	3	4	3	3	3	3	2	2	2	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	125	125	105	125	110	120	115	135	125	120	120	120
					IPT	.0003	.0009	.0019	.0023	.0030	.0033	.0037	.0037	.0036	.0033	.0038	.0043
					RPM	3840	1920	1080	960	670	600	540	540	480	300	260	230
					IPM	4	7	8	9	8	8	8	8	7	4	4	4
	11.1		0.1D	1.5D	SFM	65	65	55	65	55	60	55	65	55	55	60	50
					IPT	.0001	.0008	.0014	.0021	.0022	.0025	.0029	.0029	.0023	.0036	.0038	.0025
					RPM	1920	960	540	480	340	300	260	260	220	140	130	100
					IPM	1	3	3	4	3	3	3	3	2	2	2	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	430	440	365	395	395	425	355	410	375	425	440	395
					IPT	.0003	.0008	.0019	.0023	.0026	.0029	.0031	.0031	.0035	.0037	.0036	.0046
					RPM	13200	6720	3720	3000	2400	2160	1680	1680	1440	1080	960	760
					IPM	18	22	28	27	25	25	21	21	20	16	14	14
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	430	440	365	395	395	425	355	410	375	425	440	395
					IPT	.0003	.0008	.0019	.0023	.0026	.0029	.0031	.0031	.0035	.0037	.0036	.0046
					RPM	13200	6720	3720	3000	2400	2160	1680	1680	1440	1080	960	760
					IPM	18	22	28	27	25	25	21	21	20	16	14	14



※ The Feed, in long & extra long types, should be reduced by around 50%.

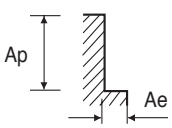
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2031, E1031, E2034, E1034, E2036, E1036, E2051, E1051, E2039, E1039, E2040, E1040, E2041, E1041, E2053, E1053 SERIES

TiCN Coated 4 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/8	1/4	3/8	1/2	5/8	3/4	13/16	15/16	1	1 1/2	1 3/4	2
P	1	Non-alloy steel	0.1D	1.5D	SFM	150	155	140	155	150	160	140	160	155	160	165	190
					IPT	.0003	.0010	.0017	.0024	.0030	.0030	.0038	.0038	.0038	.0038	.0042	.0042
					RPM	4550	2340	1430	1170	910	820	650	650	590	400	360	360
					IPM	6	9	10	11	11	10	10	10	9	6	6	6
	2		0.1D	1.5D	SFM	135	135	115	135	120	130	125	145	135	130	130	130
					IPT	.0002	.0008	.0017	.0022	.0027	.0031	.0034	.0034	.0034	.0038	.0043	.0050
					RPM	4160	2090	1170	1040	730	650	590	590	520	330	290	250
					IPM	4	7	8	9	8	8	8	8	7	5	5	5
	3-4		0.1D	1.5D	SFM	105	100	100	105	95	100	95	110	105	100	105	75
					IPT	.0002	.0008	.0014	.0018	.0021	.0024	.0027	.0027	.0031	.0029	.0033	.0036
					RPM	3250	1560	1040	820	590	520	460	460	400	260	230	140
					IPM	3	5	6	6	5	5	5	5	5	3	3	2
	5		0.1D	1.5D	SFM	70	70	55	70	60	65	60	70	60	60	65	55
					IPT	.0002	.0007	.0013	.0019	.0021	.0023	.0026	.0026	.0033	.0031	.0036	.0025
					RPM	2080	1040	590	520	360	330	290	290	230	160	140	100
					IPM	2	3	3	4	3	3	3	3	3	2	2	1
	6	Low alloy steel	0.1D	1.5D	SFM	135	135	115	135	120	130	125	145	135	130	130	130
					IPT	.0002	.0008	.0017	.0022	.0027	.0031	.0034	.0034	.0034	.0038	.0043	.0050
					RPM	4160	2090	1170	1040	730	650	590	590	520	330	290	250
					IPM	4	7	8	9	8	8	8	8	7	5	5	5
	7		0.1D	1.5D	SFM	105	100	100	105	95	100	95	110	105	100	105	75
					IPT	.0002	.0008	.0014	.0018	.0021	.0024	.0027	.0027	.0031	.0029	.0033	.0036
					RPM	3250	1560	1040	820	590	520	460	460	400	260	230	140
					IPM	3	5	6	6	5	5	5	5	5	3	3	2
	8-9		0.1D	1.5D	SFM	70	70	55	70	60	65	60	70	60	60	65	55
					IPT	.0002	.0007	.0013	.0019	.0021	.0023	.0026	.0026	.0033	.0031	.0036	.0025
					RPM	2080	1040	590	520	360	330	290	290	230	160	140	100
					IPM	2	3	3	4	3	3	3	3	3	2	2	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	135	135	115	135	120	130	125	145	135	130	130	130
					IPT	.0002	.0008	.0017	.0022	.0027	.0031	.0034	.0034	.0034	.0038	.0043	.0050
					RPM	4160	2090	1170	1040	730	650	590	590	520	330	290	250
					IPM	4	7	8	9	8	8	8	8	7	5	5	5
	11.1		0.1D	1.5D	SFM	70	70	55	70	60	65	60	70	60	60	65	55
					IPT	.0002	.0007	.0013	.0019	.0021	.0023	.0026	.0026	.0033	.0031	.0036	.0025
					RPM	2080	1040	590	520	360	330	290	290	230	160	140	100
					IPM	2	3	3	4	3	3	3	3	3	2	2	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	470	475	395	425	425	460	385	445	410	460	475	545
					IPT	.0003	.0008	.0019	.0022	.0026	.0029	.0032	.0032	.0035	.0036	.0036	.0036
					RPM	14300	7280	4030	3250	2600	2340	1820	1820	1560	1170	1040	1040
					IPM	20	24	31	29	27	27	23	23	22	17	15	15
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	470	475	395	425	425	460	385	445	410	460	475	545
					IPT	.0003	.0008	.0019	.0022	.0026	.0029	.0032	.0032	.0035	.0036	.0036	.0036
					RPM	14300	7280	4030	3250	2600	2340	1820	1820	1560	1170	1040	1040
					IPM	20	24	31	29	27	27	23	23	22	17	15	15



※ The Feed, in long & extra long types, should be reduced by around 50%.

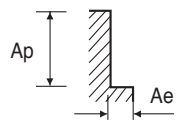
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2032, E1032, E2035, E1035, E2037, E1037, E2042, E1042, E2162, E1162, E2175, E1175, E2100, E1100 SERIES

6 & 8 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	1/4	3/8	1/2	5/8	3/4	13/16	15/16	1	1 1/2	1 3/4	2 (6 & 8 FL)
P	1	Non-alloy steel	0.1D	1.5D	SFM	115	120	110	120	115	125	105	125	120	120	130	145
					IPT	.0002	.0006	.0012	.0017	.0021	.0021	.0027	.0027	.0026	.0027	.0030	.0030 / .0022
					RPM	3500	1800	1100	900	700	630	500	500	450	310	280	280
					IPM	4	7	8	9	9	8	8	8	7	5	5	5
	2		0.1D	1.5D	SFM	105	105	90	105	90	100	95	110	105	100	100	100
					IPT	.0002	.0006	.0011	.0015	.0018	.0020	.0022	.0022	.0025	.0027	.0030	.0035 / .0026
					RPM	3200	1600	900	800	560	500	450	450	400	250	220	190
					IPM	3	6	6	7	6	6	6	6	6	4	4	4
	3-4		0.1D	1.5D	SFM	80	80	80	80	75	80	75	85	80	80	70	60
					IPT	.0001	.0006	.0010	.0013	.0015	.0017	.0019	.0019	.0022	.0017	.0022	.0030 / .0023
					RPM	2500	1200	800	630	450	400	350	350	310	200	150	110
					IPM	2	4	5	5	4	4	4	4	4	2	2	2
	5		0.1D	1.5D	SFM	50	50	45	50	45	50	45	55	45	45	50	40
					IPT	.0001	.0004	.0011	.0013	.0018	.0020	.0023	.0023	.0019	.0014	.0015	.0021 / .0016
					RPM	1600	800	450	400	280	250	220	220	180	120	110	80
					IPM	1	2	3	3	3	3	3	3	2	1	1	1
	6	Low alloy steel	0.1D	1.5D	SFM	105	105	90	105	90	100	95	110	105	100	100	100
					IPT	.0002	.0006	.0011	.0015	.0018	.0020	.0022	.0022	.0025	.0027	.0030	.0035 / .0026
					RPM	3200	1600	900	800	560	500	450	450	400	250	220	190
					IPM	3	6	6	7	6	6	6	6	6	4	4	4
	7		0.1D	1.5D	SFM	80	80	80	80	75	80	75	85	80	80	70	60
					IPT	.0001	.0006	.0010	.0013	.0015	.0017	.0019	.0019	.0022	.0017	.0022	.0030 / .0023
					RPM	2500	1200	800	630	450	400	350	350	310	200	150	110
					IPM	2	4	5	5	4	4	4	4	4	2	2	2
	8-9		0.1D	1.5D	SFM	50	50	45	50	45	50	45	55	45	45	50	40
					IPT	.0001	.0004	.0011	.0013	.0018	.0020	.0023	.0023	.0019	.0014	.0015	.0021 / .0016
					RPM	1600	800	450	400	280	250	220	220	180	120	110	80
					IPM	1	2	3	3	3	3	3	3	2	1	1	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	105	105	90	105	90	100	95	110	105	100	100	100
					IPT	.0002	.0006	.0011	.0015	.0018	.0020	.0022	.0022	.0025	.0027	.0030	.0035 / .0026
					RPM	3200	1600	900	800	560	500	450	450	400	250	220	190
					IPM	3	6	6	7	6	6	6	6	6	4	4	4
	11.1		0.1D	1.5D	SFM	50	50	45	50	45	50	45	55	45	45	50	40
					IPT	.0001	.0004	.0011	.0013	.0018	.0020	.0023	.0023	.0019	.0014	.0015	.0021 / .0016
					RPM	1600	800	450	400	280	250	220	220	180	120	110	80
					IPM	1	2	3	3	3	3	3	3	2	1	1	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	360	365	305	325	325	355	300	345	315	355	365	330
					IPT	.0002	.0006	.0013	.0015	.0018	.0019	.0021	.0021	.0024	.0024	.0025	.0032 / .0024
					RPM	11000	5600	3100	2500	2000	1800	1400	1400	1200	900	800	630
					IPM	15	19	24	22	21	21	18	18	17	13	12	12
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	360	365	305	325	325	355	300	345	315	355	365	330
					IPT	.0002	.0006	.0013	.0015	.0018	.0019	.0021	.0021	.0024	.0024	.0025	.0032 / .0024
					RPM	11000	5600	3100	2500	2000	1800	1400	1400	1200	900	800	630
					IPM	15	19	24	22	21	21	18	18	17	13	12	12



※ The Feed, in long & extra long types, should be reduced by around 50%.

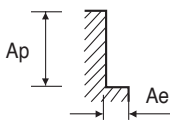
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2032, E1032, E2035, E1035, E2037, E1037, E2042, E1042, E2162, E1162, E2175, E1175, E2100, E1100 SERIES

TiN Coated 6 & 8 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/8	1/4	3/8	1/2	5/8	3/4	13/16	15/16	1	1 1/2	1 3/4	2 (6 & 8 FL)
P	1	Non-alloy steel	0.1D	1.5D	SFM	135	140	130	140	135	150	130	145	140	145	155	175
					IPT	.0002	.0007	.0013	.0015	.0020	.0022	.0028	.0028	.0028	.0027	.0029	.0029 / .0022
					RPM	4200	2160	1320	1080	840	760	600	600	540	370	340	340
					IPM	5	9	10	10	10	10	10	10	9	6	6	6
	2		0.1D	1.5D	SFM	125	125	105	125	110	120	115	135	125	120	120	120
					IPT	.0002	.0006	.0012	.0016	.0020	.0022	.0025	.0025	.0024	.0022	.0026	.0029 / .0022
					RPM	3840	1920	1080	960	670	600	540	540	480	300	260	230
					IPM	4	7	8	9	8	8	8	8	7	4	4	4
	3-4		0.1D	1.5D	SFM	100	95	95	100	90	95	90	105	95	95	80	70
					IPT	.0002	.0005	.0010	.0013	.0015	.0017	.0020	.0020	.0018	.0021	.0028	.0026 / .0019
					RPM	3000	1440	960	760	540	480	420	420	370	240	180	130
					IPM	3	4	6	6	5	5	5	5	4	3	3	2
	5		0.1D	1.5D	SFM	65	65	55	65	55	60	55	65	55	55	60	50
					IPT	.0001	.0005	.0009	.0014	.0015	.0017	.0019	.0019	.0015	.0024	.0026	.0017 / .0013
					RPM	1920	960	540	480	340	300	260	260	220	140	130	100
					IPM	1	3	3	4	3	3	3	3	2	2	2	1
	6	Low alloy steel	0.1D	1.5D	SFM	125	125	105	125	110	120	115	135	125	120	120	120
					IPT	.0002	.0006	.0012	.0016	.0020	.0022	.0025	.0025	.0024	.0022	.0026	.0029 / .0022
					RPM	3840	1920	1080	960	670	600	540	540	480	300	260	230
					IPM	4	7	8	9	8	8	8	8	7	4	4	4
	7		0.1D	1.5D	SFM	100	95	95	100	90	95	90	105	95	95	80	70
					IPT	.0002	.0005	.0010	.0013	.0015	.0017	.0020	.0020	.0018	.0021	.0028	.0026 / .0019
					RPM	3000	1440	960	760	540	480	420	420	370	240	180	130
					IPM	3	4	6	6	5	5	5	5	4	3	3	2
	8-9		0.1D	1.5D	SFM	65	65	55	65	55	60	55	65	55	55	60	50
					IPT	.0001	.0005	.0009	.0014	.0015	.0017	.0019	.0019	.0015	.0024	.0026	.0017 / .0013
					RPM	1920	960	540	480	340	300	260	260	220	140	130	100
					IPM	1	3	3	4	3	3	3	3	2	2	2	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	125	125	105	125	110	120	115	135	125	120	120	120
					IPT	.0002	.0006	.0012	.0016	.0020	.0022	.0025	.0025	.0024	.0022	.0026	.0029 / .0022
					RPM	3840	1920	1080	960	670	600	540	540	480	300	260	230
					IPM	4	7	8	9	8	8	8	8	7	4	4	4
	11.1		0.1D	1.5D	SFM	65	65	55	65	55	60	55	65	55	55	60	50
					IPT	.0001	.0005	.0009	.0014	.0015	.0017	.0019	.0019	.0015	.0024	.0026	.0017 / .0013
					RPM	1920	960	540	480	340	300	260	260	220	140	130	100
					IPM	1	3	3	4	3	3	3	3	2	2	2	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	430	440	365	395	395	425	355	410	375	425	440	395
					IPT	.0002	.0005	.0013	.0015	.0017	.0019	.0021	.0021	.0023	.0025	.0024	.0031 / .0023
					RPM	13200	6720	3720	3000	2400	2160	1680	1680	1440	1080	960	760
					IPM	18	22	28	27	25	25	21	21	20	16	14	14
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	430	440	365	395	395	425	355	410	375	425	440	395
					IPT	.0002	.0005	.0013	.0015	.0017	.0019	.0021	.0021	.0023	.0025	.0024	.0031 / .0023
					RPM	13200	6720	3720	3000	2400	2160	1680	1680	1440	1080	960	760
					IPM	18	22	28	27	25	25	21	21	20	16	14	14



※ The Feed, in long & extra long types, should be reduced by around 50%.

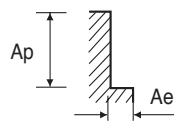
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2032, E1032, E2035, E1035, E2037, E1037, E2042, E1042, E2162, E1162, E2175, E1175, E2100, E1100 SERIES

TiCN Coated 6 & 8 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/8	1/4	3/8	1/2	5/8	3/4	13/16	15/16	1	1 1/2	1 3/4	2 (6 & 8 FL)
P	1	Non-alloy steel	0.1D	1.5D	SFM	150	155	140	155	150	160	140	160	155	160	165	190
					IPT	.0002	.0006	.0012	.0016	.0020	.0020	.0026	.0026	.0025	.0025	.0028	.0028 / .0021
					RPM	4550	2340	1430	1170	910	820	650	650	590	400	360	360
					IPM	6	9	10	11	11	10	10	10	9	6	6	6
	2		0.1D	1.5D	SFM	135	135	115	135	120	130	125	145	135	130	130	130
					IPT	.0002	.0006	.0011	.0014	.0018	.0021	.0023	.0023	.0022	.0025	.0029	.0033 / .0025
					RPM	4160	2090	1170	1040	730	650	590	590	520	330	290	250
					IPM	4	7	8	9	8	8	8	8	7	5	5	5
	3-4		0.1D	1.5D	SFM	105	100	100	105	95	100	95	110	105	100	105	75
					IPT	.0002	.0005	.0010	.0012	.0014	.0016	.0018	.0018	.0021	.0019	.0022	.0024 / .0018
					RPM	3250	1560	1040	820	590	520	460	460	400	260	230	140
					IPM	3	5	6	6	5	5	5	5	5	3	3	2
	5		0.1D	1.5D	SFM	70	70	55	70	60	65	60	70	60	60	65	55
					IPT	.0002	.0005	.0008	.0013	.0014	.0015	.0017	.0017	.0022	.0021	.0024	.0017 / .0013
					RPM	2080	1040	590	520	360	330	290	290	230	160	140	100
					IPM	2	3	3	4	3	3	3	3	3	2	2	1
	6	Low alloy steel	0.1D	1.5D	SFM	135	135	115	135	120	130	125	145	135	130	130	130
					IPT	.0002	.0006	.0011	.0014	.0018	.0021	.0023	.0023	.0022	.0025	.0029	.0033 / .0025
					RPM	4160	2090	1170	1040	730	650	590	590	520	330	290	250
					IPM	4	7	8	9	8	8	8	8	7	5	5	5
	7		0.1D	1.5D	SFM	105	100	100	105	95	100	95	110	105	100	105	75
					IPT	.0002	.0005	.0010	.0012	.0014	.0016	.0018	.0018	.0021	.0019	.0022	.0024 / .0018
					RPM	3250	1560	1040	820	590	520	460	460	400	260	230	140
					IPM	3	5	6	6	5	5	5	5	5	3	3	2
	8-9		0.1D	1.5D	SFM	70	70	55	70	60	65	60	70	60	60	65	55
					IPT	.0002	.0005	.0008	.0013	.0014	.0015	.0017	.0017	.0022	.0021	.0024	.0017 / .0013
					RPM	2080	1040	590	520	360	330	290	290	230	160	140	100
					IPM	2	3	3	4	3	3	3	3	3	2	2	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	135	135	115	135	120	130	125	145	135	130	130	130
					IPT	.0002	.0006	.0011	.0014	.0018	.0021	.0023	.0023	.0022	.0025	.0029	.0033 / .0025
					RPM	4160	2090	1170	1040	730	650	590	590	520	330	290	250
					IPM	4	7	8	9	8	8	8	8	7	5	5	5
	11.1		0.1D	1.5D	SFM	70	70	55	70	60	65	60	70	60	60	65	55
					IPT	.0002	.0005	.0008	.0013	.0014	.0015	.0017	.0017	.0022	.0021	.0024	.0017 / .0013
					RPM	2080	1040	590	520	360	330	290	290	230	160	140	100
					IPM	2	3	3	4	3	3	3	3	3	2	2	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	470	475	395	425	425	460	385	445	410	460	475	545
					IPT	.0002	.0005	.0013	.0015	.0017	.0019	.0021	.0021	.0024	.0024	.0024	.0024 / .0018
					RPM	14300	7280	4030	3250	2600	2340	1820	1820	1560	1170	1040	1040
					IPM	20	24	31	29	27	27	23	23	22	17	15	15
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	470	475	395	425	425	460	385	445	410	460	475	545
					IPT	.0002	.0005	.0013	.0015	.0017	.0019	.0021	.0021	.0024	.0024	.0024	.0024 / .0018
					RPM	14300	7280	4030	3250	2600	2340	1820	1820	1560	1170	1040	1040
					IPM	20	24	31	29	27	27	23	23	22	17	15	15



※ The Feed, in long & extra long types, should be reduced by around 50%.

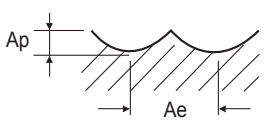
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2020, E2021, E2069 SERIES

4 FLUTE BALL NOSE- PROFILE MILLING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	3/4	1
P	1	Non-alloy steel	0.7D	0.3D	SFM	145	130	130	130	130	120	130
					IPT	.0009	.0014	.0021	.0025	.0028	.0033	.0040
					RPM	2200	1600	1300	1000	800	600	500
					IPM	8	9	11	10	9	8	8
	2		0.7D	0.3D	SFM	110	100	100	105	100	100	105
					IPT	.0007	.0013	.0018	.0019	.0025	.0025	.0025
					RPM	1700	1200	1000	800	600	500	400
					IPM	5	6	7	6	6	5	4
	3-4		0.7D	0.3D	SFM	65	55	55	60	55	60	60
					IPT	.0008	.0011	.0018	.0017	.0021	.0025	.0023
					RPM	1000	700	560	450	350	300	220
					IPM	3	3	4	3	3	3	2
	5		0.7D	0.3D	SFM	45	40	40	40	40	40	40
					IPT	.0007	.0010	.0013	.0016	.0020	.0025	.0031
					RPM	700	500	400	320	250	200	160
					IPM	2	2	2	2	2	2	2
	6	Low alloy steel	0.7D	0.3D	SFM	110	100	100	105	100	100	105
					IPT	.0007	.0013	.0018	.0019	.0025	.0025	.0025
					RPM	1700	1200	1000	800	600	500	400
					IPM	5	6	7	6	6	5	4
	7		0.7D	0.3D	SFM	65	55	55	60	55	60	60
					IPT	.0008	.0011	.0018	.0017	.0021	.0025	.0023
					RPM	1000	700	560	450	350	300	220
					IPM	3	3	4	3	3	3	2
	8-9		0.7D	0.3D	SFM	45	40	40	40	40	40	40
					IPT	.0007	.0010	.0013	.0016	.0020	.0025	.0031
					RPM	700	500	400	320	250	200	160
					IPM	2	2	2	2	2	2	2
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM	110	100	100	105	100	100	105
					IPT	.0007	.0013	.0018	.0019	.0025	.0025	.0025
					RPM	1700	1200	1000	800	600	500	400
					IPM	5	6	7	6	6	5	4
	11.1		0.7D	0.3D	SFM	45	40	40	40	40	40	40
					IPT	.0007	.0010	.0013	.0016	.0020	.0025	.0031
					RPM	700	500	400	320	250	200	160
					IPM	2	2	2	2	2	2	2
N	21-22	Aluminum-wrought alloy	0.7D	0.3D	SFM	365	325	315	325	325	315	340
					IPT	.0008	.0013	.0016	.0020	.0023	.0027	.0029
					RPM	5600	4000	3200	2500	2000	1600	1300
					IPM	17	21	21	20	18	17	15
	23-25	Aluminum-cast, alloyed	0.7D	0.3D	SFM	365	325	315	325	325	315	340
					IPT	.0008	.0013	.0016	.0020	.0023	.0027	.0029
					RPM	5600	4000	3200	2500	2000	1600	1300
					IPM	17	21	21	20	18	17	15



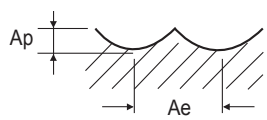
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2020, E2021, E2069 SERIES TiN Coated 4 FLUTE BALL NOSE- PROFILE MILLING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	3/4	1
P	1	Non-alloy steel	0.7D	0.3D	SFM	175	155	155	155	155	140	155
					IPT	.0009	.0014	.0021	.0025	.0029	.0035	.0042
					RPM	2640	1920	1560	1200	960	720	600
					IPM	10	11	13	12	11	10	10
	2		0.7D	0.3D	SFM	135	120	120	125	120	120	125
					IPT	.0007	.0014	.0019	.0021	.0024	.0025	.0026
					RPM	2040	1440	1200	960	720	600	480
					IPM	6	8	9	8	7	6	5
	3-4		0.7D	0.3D	SFM	80	70	65	70	70	70	70
					IPT	.0006	.0012	.0015	.0019	.0024	.0028	.0029
					RPM	1200	840	670	540	420	360	260
					IPM	3	4	4	4	4	4	3
	5		0.7D	0.3D	SFM	55	50	45	50	50	45	50
					IPT	.0006	.0008	.0010	.0013	.0017	.0021	.0026
					RPM	840	600	480	380	300	240	190
					IPM	2	2	2	2	2	2	2
	6	Low alloy steel	0.7D	0.3D	SFM	135	120	120	125	120	120	125
					IPT	.0007	.0014	.0019	.0021	.0024	.0025	.0026
					RPM	2040	1440	1200	960	720	600	480
					IPM	6	8	9	8	7	6	5
	7		0.7D	0.3D	SFM	80	70	65	70	70	70	70
					IPT	.0006	.0012	.0015	.0019	.0024	.0028	.0029
					RPM	1200	840	670	540	420	360	260
					IPM	3	4	4	4	4	4	3
	8-9		0.7D	0.3D	SFM	55	50	45	50	50	45	50
					IPT	.0006	.0008	.0010	.0013	.0017	.0021	.0026
					RPM	840	600	480	380	300	240	190
					IPM	2	2	2	2	2	2	2
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM	135	120	120	125	120	120	125
					IPT	.0007	.0014	.0019	.0021	.0024	.0025	.0026
					RPM	2040	1440	1200	960	720	600	480
					IPM	6	8	9	8	7	6	5
	11.1		0.7D	0.3D	SFM	55	50	45	50	50	45	50
					IPT	.0006	.0008	.0010	.0013	.0017	.0021	.0026
					RPM	840	600	480	380	300	240	190
					IPM	2	2	2	2	2	2	2
N	21-22	Aluminum-wrought alloy	0.7D	0.3D	SFM	440	395	375	395	395	375	410
					IPT	.0007	.0013	.0017	.0020	.0022	.0026	.0029
					RPM	6720	4800	3840	3000	2400	1920	1560
					IPM	20	25	26	24	21	20	18
	23-25	Aluminum-cast, alloyed	0.7D	0.3D	SFM	440	395	375	395	395	375	410
					IPT	.0007	.0013	.0017	.0020	.0022	.0026	.0029
					RPM	6720	4800	3840	3000	2400	1920	1560
					IPM	20	25	26	24	21	20	18



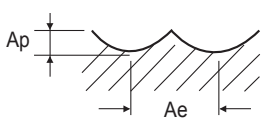
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2020, E2021, E2069 SERIES TiCN Coated 4 FLUTE BALL NOSE- PROFILE MILLING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	3/4	1
P	1	Non-alloy steel	0.7D	0.3D	SFM	185	170	165	170	170	155	170
					IPT	.0009	.0014	.0021	.0025	.0029	.0035	.0038
					RPM	2860	2080	1690	1300	1040	780	650
					IPM	10	12	14	13	12	11	10
	2		0.7D	0.3D	SFM	145	130	130	135	130	130	135
					IPT	.0008	.0013	.0017	.0019	.0026	.0027	.0024
					RPM	2210	1560	1300	1040	780	650	520
					IPM	7	8	9	8	8	7	5
	3-4		0.7D	0.3D	SFM	85	75	70	75	75	75	75
					IPT	.0008	.0011	.0017	.0017	.0022	.0026	.0026
					RPM	1300	910	730	590	460	390	290
					IPM	4	4	5	4	4	4	3
	5		0.7D	0.3D	SFM	60	55	50	55	55	50	55
					IPT	.0005	.0008	.0014	.0018	.0023	.0029	.0024
					RPM	910	650	520	420	330	260	210
					IPM	2	2	3	3	3	3	2
	6	Low alloy steel	0.7D	0.3D	SFM	145	130	130	135	130	130	135
					IPT	.0008	.0013	.0017	.0019	.0026	.0027	.0024
					RPM	2210	1560	1300	1040	780	650	520
					IPM	7	8	9	8	8	7	5
	7		0.7D	0.3D	SFM	85	75	70	75	75	75	75
					IPT	.0008	.0011	.0017	.0017	.0022	.0026	.0026
					RPM	1300	910	730	590	460	390	290
					IPM	4	4	5	4	4	4	3
	8-9		0.7D	0.3D	SFM	60	55	50	55	55	50	55
					IPT	.0005	.0008	.0014	.0018	.0023	.0029	.0024
					RPM	910	650	520	420	330	260	210
					IPM	2	2	3	3	3	3	2
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM	145	130	130	135	130	130	135
					IPT	.0008	.0013	.0017	.0019	.0026	.0027	.0024
					RPM	2210	1560	1300	1040	780	650	520
					IPM	7	8	9	8	8	7	5
	11.1		0.7D	0.3D	SFM	60	55	50	55	55	50	55
					IPT	.0005	.0008	.0014	.0018	.0023	.0029	.0024
					RPM	910	650	520	420	330	260	210
					IPM	2	2	3	3	3	3	2
N	21-22	Aluminum-wrought alloy	0.7D	0.3D	SFM	475	425	410	425	425	410	440
					IPT	.0008	.0013	.0017	.0020	.0022	.0026	.0030
					RPM	7280	5200	4160	3250	2600	2080	1690
					IPM	22	27	28	26	23	22	20
	23-25	Aluminum-cast, alloyed	0.7D	0.3D	SFM	475	425	410	425	425	410	440
					IPT	.0008	.0013	.0017	.0020	.0022	.0026	.0030
					RPM	7280	5200	4160	3250	2600	2080	1690
					IPM	22	27	28	26	23	22	20



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2001, E1001, E2003, E1003, E2005, E1005, E2002, E1002, E2004, E1004, E2006, E1006, E2008, E1008, E2013, E1013, E2015, E1015 SERIES

MINIATURE

ISO	VDI 3323	Material Description	Parameter	Diameter (Ø)											
				1/64	1/32	3/64	1/16	5/64	3/32	7/64	1/8	9/64	5/32	11/64	3/16
P	1-5	Non-alloy steel Low alloy steel	SFM	45	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55
			RPM	11000 up	5500~5600	3670~4400	2750~3300	2200~2640	1840~2200	1570~1890	1380~1650	1220~1470	1100~1320	1000~1200	920~1100
			IPM	0.5	0.6	0.6	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.4
	6-9	Low alloy steel	SFM	45	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55
			RPM	11000 up	5500~5600	3670~4400	2750~3300	2200~2640	1840~2200	1570~1890	1380~1650	1220~1470	1100~1320	1000~1200	920~1100
			IPM	0.5	0.6	0.6	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.4
	10-11	High alloyed steel, and tool steel	SFM	25~35	25~35	25~35	25~35	25~35	25~30	25~35	25~35	25~35	25~35	25~35	25~35
			RPM	6600~8800	3300~4400	2200~2940	1650~2260	1320~1760	1100~1290	850~1260	830~1100	740~980	560~880	600~800	550~740
			IPM	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.9	1.0
M	12-14	Stainless steel	SFM	25~35	25~35	25~35	25~35	25~35	25~30	25~35	25~35	25~35	25~35	25~35	25~35
			RPM	6600~8800	3300~4400	2200~2940	1650~2260	1320~1760	1100~1290	850~1260	830~1100	740~980	560~880	600~800	550~740
			IPM	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.9	1.0
N	21-22	Aluminum-wrought alloy	SFM	45	90	135	180	175	180	160	180	180~360	180~360	180~360	180~360
			RPM	11000 up	11000 up	11000 up	11000 up	8500 up	7330 up	5625 up	5500 up	4890~9780	4400~8800	3000~8000	3690~7340
			IPM	1.5	2.5	2.6	4.2	4.2	4.2	4.3	4.5	4.5	4.5	4.6	4.7
	23-25	Aluminum-cast, alloyed	SFM	45	90	135	180	175	180	160	180	180~360	180~360	180~360	180~360
			RPM	11000 up	11000 up	11000 up	11000 up	8500 up	7330 up	5625 up	5500 up	4890~9780	4400~8800	3000~8000	3690~7340
			IPM	1.5	2.5	2.6	4.2	4.2	4.2	4.3	4.5	4.5	4.5	4.6	4.7
	26-28	Copper and Copper Alloys (Bronze / Brass)	SFM	45	65~80	65~80	55~80	80	65~80	65~80	65~80	65~80	65~80	65~80	65~80
			RPM	11000 up	7700~9900	5140~6600	3350~4950	3850~3960	2570~3300	2200~2830	1930~2480	1710~2200	1540~1980	1400~1800	1290~1650
			IPM	0.8	1.6	2.5	3.3	3.3	3.3	3.3	3.3	3.4	3.6	3.7	3.3
	30	Non Metallic Materials	SFM	45	90	90~110	90~110	90~120	90~110	90~110	90~110	90~140	90~110	90~110	75~110
			RPM	11000 up	11000 up	7335~8800	5500~6600	4400~5820	3665~4400	3140~3770	2750~3300	2445~3770	2205~2640	2000~2400	1535~2200
			IPM	1.2	1.6	2.0	2.6	2.6	2.6	2.6	2.8	2.8	2.9	3.0	3.3
S	36	Titanium Alloys	SFM	45	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55	45~55
			RPM	11000 up	5500~5600	3670~4400	2750~3300	2200~2640	1840~2200	1570~1890	1380~1650	1220~1470	1100~1320	1000~1200	920~1100
			IPM	0.5	0.6	0.6	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.4
	37		SFM	25~35	25~35	25~35	25~35	25~35	25~30	25~35	25~35	25~35	25~35	25~35	25~35
			RPM	6600~8800	3300~4400	2200~2940	1650~2260	1320~1760	1100~1290	850~1260	830~1100	740~980	560~880	600~800	550~740
			IPM	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.9	1.0

※ The Feed, in long & extra long types, should be reduced by around 50%.

NOTES :

(1) The cutting conditions in this table are given for reference, which should be varied depending on the machine, tooling, depth of cut. cutting fluid and other conditons.

(2) Use a holder of strong gripping force and machine of high stiffness

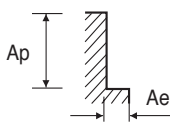
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2086, E2085, E2079, E2077, E2170, E2171, E2172, E2241, E2195, E2197 SERIES

MULTI FLUTE ROUGHING - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	11/16	7/8	1	1 1/8	1 1/4	1 3/8	1 3/4	2
P	1	Non-alloy steel	0.5D	1.5D	SFM	120	115	110	120	115	115	115	120	120	115	110	130	115
					RPM	1800	1400	1100	900	700	630	500	450	400	350	310	280	220
					IPM	3	4	6	7	7	7	9	9	8	8	8	8	8
	2		0.5D	1.5D	SFM	105	90	90	105	90	90	105	105	105	90	90	100	95
					RPM	1600	1100	900	800	560	500	450	400	350	280	250	220	180
					IPM	2	3	5	6	6	6	7	7	6	6	6	6	7
	3-4		0.5D	1.5D	SFM	80	75	80	80	75	70	80	80	80	70	70	80	85
					RPM	1200	900	800	630	450	400	350	310	280	220	200	180	160
					IPM	2	3	4	4	4	4	6	6	5	5	5	5	6
	5		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45	45	50	45
					RPM	800	560	450	400	280	250	220	180	160	140	120	110	90
					IPM	1	1	2	3	3	3	3	3	3	3	3	3	3
	6	Low alloy steel	0.5D	1.5D	SFM	105	90	90	105	90	90	105	105	105	90	90	100	95
					RPM	1600	1100	900	800	560	500	450	400	350	280	250	220	180
					IPM	2	3	5	6	6	6	7	7	6	6	6	6	7
	7		0.5D	1.5D	SFM	80	75	80	80	75	70	80	80	80	70	70	80	85
					RPM	1200	900	800	630	450	400	350	310	280	220	200	180	160
					IPM	2	3	4	4	4	4	6	6	5	5	5	5	6
	8-9		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45	45	50	45
					RPM	800	560	450	400	280	250	220	180	160	140	120	110	90
					IPM	1	1	2	3	3	3	3	3	3	3	3	3	3
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM	105	90	90	105	90	90	105	105	105	90	90	100	95
					RPM	1600	1100	900	800	560	500	450	400	350	280	250	220	180
					IPM	2	3	5	6	6	6	7	7	6	6	6	6	7
	11.1		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45	45	50	45
					RPM	800	560	450	400	280	250	220	180	160	140	120	110	90
					IPM	1	1	2	3	3	3	3	3	3	3	3	3	3
N	21-22	Aluminum-wrought alloy	0.5D	1.5D	SFM	295	255	245	260	260	250	250	260	265	260	250	290	260
					RPM	4500	3100	2500	2000	1600	1400	1100	1000	900	800	700	630	500
					IPM	8	9	14	16	18	19	19	18	20	20	19	18	15
	23-25	Aluminum-cast, alloyed	0.5D	1.5D	SFM	295	255	245	260	260	250	250	260	265	260	250	290	260
					RPM	4500	3100	2500	2000	1600	1400	1100	1000	900	800	700	630	500
					IPM	8	9	14	16	18	19	19	18	20	20	19	18	15



※ The Feed, in long & extra long types, should be reduced by around 50%.

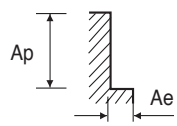
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2086, E2085, E2079, E2077, E2170, E2171, E2172, E2241, E2195, E2197 SERIES

TiN Coated
MULTI FLUTE ROUGHING
- SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/4	5/16	3/8	1/2	5/8	11/16	7/8	1	1 1/8	1 1/4	1 3/8	1 3/4	2
P	1	Non-alloy steel	0.5D	1.5D	SFM	140	135	130	140	135	135	135	140	140	135	135	155	140
					RPM	2160	1680	1320	1080	840	760	600	540	480	420	370	340	260
					IPM	4	5	7	9	9	9	10	10	10	10	10	10	10
	2		0.5D	1.5D	SFM	125	110	105	125	110	110	125	125	125	110	110	120	115
					RPM	1920	1320	1080	960	670	600	540	480	420	340	300	260	220
					IPM	3	4	6	7	7	7	8	8	8	8	8	7	8
	3-4		0.5D	1.5D	SFM	95	90	95	100	90	85	95	95	100	85	85	100	100
					RPM	1440	1080	960	760	540	480	420	370	340	260	240	220	190
					IPM	3	3	5	5	5	5	7	7	6	6	6	6	7
	5		0.5D	1.5D	SFM	65	55	55	65	55	55	60	55	55	55	50	60	55
					RPM	960	670	540	480	340	300	260	220	190	170	140	130	110
					IPM	1	2	3	3	3	3	4	4	4	4	4	4	4
	6	Low alloy steel	0.5D	1.5D	SFM	125	110	105	125	110	110	125	125	125	110	110	120	115
					RPM	1920	1320	1080	960	670	600	540	480	420	340	300	260	220
					IPM	3	4	6	7	7	7	8	8	8	8	8	7	8
	7		0.5D	1.5D	SFM	95	90	95	100	90	85	95	95	100	85	85	100	100
					RPM	1440	1080	960	760	540	480	420	370	340	260	240	220	190
					IPM	3	3	5	5	5	5	7	7	6	6	6	6	7
	8-9		0.5D	1.5D	SFM	65	55	55	65	55	55	60	55	55	55	50	60	55
					RPM	960	670	540	480	340	300	260	220	190	170	140	130	110
					IPM	1	2	3	3	3	3	4	4	4	4	4	4	4
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM	125	110	105	125	110	110	125	125	125	110	110	120	115
					RPM	1920	1320	1080	960	670	600	540	480	420	340	300	260	220
					IPM	3	4	6	7	7	7	8	8	8	8	8	7	8
	11.1		0.5D	1.5D	SFM	65	55	55	65	55	55	60	55	55	55	50	60	55
					RPM	960	670	540	480	340	300	260	220	190	170	140	130	110
					IPM	1	2	3	3	3	3	4	4	4	4	4	4	4
N	21-22	Aluminum-wrought alloy	0.5D	1.5D	SFM	355	305	295	315	315	300	300	315	320	315	300	345	315
					RPM	5400	3720	3000	2400	1920	1680	1320	1200	1080	960	840	760	600
					IPM	10	11	17	19	21	22	22	21	24	24	22	21	18
	23-25	Aluminum-cast, alloyed	0.5D	1.5D	SFM	355	305	295	315	315	300	300	315	320	315	300	345	315
					RPM	5400	3720	3000	2400	1920	1680	1320	1200	1080	960	840	760	600
					IPM	10	11	17	19	21	22	22	21	24	24	22	21	18



※ The Feed, in long & extra long types, should be reduced by around 50%.

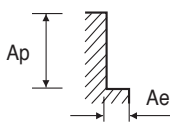
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2086, E2085, E2079, E2077, E2170, E2171, E2172, E2241, E2195, E2197 SERIES

TiCN Coated
MULTI FLUTE ROUGHING
- SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/4	5/16	3/8	1/2	5/8	11/16	7/8	1	1 1/8	1 1/4	1 3/8	1 3/4	2
P	1	Non-alloy steel	0.5D	1.5D	SFM	155	150	140	155	150	145	150	155	155	150	145	165	150
					RPM	2340	1820	1430	1170	910	820	650	590	520	460	400	360	290
					IPM	4	5	8	9	9	9	11	11	11	11	11	10	10
	2		0.5D	1.5D	SFM	135	115	115	135	120	115	135	135	135	120	115	130	125
					RPM	2080	1430	1170	1040	730	650	590	520	460	360	330	290	230
					IPM	3	4	6	7	7	7	9	9	8	8	8	8	9
	3-4		0.5D	1.5D	SFM	100	95	100	105	95	95	105	105	105	95	95	105	110
					RPM	1560	1170	1040	820	590	520	460	400	360	290	260	230	210
					IPM	3	3	6	6	6	6	7	7	7	7	7	6	7
	5		0.5D	1.5D	SFM	70	60	55	70	60	60	65	60	60	60	55	65	60
					RPM	1040	730	590	520	360	330	290	230	210	180	160	140	120
					IPM	2	2	3	4	4	4	4	4	4	4	4	4	4
	6	Low alloy steel	0.5D	1.5D	SFM	135	115	115	135	120	115	135	135	135	120	115	130	125
					RPM	2080	1430	1170	1040	730	650	590	520	460	360	330	290	230
					IPM	3	4	6	7	7	7	9	9	8	8	8	8	9
	7		0.5D	1.5D	SFM	100	95	100	105	95	95	105	105	105	95	95	105	110
					RPM	1560	1170	1040	820	590	520	460	400	360	290	260	230	210
					IPM	3	3	6	6	6	6	7	7	7	7	7	6	7
	8-9		0.5D	1.5D	SFM	70	60	55	70	60	60	65	60	60	60	55	65	60
					RPM	1040	730	590	520	360	330	290	230	210	180	160	140	120
					IPM	2	2	3	4	4	4	4	4	4	4	4	4	4
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM	135	115	115	135	120	115	135	135	135	120	115	130	125
					RPM	2080	1430	1170	1040	730	650	590	520	460	360	330	290	230
					IPM	3	4	6	7	7	7	9	9	8	8	8	8	9
	11.1		0.5D	1.5D	SFM	70	60	55	70	60	60	65	60	60	60	55	65	60
					RPM	1040	730	590	520	360	330	290	230	210	180	160	140	120
					IPM	2	2	3	4	4	4	4	4	4	4	4	4	4
N	21-22	Aluminum-wrought alloy	0.5D	1.5D	SFM	385	330	320	340	340	330	330	340	345	340	330	375	340
					RPM	5850	4030	3250	2600	2080	1820	1430	1300	1170	1040	910	820	650
					IPM	10	12	18	21	23	24	24	23	26	26	24	23	19
	23-25	Aluminum-cast, alloyed	0.5D	1.5D	SFM	385	330	320	340	340	330	330	340	345	340	330	375	340
					RPM	5850	4030	3250	2600	2080	1820	1430	1300	1170	1040	910	820	650
					IPM	10	12	18	21	23	24	24	23	26	26	24	23	19



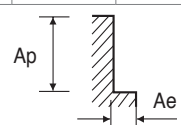
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2193, E2125 SERIES — MULTI FLUTE BALL ROUGHING - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 5/16	3/8	1/2	5/8	3/4	1	1 1/4	1 3/4
P	1	Non-alloy steel	0.5D	1.5D	SFM	115	110	120	115	110	120	115	130
					IPT	.0010	.0014	.0019	.0025	.0031	.0040	.0038	.0048
					RPM	1400	1100	900	700	560	450	350	280
					IPM	4	6	7	7	7	9	8	8
	2		0.5D	1.5D	SFM	90	90	105	90	90	105	90	100
					IPT	.0009	.0014	.0019	.0027	.0033	.0035	.0036	.0045
					RPM	1100	900	800	560	450	400	280	220
					IPM	3	5	6	6	6	7	6	6
	3-4		0.5D	1.5D	SFM	75	80	80	75	80	80	70	80
					IPT	.0011	.0013	.0016	.0022	.0025	.0039	.0038	.0046
					RPM	900	800	630	450	400	310	220	180
					IPM	3	4	4	4	4	6	5	5
	5		0.5D	1.5D	SFM	45	45	50	45	45	45	45	50
					IPT	.0006	.0011	.0019	.0027	.0034	.0033	.0036	.0045
					RPM	560	450	400	280	220	180	140	110
					IPM	1	2	3	3	3	3	3	3
	6	Low alloy steel	0.5D	1.5D	SFM	90	90	105	90	90	105	90	100
					IPT	.0009	.0014	.0019	.0027	.0033	.0035	.0036	.0045
					RPM	1100	900	800	560	450	400	280	220
					IPM	3	5	6	6	6	7	6	6
	7		0.5D	1.5D	SFM	75	80	80	75	80	80	70	80
					IPT	.0011	.0013	.0016	.0022	.0025	.0039	.0038	.0046
					RPM	900	800	630	450	400	310	220	180
					IPM	3	4	4	4	4	6	5	5
	8-9		0.5D	1.5D	SFM	45	45	50	45	45	45	45	50
					IPT	.0006	.0011	.0019	.0027	.0034	.0033	.0036	.0045
					RPM	560	450	400	280	220	180	140	110
					IPM	1	2	3	3	3	3	3	3
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM	90	90	105	90	90	105	90	100
					IPT	.0009	.0014	.0019	.0027	.0033	.0035	.0036	.0045
					RPM	1100	900	800	560	450	400	280	220
					IPM	3	5	6	6	6	7	6	6
	11.1		0.5D	1.5D	SFM	45	45	50	45	45	45	45	50
					IPT	.0006	.0011	.0019	.0027	.0034	.0033	.0036	.0045
					RPM	560	450	400	280	220	180	140	110
					IPM	1	2	3	3	3	3	3	3
N	21-22	Aluminum-wrought alloy	0.5D	1.5D	SFM	255	245	260	260	235	260	260	290
					IPT	.0010	.0010	.0020	.0028	.0042	.0036	.0042	.0048
					RPM	3100	2500	2000	1600	1200	1000	800	630
					IPM	9	10	16	18	20	18	20	18
	23-25	Aluminum-cast, alloyed	0.5D	1.5D	SFM	255	245	260	260	235	260	260	290
					IPT	.0010	.0010	.0020	.0028	.0042	.0036	.0042	.0048
					RPM	3100	2500	2000	1600	1200	1000	800	630
					IPM	9	10	16	18	20	18	20	18



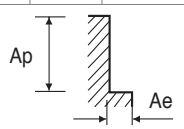
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2248 SERIES — MULTI FLUTE ROUGHING & FINISHING - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	11/16	7/8	1	1 1/4	1 3/8	2 (6 & 8 FL)
P	1	Non-alloy steel	0.5D	1.5D	SFM	120	115	110	120	115	115	115	120	115	110	125
					IPT	.0004	.0005	.0011	.0017	.0021	.0024	.0028	.0031	.0033	.0038	.0035/ .0026
					RPM	1800	1400	1100	900	700	630	500	450	350	310	240
					IPM	3	3	5	6	6	6	7	7	7	7	5
	2		0.5D	1.5D	SFM	85	90	90	105	90	90	105	105	90	90	100
					IPT	.0004	.0005	.0011	.0013	.0018	.0020	.0022	.0025	.0030	.0033	.0035 / .0026
					RPM	1300	1100	900	800	560	500	450	400	280	250	190
					IPM	2	2	4	4	4	4	5	5	5	5	4
	3-4		0.5D	1.5D	SFM	80	75	80	80	75	70	80	80	70	70	80
					IPT	.0004	.0006	.0013	.0016	.0022	.0025	.0023	.0026	.0030	.0033	.0033 / .0025
					RPM	1200	900	800	630	450	400	350	310	220	200	150
					IPM	2	2	4	4	4	4	4	4	4	4	3
	5		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45	60
					IPT	.0003	.0004	.0011	.0013	.0018	.0020	.0027	.0033	.0036	.0042	.0045 / .0034
					RPM	800	560	450	400	280	250	220	180	140	120	110
					IPM	1	1	2	2	2	2	3	3	3	3	3
	6	Low alloy steel	0.5D	1.5D	SFM	85	90	90	105	90	90	105	105	90	90	100
					IPT	.0004	.0005	.0011	.0013	.0018	.0020	.0022	.0025	.0030	.0033	.0035 / .0026
					RPM	1300	1100	900	800	560	500	450	400	280	250	190
					IPM	2	2	4	4	4	4	5	5	5	5	4
	7		0.5D	1.5D	SFM	80	75	80	80	75	70	80	80	70	70	80
					IPT	.0004	.0006	.0013	.0016	.0022	.0025	.0023	.0026	.0030	.0033	.0033 / .0025
					RPM	1200	900	800	630	450	400	350	310	220	200	150
					IPM	2	2	4	4	4	4	4	4	4	4	3
	8-9		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45	60
					IPT	.0003	.0004	.0011	.0013	.0018	.0020	.0027	.0033	.0036	.0042	.0045 / .0034
					RPM	800	560	450	400	280	250	220	180	140	120	110
					IPM	1	1	2	2	2	2	3	3	3	3	3
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM	85	90	90	105	90	90	105	105	90	90	100
					IPT	.0004	.0005	.0011	.0013	.0018	.0020	.0022	.0025	.0030	.0033	.0035 / .0026
					RPM	1300	1100	900	800	560	500	450	400	280	250	190
					IPM	2	2	4	4	4	4	5	5	5	5	4
	11.1		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45	60
					IPT	.0003	.0004	.0011	.0013	.0018	.0020	.0027	.0033	.0036	.0042	.0045 / .0034
					RPM	800	560	450	400	280	250	220	180	140	120	110
					IPM	1	1	2	2	2	2	3	3	3	3	3
N	21-22	Aluminum-wrought alloy	0.5D	1.5D	SFM	295	255	245	260	260	250	250	260	260	250	260
					IPT	.0003	.0006	.0011	.0016	.0022	.0027	.0027	.0028	.0033	.0036	.0037 / .0028
					RPM	4500	3100	2500	2000	1600	1400	1100	1000	800	700	500
					IPM	6	7	11	13	14	15	15	14	16	15	11
	23-25	Aluminum-cast, alloyed	0.5D	1.5D	SFM	295	255	245	260	260	250	250	260	260	250	260
					IPT	.0003	.0006	.0011	.0016	.0022	.0027	.0027	.0028	.0033	.0036	.0037 / .0028
					RPM	4500	3100	2500	2000	1600	1400	1100	1000	800	700	500
					IPM	6	7	11	13	14	15	15	14	16	15	11



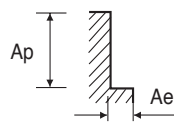
※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2191, E2226, E2192 SERIES — 3 FLUTE ROUGHING FOR ALUMINIUM - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/4	5/16	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
P	1	Non-alloy steel	0.5D	1.5D	SFM	120	115	110	120	115	115	115	120	115	110
					IPT	.0006	.0010	.0018	.0026	.0033	.0037	.0060	.0067	.0076	.0086
					RPM	1800	1400	1100	900	700	630	500	450	350	310
					IPM	3	4	6	7	7	7	9	9	8	8
	2		0.5D	1.5D	SFM	105	90	90	105	90	90	105	105	90	90
					IPT	.0004	.0009	.0019	.0025	.0036	.0040	.0052	.0058	.0071	.0080
					RPM	1600	1100	900	800	560	500	450	400	280	250
					IPM	2	3	5	6	6	6	7	7	6	6
	3-4		0.5D	1.5D	SFM	80	75	80	80	75	70	80	80	70	70
					IPT	.0006	.0011	.0017	.0021	.0030	.0033	.0057	.0065	.0076	.0083
					RPM	1200	900	800	630	450	400	350	310	220	200
					IPM	2	3	4	4	4	4	6	6	5	5
	5		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45
					IPT	.0004	.0006	.0015	.0017	.0024	.0027	.0045	.0056	.0071	.0083
					RPM	800	560	450	400	280	250	220	180	140	120
					IPM	1	1	2	2	2	2	3	3	3	3
	6	Low alloy steel	0.5D	1.5D	SFM	105	90	90	105	90	90	105	105	90	90
					IPT	.0004	.0009	.0019	.0025	.0036	.0040	.0052	.0058	.0071	.0080
					RPM	1600	1100	900	800	560	500	450	400	280	250
					IPM	2	3	5	6	6	6	7	7	6	6
	7		0.5D	1.5D	SFM	80	75	80	80	75	70	80	80	70	70
					IPT	.0006	.0011	.0017	.0021	.0030	.0033	.0057	.0065	.0076	.0083
					RPM	1200	900	800	630	450	400	350	310	220	200
					IPM	2	3	4	4	4	4	6	6	5	5
	8-9		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45
					IPT	.0004	.0006	.0015	.0017	.0024	.0027	.0045	.0056	.0071	.0083
					RPM	800	560	450	400	280	250	220	180	140	120
					IPM	1	1	2	2	2	2	3	3	3	3
	10	High alloyed steel, and tool steel	0.5D	1.5D	SFM	105	90	90	105	90	90	105	105	90	90
					IPT	.0004	.0009	.0019	.0025	.0036	.0040	.0052	.0058	.0071	.0080
					RPM	1600	1100	900	800	560	500	450	400	280	250
					IPM	2	3	5	6	6	6	7	7	6	6
	11.1		0.5D	1.5D	SFM	50	45	45	50	45	45	50	45	45	45
					IPT	.0004	.0006	.0015	.0017	.0024	.0027	.0045	.0056	.0071	.0083
					RPM	800	560	450	400	280	250	220	180	140	120
					IPM	1	1	2	2	2	2	3	3	3	3
N	21-22	Aluminum-wrought alloy	0.5D	1.5D	SFM	295	255	245	260	260	250	250	260	260	250
					IPT	.0004	.0008	.0015	.0022	.0029	.0036	.0045	.0047	.0067	.0071
					RPM	4500	3100	2500	2000	1600	1400	1100	1000	800	700
					IPM	6	7	11	13	14	15	15	14	16	15
	23-25	Aluminum-cast, alloyed	0.5D	1.5D	SFM	295	255	245	260	260	250	250	260	260	250
					IPT	.0004	.0008	.0015	.0022	.0029	.0036	.0045	.0047	.0067	.0071
					RPM	4500	3100	2500	2000	1600	1400	1100	1000	800	700
					IPM	6	7	11	13	14	15	15	14	16	15



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2237, E1237 SERIES — 4 FLUTE CORNER ROUNDING

ISO	VDI 3323	Material Description	Parameter	Diameter (Ø)												
				7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 15/16	1 7/8
P	1	Non-alloy steel	SFM	65	65	65	65	65	65	65	65	65	65	65	65	65
			IPT	.0008	.0008	.0011	.0012	.0014	.0016	.0017	.0019	.0019	.0021	.0022	.0023	.0023
			RPM	580	500	400	340	290	250	220	200	180	170	160	130	130
			IPM	1.8	1.6	1.8	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.2	1.2
	2		SFM	50	50	50	50	50	50	50	50	50	50	50	50	50
			IPT	.0008	.0008	.0011	.0012	.0014	.0016	.0016	.0018	.0018	.0021	.0021	.0023	.0023
			RPM	430	370	300	250	210	190	170	150	140	120	120	100	100
			IPM	1.4	1.2	1.3	1.2	1.2	1.2	1.1	1.1	1	1	1	0.9	0.9
	3-4		SFM	35	35	35	35	35	35	35	35	35	35	35	35	35
			IPT	.0009	.0010	.0013	.0015	.0018	.0019	.0023	.0025	.0028	.0031	.0000	.0000	.0036
			RPM	290	250	200	170	140	130	110	100	90	80	80	70	70
			IPM	1	1	1	1	1	1	1	1	1	1	0	0	1
	5		SFM	50	45	45	50	45	45	50	45	45	45	45	45	45
			IPT	.0004	.0006	.0015	.0017	.0024	.0027	.0045	.0056	.0071	.0083	.0083	.0083	.0083
			RPM	800	560	450	400	280	250	220	180	140	120	120	120	120
			IPM	1	1	2	2	2	2	3	3	3	3	3	3	3
	6	Low alloy steel	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50
			IPT	.0008	.0008	.0011	.0012	.0014	.0016	.0016	.0018	.0018	.0021	.0021	.0023	.0023
			RPM	430	370	300	250	210	190	170	150	140	120	120	100	100
			IPM	1.4	1.2	1.3	1.2	1.2	1.2	1.1	1.1	1	1	1	0.9	0.9
	7		SFM	35	35	35	35	35	35	35	35	35	35	35	35	35
			IPT	.0009	.0010	.0013	.0015	.0018	.0019	.0023	.0025	.0028	.0031	.0000	.0000	.0036
			RPM	290	250	200	170	140	130	110	100	90	80	80	70	70
			IPM	1	1	1	1	1	1	1	1	1	1	0	0	1
	8-9		SFM	50	45	45	50	45	45	50	45	45	45	45	45	45
			IPT	.0004	.0006	.0015	.0017	.0024	.0027	.0045	.0056	.0071	.0083	.0083	.0083	.0083
			RPM	800	560	450	400	280	250	220	180	140	120	120	120	120
			IPM	1	1	2	2	2	2	3	3	3	3	3	3	3
	10	High alloyed steel, and tool steel	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50
			IPT	.0008	.0008	.0011	.0012	.0014	.0016	.0016	.0018	.0018	.0021	.0021	.0023	.0023
			RPM	430	370	300	250	210	190	170	150	140	120	120	100	100
			IPM	1.4	1.2	1.3	1.2	1.2	1.2	1.1	1.1	1	1	1	0.9	0.9
	11.1		SFM	50	45	45	50	45	45	50	45	45	45	45	45	45
			IPT	.0004	.0006	.0015	.0017	.0024	.0027	.0045	.0056	.0071	.0083	.0083	.0083	.0083
			RPM	800	560	450	400	280	250	220	180	140	120	120	120	120
			IPM	1	1	2	2	2	2	3	3	3	3	3	3	3
N	21-22	Aluminum-wrought alloy	SFM	295	295	295	295	295	295	295	295	295	295	295	295	295
			IPT	.0009	.0009	.0013	.0013	.0016	.0015	.0018	.0019	.0021	.0023	.0022	.0022	.0025
			RPM	2580	2250	1800	1500	1290	1130	1000	900	820	750	690	580	600
			IPM	9	8	9	8	8	7	7	7	7	7	6	5	6
	23-25	Aluminum-cast, alloyed	SFM	295	295	295	295	295	295	295	295	295	295	295	295	295
			IPT	.0009	.0009	.0013	.0013	.0016	.0015	.0018	.0019	.0021	.0023	.0022	.0022	.0025
			RPM	2580	2250	1800	1500	1290	1130	1000	900	820	750	690	580	600
			IPM	9	8	9	8	8	7	7	7	7	7	6	5	6

※ The Feed, in long & extra long types, should be reduced by around 50%.

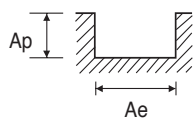
COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2482, E1482 SERIES

2FLUTE - SLOTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)																	
						2	3	4	5	6	8	10	12	14	16	18	20	22	25	28	30	32	36	40
P	1	Non-alloy steel	1.0D	0.5D	SFM	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
					IPT	.0002	.0003	.0005	.0009	.0011	.0014	.0018	.0022	.0025	.0029	.0032	.0036	.0039	.0044	.0038	.0041	.0043	.0032	.0036
					RPM	5570	3710	2790	2230	1860	1390	1110	930	800	700	620	560	510	450	400	370	350	310	280
					IPM	2	2	3	4	4	4	4	4	4	4	4	4	4	4	3	3	3	2	2
	2		1.0D	0.5D	SFM	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100
					IPT	.0001	.0003	.0004	.0008	.0009	.0017	.0021	.0025	.0022	.0033	.0038	.0042	.0035	.0039	.0044	.0031	.0033	.0037	.0042
					RPM	4780	3180	2390	1910	1590	1190	960	800	680	600	530	480	430	380	340	320	300	270	240
					IPM	1	2	2	3	3	4	4	4	3	4	4	4	3	3	3	2	2	2	2
	3-4		1.0D	0.5D	SFM	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	85	65	80	80
					IPT	.0001	.0004	.0005	.0006	.0011	.0015	.0019	.0023	.0026	.0030	.0034	.0038	.0042	.0031	.0036	.0037	.0050	.0045	.0050
					RPM	3980	2650	1990	1590	1330	1000	800	660	570	500	440	400	360	320	280	270	200	220	200
					IPM	1	2	2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2
	5		1.0D	0.5D	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
					IPT	.0002	.0003	.0004	.0005	.0013	.0017	.0021	.0025	.0029	.0033	.0037	.0042	.0045	.0026	.0029	.0031	.0033	.0038	.0042
					RPM	2390	1590	1190	960	800	600	480	400	340	300	270	240	220	190	170	160	150	130	120
					IPM	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1
	6	Low alloy steel	1.0D	0.5D	SFM	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100
					IPT	.0001	.0003	.0004	.0008	.0009	.0017	.0021	.0025	.0022	.0033	.0038	.0042	.0035	.0039	.0044	.0031	.0033	.0037	.0042
					RPM	4780	3180	2390	1910	1590	1190	960	800	680	600	530	480	430	380	340	320	300	270	240
					IPM	1	2	2	3	3	4	4	4	3	4	4	4	3	3	3	2	2	2	2
	7		1.0D	0.5D	SFM	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	85	65	80	80
					IPT	.0001	.0004	.0005	.0006	.0011	.0015	.0019	.0023	.0026	.0030	.0034	.0038	.0042	.0031	.0036	.0037	.0050	.0045	.0050
					RPM	3980	2650	1990	1590	1330	1000	800	660	570	500	440	400	360	320	280	270	200	220	200
					IPM	1	2	2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2
	8-9		1.0D	0.5D	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
					IPT	.0002	.0003	.0004	.0005	.0013	.0017	.0021	.0025	.0029	.0033	.0037	.0042	.0045	.0026	.0029	.0031	.0033	.0038	.0042
					RPM	2390	1590	1190	960	800	600	480	400	340	300	270	240	220	190	170	160	150	130	120
					IPM	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1
	10	High alloyed steel, and tool steel	1.0D	0.5D	SFM	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100
					IPT	.0001	.0003	.0004	.0008	.0009	.0017	.0021	.0025	.0022	.0033	.0038	.0042	.0035	.0039	.0044	.0031	.0033	.0037	.0042
					RPM	4780	3180	2390	1910	1590	1190	960	800	680	600	530	480	430	380	340	320	300	270	240
					IPM	1	2	2	3	3	4	4	4	3	4	4	4	3	3	3	2	2	2	2
	11.1		1.0D	0.5D	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
					IPT	.0002	.0003	.0004	.0005	.0013	.0017	.0021	.0025	.0029	.0033	.0037	.0042	.0045	.0026	.0029	.0031	.0033	.0038	.0042
					RPM	2390	1590	1190	960	800	600	480	400	340	300	270	240	220	190	170	160	150	130	120
					IPM	1	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1
N	21-22	Aluminum-wrought alloy	1.0D	0.5D	SFM	245	345	330	330	345	330	310	310	310	330	330	330	315	310	310	345	330	325	330
					IPT	.0003	.0004	.0007	.0010	.0011	.0019	.0025	.0030	.0032	.0035	.0040	.0041	.0043	.0045	.0046	.0050	.0045	.0051	.0050
					RPM	11940	11140	7960	6370	5570	3980	3020	2520	2160	1990	1770	1590	1380	1210	1080	1110	1000	880	800
					IPM	7	10	11	13	12	15	15	15	14	14	14	13	12	11	10	11	9	9	8
	23-25	Aluminum-cast, alloyed	1.0D	0.5D	SFM	160	225	215	215	225	215	205	205	205	215	215	215	205	205	205	225	215	215	215
					IPT	.0003	.0004	.0007	.0010	.0011	.0019	.0025	.0030	.0032	.0035	.0039	.0038	.0044	.0044	.0049	.0049	.0046	.0052	.0048
					RPM	7800	7220	5170	4140	3610	2590	1970	1650	1410	1290	1150	1040	900	790	710	720	650	580	520
					IPM	4	6	7	8	8	10	10	10	9	9	9	8	8	7	7	7	6	6	5



※ The Feed, in long & extra long types, should be reduced by around 50%.

COBALT & HSS END MILLS

RECOMMENDED CUTTING CONDITIONS

E2483, E1483 SERIES — 4 FLUTE - SIDE CUTTING

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)																		
						2	3	4	5	6	8	10	12	14	16	18	20	22	25	28	30	32	36	40
P	1	Non-alloy steel	0.1D	1.5D	SFM	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
					IPT	.0002	.0003	.0005	.0008	.0009	.0014	.0018	.0024	.0028	.0032	.0032	.0036	.0039	.0039	.0038	.0041	.0043	.0040	.0045
					RPM	5570	3710	2790	2230	1860	1390	1110	930	800	700	620	560	510	450	400	370	350	310	280
					IPM	4	5	6	7	7	8	8	9	9	9	8	8	8	7	6	6	6	5	5
	2		0.1D	1.5D	SFM	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100
					IPT	.0001	.0002	.0004	.0007	.0009	.0015	.0018	.0022	.0066	.0029	.0033	.0036	.0035	.0033	.0037	.0031	.0033	.0037	.0042
					RPM	4780	3180	2390	1910	1590	1190	960	800	680	600	530	480	430	380	340	320	300	270	240
					IPM	2	3	4	5	6	7	7	7	18	7	7	7	6	5	5	4	4	4	4
	3-4		0.1D	1.5D	SFM	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	85	65	80	80
					IPT	.0001	.0003	.0004	.0006	.0008	.0013	.0016	.0019	.0022	.0025	.0028	.0025	.0028	.0031	.0027	.0028	.0025	.0034	.0038
					RPM	3980	2650	1990	1590	1330	1000	800	660	570	500	440	400	360	320	280	270	200	220	200
					IPM	2	3	3	4	4	5	5	5	5	5	5	4	4	4	3	3	2	3	3
	5		0.1D	1.5D	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
					IPT	.0001	.0002	.0004	.0005	.0006	.0013	.0016	.0019	.0022	.0025	.0028	.0031	.0034	.0026	.0029	.0031	.0033	.0038	.0021
					RPM	2390	1590	1190	960	800	600	480	400	340	300	270	240	220	190	170	160	150	130	120
					IPM	1	1	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	1
	6	Low alloy steel	0.1D	1.5D	SFM	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100
					IPT	.0001	.0002	.0004	.0007	.0009	.0015	.0018	.0022	.0066	.0029	.0033	.0036	.0035	.0033	.0037	.0031	.0033	.0037	.0042
					RPM	4780	3180	2390	1910	1590	1190	960	800	680	600	530	480	430	380	340	320	300	270	240
					IPM	2	3	4	5	6	7	7	7	18	7	7	7	6	5	5	4	4	4	4
	7		0.1D	1.5D	SFM	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	85	65	80	80
					IPT	.0001	.0003	.0004	.0006	.0008	.0013	.0016	.0019	.0022	.0025	.0028	.0025	.0028	.0031	.0027	.0028	.0025	.0034	.0038
					RPM	3980	2650	1990	1590	1330	1000	800	660	570	500	440	400	360	320	280	270	200	220	200
					IPM	2	3	3	4	4	5	5	5	5	5	5	4	4	4	3	3	2	3	3
	8-9		0.1D	1.5D	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
					IPT	.0001	.0002	.0004	.0005	.0006	.0013	.0016	.0019	.0022	.0025	.0028	.0031	.0034	.0026	.0029	.0031	.0033	.0038	.0021
					RPM	2390	1590	1190	960	800	600	480	400	340	300	270	240	220	190	170	160	150	130	120
					IPM	1	1	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	1
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM	100	100	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100
					IPT	.0001	.0002	.0004	.0007	.0009	.0015	.0018	.0022	.0066	.0029	.0033	.0036	.0035	.0033	.0037	.0031	.0033	.0037	.0042
					RPM	4780	3180	2390	1910	1590	1190	960	800	680	600	530	480	430	380	340	320	300	270	240
					IPM	2	3	4	5	6	7	7	7	18	7	7	7	6	5	5	4	4	4	4
	11.1		0.1D	1.5D	SFM	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
					IPT	.0001	.0002	.0004	.0005	.0006	.0013	.0016	.0019	.0022	.0025	.0028	.0031	.0034	.0026	.0029	.0031	.0033	.0038	.0021
					RPM	2390	1590	1190	960	800	600	480	400	340	300	270	240	220	190	170	160	150	130	120
					IPM	1	1	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	1
N	21-22	Aluminum-wrought alloy	0.1D	1.5D	SFM	245	345	330	330	345	330	310	310	310	330	330	330	315	310	310	345	330	325	330
					IPT	.0002	.0004	.0006	.0007	.0008	.0014	.0019	.0023	.0023	.0026	.0030	.0030	.0031	.0035	.0037	.0036	.0035	.0037	.0034
					RPM	11940	11140	7960	6370	5570	3980	3020	2520	2160	1990	1770	1590	1380	1210	1080	1110	1000	880	800
					IPM	9	16	18	19	18	23	23	23	20	21	21	19	17	17	16	16	14	13	11
	23-25	Aluminum-cast, alloyed	0.1D	1.5D	SFM	160	225	215	215	225	215	205	205	205	215	215	215	205	205	205	225	215	215	215
					IPT	.0002	.0003	.0005	.0007	.0008	.0014	.0019	.0023	.0023	.0025	.0028	.0029	.0031	.0035	.0035	.0035	.0035	.0034	.0034
					RPM	7800	7220	5170	4140	3610	2590	1970	1650	1410	1290	1150	1040	900	790	710	720	650	580	520
					IPM	6	10	11	12	12	15	15	15	13	13	13	12	11	11	10	10	9	8	7

※ The Feed, in long & extra long types, should be reduced by around 50%.