Being the best through innovation

SOLID CARBIDE

STANDARD CARBIDE END MILLS

- General Purpose

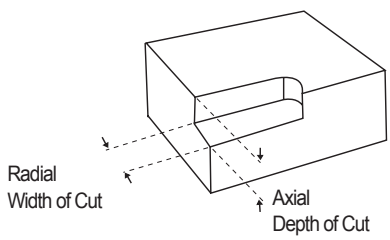
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

SPEED & FEED RECOMMENDATIONS

Material	Speed	Chip Load per Tooth by End Mill Diameter			Recommended Coating
		Up to 1/4″	Up to 1/2″	Up to 1″	
Carbon + Alloy Steel <45Rc	**100-700**	**.0002-.002**	**.001-.003**	.003-.007	TF
Carbon + Alloy Steel >45Rc	**50-400**	**.0002-.001**	**.0005-.0015**	.001-.003	TE
Stainless Steels Non-Hardenable 200-300 Series	**150-500**	**.0002-.001**	**.001-.002**	.002-.006	TF
Stainless Steels Hardenable 400 Series Martensitic and PH Series	**100-450**	**.0002-.0005**	**.0005-.001**	.001-.005	TF
Cast+Ductile Iron	**100-800**	**.0002-.0015**	**.002-.003**	.003-.008	TF or TE
Nickel+Cobalt Based Alloys	**20-200**	**.0003-.0008**	**.0008-.001**	.001-.002	TE
Titanium	**30-200**	**.0002-.0008**	**.0008-.002**	.002-.004	TE
Aluminum	**600-2000**	**.0002-.002**	**.002-.004**	.004-.008	TiCN
Copper	**300-1000**	**.0005-.002**	**.002-.003**	.003-.006	CrN
Brass+ Bronze Alloys **Graphite**	**600-1000** **600-1000**	**.0005-.002** **.0005-.005**	**.002-.003** **.001-.008**	.003-.006 .002-.010	TiCN D
Plastic	**600-1200**	**.0006-.003**	**.003-.006**	.006-.012	TF

TF = YG:TYLON F
TE = YG:TYLON E
D = DIAMOND
CrN = CHROME NITRIDE



SPEED & FEED DETERMINANTS

1. MATERIAL HARDNESS
2. MACHINE RIGIDITY
3. TYPE OF COATING
4. TOOL GEOMETRY
5. FINISH REQUIREMENTS
6. DEPTH & WIDTH OF CUT

CARBIDE END MILLS

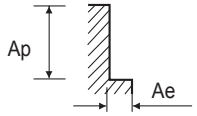
RECOMMENDED CUTTING CONDITIONS

UGMF89, UGMGF57, UGMGF58, UGMGF59 SERIES

4 FLUTE - SIDE CUTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)											
						1/16	5/64	3/32	7/64	1/8	9/64	5/32	11/64	3/16	13/64	7/32	15/64
P	1-2	Non-alloy steel	0.1D	1.5D	SFM (Vc)	185	205	225	215	200	195	190	185	175	185	190	195
					IPT (fz)	.0003	.0004	.0004	.0005	.0007	.0008	.0009	.0010	.0012	.0012	.0013	.0013
					RPM	11200	10080	9070	7560	6050	5320	4590	4100	3600	3460	3310	3170
					IPM (FEED)	15	15	15	16	17	17	17	17	17	17	17	17
	3-4		0.1D	1.5D	SFM (Vc)	160	180	190	190	175	170	160	160	155	160	165	165
					IPT (fz)	.0003	.0004	.0004	.0005	.0007	.0008	.0010	.0011	.0012	.0013	.0013	.0014
					RPM	9640	8680	7810	6550	5290	4600	3910	3530	3150	2990	2840	2680
					IPM (FEED)	13	13	13	14	15	15	15	15	15	15	15	15
	5		0.1D	1.5D	SFM (Vc)	130	150	160	155	140	140	135	130	125	130	135	135
					IPT (fz)	.0003	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.0011	.0011	.0012	.0012
					RPM	8090	7280	6550	5420	4280	3780	3280	2900	2520	2430	2330	2240
					IPM (FEED)	10	10	10	11	11	11	11	11	11	11	11	11
	6	Low alloy steel	0.1D	1.5D	SFM (Vc)	185	205	225	215	200	195	190	185	175	185	190	195
					IPT (fz)	.0003	.0004	.0004	.0005	.0007	.0008	.0009	.0010	.0012	.0012	.0013	.0013
					RPM	11200	10080	9070	7560	6050	5320	4590	4100	3600	3460	3310	3170
					IPM (FEED)	15	15	15	16	17	17	17	17	17	17	17	17
	7		0.1D	1.5D	SFM (Vc)	160	180	190	190	175	170	160	160	155	160	165	165
					IPT (fz)	.0003	.0004	.0004	.0005	.0007	.0008	.0010	.0011	.0012	.0013	.0013	.0014
					RPM	9640	8680	7810	6550	5290	4600	3910	3530	3150	2990	2840	2680
					IPM (FEED)	13	13	13	14	15	15	15	15	15	15	15	15
	8-9		0.1D	1.5D	SFM (Vc)	130	150	160	155	140	140	135	130	125	130	135	135
					IPT (fz)	.0003	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.0011	.0011	.0012	.0012
					RPM	8090	7280	6550	5420	4280	3780	3280	2900	2520	2430	2330	2240
					IPM (FEED)	10	10	10	11	11	11	11	11	11	11	11	11
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM (Vc)	185	205	225	215	200	195	190	185	175	185	190	195
					IPT (fz)	.0003	.0004	.0004	.0005	.0007	.0008	.0009	.0010	.0012	.0012	.0013	.0013
					RPM	11200	10080	9070	7560	6050	5320	4590	4100	3600	3460	3310	3170
					IPM (FEED)	15	15	15	16	17	17	17	17	17	17	17	17
	11.1		0.1D	1.5D	SFM (Vc)	130	150	160	155	140	140	135	130	125	130	135	135
					IPT (fz)	.0003	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.0011	.0011	.0012	.0012
					RPM	8090	7280	6550	5420	4280	3780	3280	2900	2520	2430	2330	2240
					IPM (FEED)	10	10	10	11	11	11	11	11	11	11	11	11
M	12-13	Stainless steel	0.1D	1.5D	SFM (Vc)	255	285	310	305	285	280	270	265	260	270	275	280
					IPT (fz)	.0002	.0002	.0003	.0003	.0004	.0004	.0005	.0005	.0006	.0006	.0007	.0007
					RPM	15560	14000	12600	10650	8690	7620	6550	5920	5290	5040	4790	4540
					IPM (FEED)	13	13	13	13	13	13	13	13	13	13	13	13
	14.1-14.2		0.1D	1.5D	SFM (Vc)	255	285	310	305	285	280	270	265	260	270	275	280
					IPT (fz)	.0002	.0002	.0003	.0003	.0004	.0004	.0005	.0005	.0006	.0006	.0007	.0007
					RPM	15560	14000	12600	10650	8690	7620	6550	5920	5290	5040	4790	4540
					IPM (FEED)	13	13	13	13	13	13	13	13	13	13	13	13
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.1D	1.5D	SFM (Vc)	215	245	265	255	225	225	215	215	205	210	215	220
					IPT (fz)	.0005	.0006	.0007	.0008	.0010	.0012	.0014	.0015	.0017	.0019	.0021	.0023
					RPM	13220	11900	10710	8820	6930	6110	5290	4730	4160	3970	3780	3590
					IPM (FEED)	29	29	29	29	29	29	29	29	29	30	32	33
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.1D	1.5D	SFM (Vc)	510	575	620	615	575	555	515	520	515	535	550	560
					IPT (fz)	.0005	.0005	.0006	.0007	.0009	.0010	.0012	.0013	.0014	.0015	.0016	.0017
					RPM	31110	28000	25200	21420	17640	15120	12600	11530	10460	10020	9580	9140
					IPM (FEED)	60	60	60	60	60	60	60	60	60	61	62	63
	26-28	Copper and Copper Alloys (Bronze / Brass)	0.1D	1.5D	SFM (Vc)	380	430	465	450	410	415	410	405	385	400	410	420
					IPT (fz)	.0005	.0006	.0006	.0007	.0009	.0010	.0012	.0013	.0015	.0016	.0017	.0018
					RPM	23330	21000	18900	15750	12600	11340	10080	8950	7810	7500	7180	6870
					IPM (FEED)	47	47	47	47	47	47	47	47	47	47	48	49



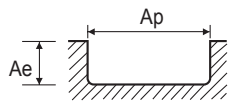
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

UGMF90 SERIES — 2 FLUTE - SLOTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 1/8	3/16	1/4	3/8	1/2	5/8	3/4	1
P	1-2	Non-alloy steel	1.0D	1.0D	SFM (Vc)	200	175	200	175	200	185	190	195
					IPT (fz)	.0005	.0008	.0010	.0017	.0020	.0027	.0031	.0033
					RPM	6050	3600	3020	1760	1510	1130	980	750
					IPM (FEED)	6	6	6	6	6	6	6	5
	3-4		1.0D	1.0D	SFM (Vc)	175	155	165	150	165	165	165	165
					IPT (fz)	.0005	.0008	.0010	.0017	.0020	.0025	.0030	.0032
					RPM	5290	3150	2520	1510	1260	1010	830	630
					IPM (FEED)	5	5	5	5	5	5	5	4
	5		1.0D	1.0D	SFM (Vc)	140	125	140	125	140	135	135	140
					IPT (fz)	.0005	.0008	.0009	.0016	.0019	.0030	.0036	.0038
					RPM	4280	2520	2140	1260	1080	820	690	530
					IPM (FEED)	4	4	4	4	4	5	5	4
	6	Low alloy steel	1.0D	1.0D	SFM (Vc)	200	175	200	175	200	185	190	195
					IPT (fz)	.0005	.0008	.0010	.0017	.0020	.0027	.0031	.0033
					RPM	6050	3600	3020	1760	1510	1130	980	750
					IPM (FEED)	6	6	6	6	6	6	6	5
	7		1.0D	1.0D	SFM (Vc)	175	155	165	150	165	165	165	165
					IPT (fz)	.0005	.0008	.0010	.0017	.0020	.0025	.0030	.0032
					RPM	5290	3150	2520	1510	1260	1010	830	630
					IPM (FEED)	5	5	5	5	5	5	5	4
	8-9		1.0D	1.0D	SFM (Vc)	140	125	140	125	140	135	135	140
					IPT (fz)	.0005	.0008	.0009	.0016	.0019	.0030	.0036	.0038
					RPM	4280	2520	2140	1260	1080	820	690	530
					IPM (FEED)	4	4	4	4	4	5	5	4
	10	High alloyed steel, and tool steel	1.0D	1.0D	SFM (Vc)	200	175	200	175	200	185	190	195
					IPT (fz)	.0005	.0008	.0010	.0017	.0020	.0027	.0031	.0033
					RPM	6050	3600	3020	1760	1510	1130	980	750
					IPM (FEED)	6	6	6	6	6	6	6	5
	11.1		1.0D	1.0D	SFM (Vc)	140	125	140	125	140	135	135	140
					IPT (fz)	.0005	.0008	.0009	.0016	.0019	.0030	.0036	.0038
					RPM	4280	2520	2140	1260	1080	820	690	530
					IPM (FEED)	4	4	4	4	4	5	5	4
M	12-13	Stainless steel	1.0D	1.0D	SFM (Vc)	285	260	280	245	280	270	265	265
					IPT (fz)	.0002	.0004	.0005	.0008	.0009	.0015	.0019	.0020
					RPM	8690	5290	4280	2520	2140	1640	1350	1020
					IPM (FEED)	4	4	4	4	4	5	5	4
	14.1-14.2		1.0D	1.0D	SFM (Vc)	285	260	280	245	280	270	265	265
					IPT (fz)	.0002	.0004	.0005	.0008	.0009	.0015	.0019	.0020
					RPM	8690	5290	4280	2520	2140	1640	1350	1020
					IPM (FEED)	4	4	4	4	4	5	5	4
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	1.0D	1.0D	SFM (Vc)	225	205	225	210	215	205	215	225
					IPT (fz)	.0007	.0012	.0016	.0030	.0040	.0056	.0068	.0071
					RPM	6930	4160	3400	2140	1640	1260	1100	850
					IPM (FEED)	10	10	11	13	13	14	15	12
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	1.0D	1.0D	SFM (Vc)	575	515	570	520	560	535	530	535
					IPT (fz)	.0006	.0010	.0013	.0021	.0026	.0034	.0041	.0044
					RPM	17640	10460	8690	5290	4280	3280	2710	2040
					IPM (FEED)	21	21	22	22	22	22	22	18
	26-28	Copper and Copper Alloys (Bronze / Brass)	1.0D	1.0D	SFM (Vc)	410	385	430	385	430	410	410	415
					IPT (fz)	.0006	.0010	.0013	.0022	.0026	.0034	.0040	.0044
					RPM	12600	7810	6550	3910	3280	2520	2100	1590
					IPM (FEED)	15	15	17	17	17	17	17	14



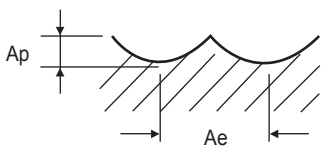
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

UGMF91 SERIES 4 FLUTE BALL NOSE - PLANE

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø)							
						1/8	3/16	1/4	3/8	1/2	5/8	3/4	1
P	1-4	Non-alloy steel	0.7D	0.3D	SFM (Vc)	185	165	180	160	180	175	190	200
					IPT (fz)	.0004	.0007	.0009	.0014	.0014	.0019	.0020	.0023
					RPM	5670	3400	2770	1640	1390	1070	980	770
					IPM (FEED)	10	10	10	9	8	8	8	7
	5		0.7D	0.3D	SFM (Vc)	155	135	155	135	155	145	155	165
					IPT (fz)	.0002	.0004	.0004	.0007	.0008	.0011	.0013	.0016
					RPM	4790	2770	2380	1390	1200	880	800	630
					IPM (FEED)	4	4	4	4	4	4	4	4
	6-7	Low alloy steel	0.7D	0.3D	SFM (Vc)	185	165	180	160	180	175	190	200
					IPT (fz)	.0004	.0007	.0009	.0014	.0014	.0019	.0020	.0023
					RPM	5670	3400	2770	1640	1390	1070	980	770
					IPM (FEED)	10	10	10	9	8	8	8	7
	8-9		0.7D	0.3D	SFM (Vc)	155	135	155	135	155	145	155	165
					IPT (fz)	.0002	.0004	.0004	.0007	.0008	.0011	.0013	.0016
					RPM	4790	2770	2380	1390	1200	880	800	630
					IPM (FEED)	4	4	4	4	4	4	4	4
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM (Vc)	185	165	180	160	180	175	190	200
					IPT (fz)	.0004	.0007	.0009	.0014	.0014	.0019	.0020	.0023
					RPM	5670	3400	2770	1640	1390	1070	980	770
					IPM (FEED)	10	10	10	9	8	8	8	7
	11.1		0.7D	0.3D	SFM (Vc)	155	135	155	135	155	145	155	165
					IPT (fz)	.0002	.0004	.0004	.0007	.0008	.0011	.0013	.0016
					RPM	4790	2770	2380	1390	1200	880	800	630
					IPM (FEED)	4	4	4	4	4	4	4	4
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.7D	0.3D	SFM (Vc)	265	235	255	235	265	245	260	265
					IPT (fz)	.0005	.0011	.0015	.0033	.0038	.0053	.0061	.0064
					RPM	8060	4790	3910	2380	2020	1510	1320	1020
					IPM (FEED)	15	22	24	31	31	32	32	26
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.7D	0.3D	SFM (Vc)	765	680	775	695	775	720	790	825
					IPT (fz)	.0003	.0006	.0007	.0013	.0018	.0021	.0023	.0024
					RPM	23440	13860	11840	7060	5920	4410	4030	3160
					IPM (FEED)	27	32	32	37	43	37	37	30



CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

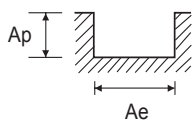
E5020, E5244, E5011 E5026, E5022, E5025 SERIES

2 FLUTE - SLOTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

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	13/16
P	1-2	Non-alloy steel	1.0D	1.0D	SFM (Vc)	135	120	115	110	120	115	110	120	120	115	115
					IPT (fz)	.0003	.0005	.0007	.0009	.0011	.0014	.0018	.0022	.0025	.0029	.0036
					RPM	5500	3700	2800	2200	1800	1400	1100	900	800	700	550
					IPM (FEED)	3	4	4	4	4	4	4	4	4	4	4
	3-4		1.0D	1.0D	SFM (Vc)	120	105	100	95	105	100	95	105	105	100	100
					IPT (fz)	.0003	.0005	.0006	.0008	.0009	.0013	.0016	.0019	.0021	.0025	.0031
					RPM	4800	3200	2400	1900	1600	1200	950	800	700	600	480
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3
	5		1.0D	1.0D	SFM (Vc)	100	85	80	80	85	80	80	85	85	80	85
					IPT (fz)	.0003	.0004	.0005	.0006	.0008	.0010	.0013	.0015	.0018	.0030	.0038
					RPM	4000	2600	2000	1600	1300	1000	800	660	570	500	400
					IPM (FEED)	2	2	2	2	2	2	2	2	2	3	3
	6	Low alloy steel	1.0D	1.0D	SFM (Vc)	135	120	115	110	120	115	110	120	120	115	115
					IPT (fz)	.0003	.0005	.0007	.0009	.0011	.0014	.0018	.0022	.0025	.0029	.0036
					RPM	5500	3700	2800	2200	1800	1400	1100	900	800	700	550
					IPM (FEED)	3	4	4	4	4	4	4	4	4	4	4
	7		1.0D	1.0D	SFM (Vc)	120	105	100	95	105	100	95	105	105	100	100
					IPT (fz)	.0003	.0005	.0006	.0008	.0009	.0013	.0016	.0019	.0021	.0025	.0031
					RPM	4800	3200	2400	1900	1600	1200	950	800	700	600	480
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3
	8-9		1.0D	1.0D	SFM (Vc)	100	85	80	80	85	80	80	85	85	80	85
					IPT (fz)	.0003	.0004	.0005	.0006	.0008	.0010	.0013	.0015	.0018	.0030	.0038
					RPM	4000	2600	2000	1600	1300	1000	800	660	570	500	400
					IPM (FEED)	2	2	2	2	2	2	2	2	2	3	3
	10	High alloyed steel, and tool steel	1.0D	1.0D	SFM (Vc)	135	120	115	110	120	115	110	120	120	115	115
					IPT (fz)	.0003	.0005	.0007	.0009	.0011	.0014	.0018	.0022	.0025	.0029	.0036
					RPM	5500	3700	2800	2200	1800	1400	1100	900	800	700	550
					IPM (FEED)	3	4	4	4	4	4	4	4	4	4	4
	11.1		1.0D	1.0D	SFM (Vc)	100	85	80	80	85	80	80	85	85	80	85
					IPT (fz)	.0003	.0004	.0005	.0006	.0008	.0010	.0013	.0015	.0018	.0030	.0038
					RPM	4000	2600	2000	1600	1300	1000	800	660	570	500	400
					IPM (FEED)	2	2	2	2	2	2	2	2	2	3	3
M	12-13	Stainless steel	1.0D	1.0D	SFM (Vc)	195	175	165	155	170	165	155	170	160	165	170
					IPT (fz)	.0002	.0003	.0004	.0005	.0006	.0008	.0009	.0012	.0014	.0015	.0019
					RPM	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3
	14.1-14.2		1.0D	1.0D	SFM (Vc)	195	175	165	155	170	165	155	170	160	165	170
					IPT (fz)	.0002	.0003	.0004	.0005	.0006	.0008	.0009	.0012	.0014	.0015	.0019
					RPM	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	1.0D	1.0D	SFM (Vc)	160	135	130	125	135	130	130	130	135	130	135
					IPT (fz)	.0005	.0007	.0009	.0012	.0017	.0025	.0031	.0040	.0050	.0056	.0078
					RPM	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640
					IPM (FEED)	6	6	6	6	7	8	8	8	9	9	10
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	1.0D	1.0D	SFM (Vc)	395	360	325	315	345	325	315	340	340	325	340
					IPT (fz)	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0025	.0028	.0033	.0041
					RPM	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600
					IPM (FEED)	13	13	13	13	13	13	13	13	13	13	13
	26-28	Copper and Copper Alloys (Bronze / Brass)	1.0D	1.0D	SFM (Vc)	295	260	245	235	260	245	235	260	250	245	255
					IPT (fz)	.0004	.0006	.0008	.0010	.0013	.0017	.0021	.0025	.0029	.0033	.0042
					RPM	12000	8000	6000	4800	4000	3000	2400	2000	1700	1500	1200
					IPM (FEED)	10	10	10	10	10	10	10	10	10	10	10

RPM = rev./min.
Feed = inch/min.
SFM = ft/min
Fz = inch/tooth



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

CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

E5020, E5244, E5011 E5026, E5022, E5025 SERIES

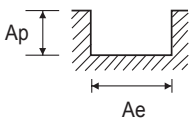
TiAlN Coated

2 FLUTE - SLOTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

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	13/16
P	1-2	Non-alloy steel	1.0D	1.0D	SFM (Vc)	210	190	180	170	190	175	165	190	175	175	185
					IPT (fz)	.0003	.0005	.0007	.0009	.0010	.0014	.0018	.0021	.0025	.0028	.0034
					RPM	8640	5760	4370	3430	2880	2160	1680	1440	1200	1080	880
					IPM (FEED)	5	6	6	6	6	6	6	6	6	6	6
	3-4		1.0D	1.0D	SFM (Vc)	185	165	150	145	155	145	140	155	160	155	155
					IPT (fz)	.0003	.0005	.0007	.0008	.0010	.0014	.0017	.0021	.0023	.0026	.0034
					RPM	7440	5040	3720	3000	2400	1800	1440	1200	1080	960	740
					IPM (FEED)	4	5	5	5	5	5	5	5	5	5	5
	5		1.0D	1.0D	SFM (Vc)	155	135	130	120	135	130	120	135	130	130	130
					IPT (fz)	.0002	.0005	.0006	.0008	.0010	.0013	.0017	.0019	.0022	.0032	.0040
					RPM	6240	4080	3120	2400	2040	1560	1200	1030	890	780	620
					IPM (FEED)	3	4	4	4	4	4	4	4	4	5	5
	6	Low alloy steel	1.0D	1.0D	SFM (Vc)	210	190	180	170	190	175	165	190	175	175	185
					IPT (fz)	.0003	.0005	.0007	.0009	.0010	.0014	.0018	.0021	.0025	.0028	.0034
					RPM	8640	5760	4370	3430	2880	2160	1680	1440	1200	1080	880
					IPM (FEED)	5	6	6	6	6	6	6	6	6	6	6
	7		1.0D	1.0D	SFM (Vc)	185	165	150	145	155	145	140	155	160	155	155
					IPT (fz)	.0003	.0005	.0007	.0008	.0010	.0014	.0017	.0021	.0023	.0026	.0034
					RPM	7440	5040	3720	3000	2400	1800	1440	1200	1080	960	740
					IPM (FEED)	4	5	5	5	5	5	5	5	5	5	5
	8-9		1.0D	1.0D	SFM (Vc)	155	135	130	120	135	130	120	135	130	130	130
					IPT (fz)	.0002	.0005	.0006	.0008	.0010	.0013	.0017	.0019	.0022	.0032	.0040
					RPM	6240	4080	3120	2400	2040	1560	1200	1030	890	780	620
					IPM (FEED)	3	4	4	4	4	4	4	4	4	5	5
	10	High alloyed steel, and tool steel	1.0D	1.0D	SFM (Vc)	210	190	180	170	190	175	165	190	175	175	185
					IPT (fz)	.0003	.0005	.0007	.0009	.0010	.0014	.0018	.0021	.0025	.0028	.0034
					RPM	8640	5760	4370	3430	2880	2160	1680	1440	1200	1080	880
					IPM (FEED)	5	6	6	6	6	6	6	6	6	6	6
	11.1		1.0D	1.0D	SFM (Vc)	155	135	130	120	135	130	120	135	130	130	130
					IPT (fz)	.0002	.0005	.0006	.0008	.0010	.0013	.0017	.0019	.0022	.0032	.0040
					RPM	6240	4080	3120	2400	2040	1560	1200	1030	890	780	620
					IPM (FEED)	3	4	4	4	4	4	4	4	4	5	5
M	12-13	Stainless steel	1.0D	1.0D	SFM (Vc)	295	270	255	245	265	255	235	265	245	255	255
					IPT (fz)	.0002	.0002	.0003	.0004	.0005	.0006	.0008	.0010	.0012	.0016	.0021
					RPM	12000	8280	6240	5040	4080	3120	2400	2040	1680	1560	1200
					IPM (FEED)	4	4	4	4	4	4	4	4	4	5	5
	14.1-14.2		1.0D	1.0D	SFM (Vc)	295	270	255	245	265	255	235	265	245	255	255
					IPT (fz)	.0002	.0002	.0003	.0004	.0005	.0006	.0008	.0010	.0012	.0016	.0021
					RPM	12000	8280	6240	5040	4080	3120	2400	2040	1680	1560	1200
					IPM (FEED)	4	4	4	4	4	4	4	4	4	5	5
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	1.0D	1.0D	SFM (Vc)	250	215	205	195	210	195	200	205	210	195	215
					IPT (fz)	.0004	.0007	.0009	.0011	.0017	.0025	.0029	.0042	.0045	.0058	.0075
					RPM	10200	6600	5040	3960	3240	2400	2040	1560	1440	1200	1000
					IPM (FEED)	9	9	9	9	11	12	12	13	13	14	15
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	1.0D	1.0D	SFM (Vc)	590	550	490	490	540	510	495	535	530	510	510
					IPT (fz)	.0004	.0006	.0008	.0010	.0013	.0017	.0021	.0026	.0029	.0034	.0044
					RPM	24000	16800	12000	9960	8280	6240	5040	4080	3600	3120	2400
					IPM (FEED)	20	20	20	20	21	21	21	21	21	21	21
	26-28	Copper and Copper Alloys (Bronze / Brass)	1.0D	1.0D	SFM (Vc)	440	395	395	365	410	395	365	410	390	395	400
					IPT (fz)	.0004	.0006	.0008	.0010	.0013	.0017	.0022	.0026	.0030	.0033	.0043
					RPM	18000	12000	9600	7440	6240	4800	3720	3120	2640	2400	1870
					IPM (FEED)	15	15	15	15	16	16	16	16	16	16	16

RPM = rev./min.
Feed = inch/min.
SFM = ft/min
Fz = inch/tooth



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

CARBIDE END MILLS

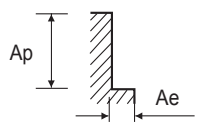
RECOMMENDED CUTTING CONDITIONS

E5021, E5245, E5012, E5065 E5023, E5024, E5216 SERIES

4 FLUTE - SIDE CUTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

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	13/16
P	1-2	Non-alloy steel	0.1D	1.5D	SFM (Vc)	135	120	115	110	120	115	110	120	120	115	115
					IPT (fz)	.0005	.0007	.0010	.0013	.0015	.0020	.0025	.0031	.0034	.0043	.0055
					RPM	5500	3700	2800	2200	1800	1400	1100	900	800	700	550
					IPM (FEED)	10	11	11	11	11	11	11	11	11	12	12
	3-4		0.1D	1.5D	SFM (Vc)	120	105	100	95	105	100	95	105	105	100	100
					IPT (fz)	.0004	.0008	.0010	.0013	.0016	.0021	.0026	.0031	.0036	.0042	.0052
					RPM	4800	3200	2400	1900	1600	1200	950	800	700	600	480
					IPM (FEED)	8	10	10	10	10	10	10	10	10	10	10
	5		0.1D	1.5D	SFM (Vc)	100	85	80	80	85	80	80	85	85	80	85
					IPT (fz)	.0004	.0007	.0009	.0011	.0013	.0018	.0022	.0027	.0031	.0045	.0056
					RPM	4000	2600	2000	1600	1300	1000	800	660	570	500	400
					IPM (FEED)	6	7	7	7	7	7	7	7	7	9	9
	6	Low alloy steel	0.1D	1.5D	SFM (Vc)	135	120	115	110	120	115	110	120	120	115	115
					IPT (fz)	.0005	.0007	.0010	.0013	.0015	.0020	.0025	.0031	.0034	.0043	.0055
					RPM	5500	3700	2800	2200	1800	1400	1100	900	800	700	550
					IPM (FEED)	10	11	11	11	11	11	11	11	11	12	12
	7		0.1D	1.5D	SFM (Vc)	120	105	100	95	105	100	95	105	105	100	100
					IPT (fz)	.0004	.0008	.0010	.0013	.0016	.0021	.0026	.0031	.0036	.0042	.0052
					RPM	4800	3200	2400	1900	1600	1200	950	800	700	600	480
					IPM (FEED)	8	10	10	10	10	10	10	10	10	10	10
	8-9		0.1D	1.5D	SFM (Vc)	100	85	80	80	85	80	80	85	85	80	85
					IPT (fz)	.0004	.0007	.0009	.0011	.0013	.0018	.0022	.0027	.0031	.0045	.0056
					RPM	4000	2600	2000	1600	1300	1000	800	660	570	500	400
					IPM (FEED)	6	7	7	7	7	7	7	7	7	9	9
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM (Vc)	135	120	115	110	120	115	110	120	120	115	115
					IPT (fz)	.0005	.0007	.0010	.0013	.0015	.0020	.0025	.0031	.0034	.0043	.0055
					RPM	5500	3700	2800	2200	1800	1400	1100	900	800	700	550
					IPM (FEED)	10	11	11	11	11	11	11	11	11	12	12
	11.1		0.1D	1.5D	SFM (Vc)	100	85	80	80	85	80	80	85	85	80	85
					IPT (fz)	.0004	.0007	.0009	.0011	.0013	.0018	.0022	.0027	.0031	.0045	.0056
					RPM	4000	2600	2000	1600	1300	1000	800	660	570	500	400
					IPM (FEED)	6	7	7	7	7	7	7	7	7	9	9
M	12-14.2	Stainless steel	0.1D	1.5D	SFM (Vc)	195	175	165	155	170	165	155	170	160	165	170
					IPT (fz)	.0003	.0004	.0005	.0006	.0008	.0010	.0013	.0015	.0018	.0023	.0031
					RPM	8000	5300	4000	3200	2600	2000	1600	1300	1100	1000	800
					IPM (FEED)	8	8	8	8	8	8	8	8	8	9	10
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.1D	1.5D	SFM (Vc)	160	135	130	125	135	130	130	130	135	130	135
					IPT (fz)	.0007	.0011	.0014	.0018	.0025	.0034	.0046	.0063	.0072	.0084	.0109
					RPM	6500	4200	3200	2500	2100	1600	1300	1000	900	800	640
					IPM (FEED)	18	18	18	18	21	22	24	25	26	27	28
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.1D	1.5D	SFM (Vc)	395	360	325	315	345	325	315	340	340	325	340
					IPT (fz)	.0006	.0009	.0012	.0015	.0019	.0025	.0031	.0038	.0043	.0050	.0063
					RPM	16000	11000	8000	6400	5300	4000	3200	2600	2300	2000	1600
					IPM (FEED)	38	38	38	38	40	40	40	40	40	40	40
	26-28	Copper and Copper Alloys (Bronze / Brass)	0.1D	1.5D	SFM (Vc)	295	260	245	235	260	245	235	260	250	245	255
					IPT (fz)	.0005	.0008	.0010	.0013	.0019	.0026	.0032	.0039	.0046	.0052	.0065
					RPM	12000	8000	6000	4800	4000	3000	2400	2000	1700	1500	1200
					IPM (FEED)	25	25	25	25	31	31	31	31	31	31	31



CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

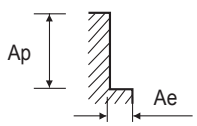
E5021, E5245, E5012, E5065 E5023, E5024, E5216 SERIES

TiAlN Coated

4 FLUTE - SIDE CUTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

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	13/16
P	1-2	Non-alloy steel	0.1D	1.5D	SFM (Vc)	210	190	180	170	190	175	165	190	175	175	185
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0020	.0025	.0030	.0035	.0042	.0051
					RPM	8640	5760	4370	3430	2880	2160	1680	1440	1200	1080	880
					IPM (FEED)	15	17	17	17	17	17	17	17	17	18	18
	3-4		0.1D	1.5D	SFM (Vc)	185	165	150	145	155	145	140	155	160	155	155
					IPT (fz)	.0004	.0007	.0010	.0013	.0016	.0021	.0026	.0031	.0035	.0042	.0054
					RPM	7440	5040	3720	3000	2400	1800	1440	1200	1080	960	740
					IPM (FEED)	13	15	15	15	15	15	15	15	15	16	16
	5		0.1D	1.5D	SFM (Vc)	155	135	130	120	135	130	120	135	130	130	130
					IPT (fz)	.0004	.0007	.0009	.0011	.0013	.0018	.0023	.0027	.0031	.0045	.0056
					RPM	6240	4080	3120	2400	2040	1560	1200	1030	890	780	620
					IPM (FEED)	10	11	11	11	11	11	11	11	11	14	14
	6	Low alloy steel	0.1D	1.5D	SFM (Vc)	210	190	180	170	190	175	165	190	175	175	185
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0020	.0025	.0030	.0035	.0042	.0051
					RPM	8640	5760	4370	3430	2880	2160	1680	1440	1200	1080	880
					IPM (FEED)	15	17	17	17	17	17	17	17	17	18	18
	7		0.1D	1.5D	SFM (Vc)	185	165	150	145	155	145	140	155	160	155	155
					IPT (fz)	.0004	.0007	.0010	.0013	.0016	.0021	.0026	.0031	.0035	.0042	.0054
					RPM	7440	5040	3720	3000	2400	1800	1440	1200	1080	960	740
					IPM (FEED)	13	15	15	15	15	15	15	15	15	16	16
	8-9		0.1D	1.5D	SFM (Vc)	155	135	130	120	135	130	120	135	130	130	130
					IPT (fz)	.0004	.0007	.0009	.0011	.0013	.0018	.0023	.0027	.0031	.0045	.0056
					RPM	6240	4080	3120	2400	2040	1560	1200	1030	890	780	620
					IPM (FEED)	10	11	11	11	11	11	11	11	11	14	14
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM (Vc)	210	190	180	170	190	175	165	190	175	175	185
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0020	.0025	.0030	.0035	.0042	.0051
					RPM	8640	5760	4370	3430	2880	2160	1680	1440	1200	1080	880
					IPM (FEED)	15	17	17	17	17	17	17	17	17	18	18
	11.1		0.1D	1.5D	SFM (Vc)	155	135	130	120	135	130	120	135	130	130	130
					IPT (fz)	.0004	.0007	.0009	.0011	.0013	.0018	.0023	.0027	.0031	.0045	.0056
					RPM	6240	4080	3120	2400	2040	1560	1200	1030	890	780	620
					IPM (FEED)	10	11	11	11	11	11	11	11	11	14	14
M	12-14.2	Stainless steel	0.1D	1.5D	SFM (Vc)	295	270	255	245	265	255	235	265	245	255	255
					IPT (fz)	.0003	.0004	.0005	.0006	.0007	.0010	.0013	.0015	.0018	.0022	.0031
					RPM	12000	8280	6240	5040	4080	3120	2400	2040	1680	1560	1200
					IPM (FEED)	12	12	12	12	12	12	12	12	12	14	15
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.1D	1.5D	SFM (Vc)	250	215	205	195	210	195	200	205	210	195	215
					IPT (fz)	.0007	.0010	.0013	.0017	.0025	.0036	.0045	.0063	.0071	.0088	.0093
					RPM	10200	6600	5040	3960	3240	2400	2040	1560	1440	1200	1000
					IPM (FEED)	27	27	27	27	33	35	37	39	41	42	37
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.1D	1.5D	SFM (Vc)	590	550	490	490	540	510	495	535	530	510	510
					IPT (fz)	.0006	.0008	.0012	.0014	.0018	.0024	.0030	.0037	.0042	.0049	.0064
					RPM	24000	16800	12000	9960	8280	6240	5040	4080	3600	3120	2400
					IPM (FEED)	57	57	57	57	61	61	61	61	61	61	61
	26-28	Copper and Copper Alloys (Bronze / Brass)	0.1D	1.5D	SFM (Vc)	440	395	395	365	410	395	365	410	390	395	400
					IPT (fz)	.0006	.0009	.0011	.0015	.0019	.0024	.0032	.0038	.0045	.0049	.0063
					RPM	18000	12000	9600	7440	6240	4800	3720	3120	2640	2400	1870
					IPM (FEED)	44	44	44	44	47	47	47	47	47	47	47



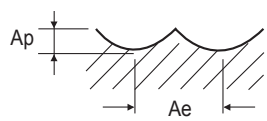
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

E5249, E5014, E5018, E5251 SERIES 2 FLUTE BALL NOSE - PLANE

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

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
P	1-4	Non-alloy steel	0.7D	0.3D	SFM (Vc)	130	115	105	105	110	105	100	115	110	105	105	105
					IPT (fz)	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0017	.0020	.0023	.0026	.0030
					RPM	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
					IPM (FEED)	4	4	4	4	4	4	4	3	3	3	3	3
	5		0.7D	0.3D	SFM (Vc)	110	95	85	85	95	90	85	95	90	90	85	90
					IPT (fz)	.0002	.0003	.0005	.0006	.0007	.0009	.0011	.0014	.0016	.0019	.0021	.0023
					RPM	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430
					IPM (FEED)	2	2	2	2	2	2	2	2	2	2	2	2
	6-7	Low alloy steel	0.7D	0.3D	SFM (Vc)	130	115	105	105	110	105	100	115	110	105	105	105
					IPT (fz)	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0017	.0020	.0023	.0026	.0030
					RPM	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
					IPM (FEED)	4	4	4	4	4	4	4	3	3	3	3	3
	8-9		0.7D	0.3D	SFM (Vc)	110	95	85	85	95	90	85	95	90	90	85	90
					IPT (fz)	.0002	.0003	.0005	.0006	.0007	.0009	.0011	.0014	.0016	.0019	.0021	.0023
					RPM	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430
					IPM (FEED)	2	2	2	2	2	2	2	2	2	2	2	2
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM (Vc)	130	115	105	105	110	105	100	115	110	105	105	105
					IPT (fz)	.0004	.0006	.0008	.0010	.0012	.0016	.0020	.0017	.0020	.0023	.0026	.0030
					RPM	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
					IPM (FEED)	4	4	4	4	4	4	4	3	3	3	3	3
	11.1		0.7D	0.3D	SFM (Vc)	110	95	85	85	95	90	85	95	90	90	85	90
					IPT (fz)	.0002	.0003	.0005	.0006	.0007	.0009	.0011	.0014	.0016	.0019	.0021	.0023
					RPM	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430
					IPM (FEED)	2	2	2	2	2	2	2	2	2	2	2	2
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.7D	0.3D	SFM (Vc)	180	160	145	140	155	145	140	155	145	150	145	155
					IPT (fz)	.0004	.0006	.0011	.0016	.0021	.0036	.0045	.0054	.0065	.0071	.0080	.0075
					RPM	7300	4900	3600	2900	2400	1800	1430	1200	1000	920	810	730
					IPM (FEED)	6	6	8	9	10	13	13	13	13	13	13	11
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.7D	0.3D	SFM (Vc)	530	470	445	430	475	450	420	470	440	440	430	445
					IPT (fz)	.0003	.0004	.0005	.0007	.0009	.0014	.0017	.0024	.0028	.0028	.0031	.0036
					RPM	21500	14300	10900	8800	7260	5500	4300	3600	3000	2700	2400	2100
					IPM (FEED)	11	11	11	13	13	15	15	17	17	15	15	15



CARBIDE END MILLS

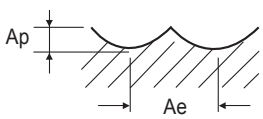
RECOMMENDED CUTTING CONDITIONS

E5249, E5014, E5018, E5251 SERIES TiAlN Coated

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

2 FLUTE BALL NOSE - PLANE

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
P	1-4	Non-alloy steel	0.7D	0.3D	SFM (Vc)	200	175	165	160	175	155	155	175	175	165	160	165
					IPT (fz)	.0004	.0006	.0007	.0009	.0011	.0016	.0019	.0019	.0021	.0025	.0028	.0032
					RPM	8110	5400	4080	3240	2640	1920	1560	1320	1180	1020	900	780
					IPM (FEED)	6	6	6	6	6	6	6	5	5	5	5	5
	5		0.7D	0.3D	SFM (Vc)	170	150	135	130	150	135	130	150	140	135	135	145
					IPT (fz)	.0002	.0003	.0005	.0006	.0007	.0009	.0011	.0013	.0016	.0018	.0020	.0022
					RPM	6840	4560	3240	2640	2270	1680	1320	1140	960	840	740	670
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3	3
	6-7	Low alloy steel	0.7D	0.3D	SFM (Vc)	200	175	165	160	175	155	155	175	175	165	160	165
					IPT (fz)	.0004	.0006	.0007	.0009	.0011	.0016	.0019	.0019	.0021	.0025	.0028	.0032
					RPM	8110	5400	4080	3240	2640	1920	1560	1320	1180	1020	900	780
					IPM (FEED)	6	6	6	6	6	6	6	5	5	5	5	5
	8-9		0.7D	0.3D	SFM (Vc)	170	150	135	130	150	135	130	150	140	135	135	145
					IPT (fz)	.0002	.0003	.0005	.0006	.0007	.0009	.0011	.0013	.0016	.0018	.0020	.0022
					RPM	6840	4560	3240	2640	2270	1680	1320	1140	960	840	740	670
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3	3
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM (Vc)	200	175	165	160	175	155	155	175	175	165	160	165
					IPT (fz)	.0004	.0006	.0007	.0009	.0011	.0016	.0019	.0019	.0021	.0025	.0028	.0032
					RPM	8110	5400	4080	3240	2640	1920	1560	1320	1180	1020	900	780
					IPM (FEED)	6	6	6	6	6	6	6	5	5	5	5	5
	11.1		0.7D	0.3D	SFM (Vc)	170	150	135	130	150	135	130	150	140	135	135	145
					IPT (fz)	.0002	.0003	.0005	.0006	.0007	.0009	.0011	.0013	.0016	.0018	.0020	.0022
					RPM	6840	4560	3240	2640	2270	1680	1320	1140	960	840	740	670
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3	3
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.7D	0.3D	SFM (Vc)	280	250	230	225	245	225	165	250	230	235	215	240
					IPT (fz)	.0004	.0007	.0011	.0015	.0022	.0036	.0060	.0052	.0064	.0069	.0083	.0079
					RPM	11400	7680	5640	4560	3720	2760	1680	1920	1560	1440	1200	1140
					IPM (FEED)	9	10	12	14	16	20	20	20	20	20	20	18
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.7D	0.3D	SFM (Vc)	825	730	685	650	740	705	660	740	690	685	670	690
					IPT (fz)	.0003	.0004	.0005	.0008	.0009	.0013	.0017	.0024	.0029	.0027	.0031	.0035
					RPM	33600	22320	16800	13200	11280	8640	6720	5640	4680	4200	3720	3240
					IPM (FEED)	17	17	17	20	20	23	23	27	27	23	23	23



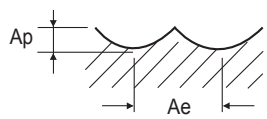
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

E5250, E5060, E5062, E5252 SERIES 4 FLUTE BALL NOSE - PLANE

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

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
P	1-4	Non-alloy steel	0.7D	0.3D	SFM (Vc)	130	115	105	105	110	105	100	115	110	105	105	105
					IPT (fz)	.0003	.0004	.0006	.0007	.0009	.0012	.0015	.0014	.0017	.0019	.0022	.0025
					RPM	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
					IPM (FEED)	6	6	6	6	6	6	6	5	5	5	5	5
	5		0.7D	0.3D	SFM (Vc)	110	95	85	85	95	90	85	95	90	90	85	90
					IPT (fz)	.0002	.0003	.0004	.0004	.0005	.0007	.0009	.0010	.0012	.0014	.0016	.0017
					RPM	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3	3
	6-7	Low alloy steel	0.7D	0.3D	SFM (Vc)	130	115	105	105	110	105	100	115	110	105	105	105
					IPT (fz)	.0003	.0004	.0006	.0007	.0009	.0012	.0015	.0014	.0017	.0019	.0022	.0025
					RPM	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
					IPM (FEED)	6	6	6	6	6	6	6	5	5	5	5	5
	8-9		0.7D	0.3D	SFM (Vc)	110	95	85	85	95	90	85	95	90	90	85	90
					IPT (fz)	.0002	.0003	.0004	.0004	.0005	.0007	.0009	.0010	.0012	.0014	.0016	.0017
					RPM	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3	3
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM (Vc)	130	115	105	105	110	105	100	115	110	105	105	105
					IPT (fz)	.0003	.0004	.0006	.0007	.0009	.0012	.0015	.0014	.0017	.0019	.0022	.0025
					RPM	5200	3500	2600	2100	1700	1270	1000	870	750	650	580	500
					IPM (FEED)	6	6	6	6	6	6	6	5	5	5	5	5
	11.1		0.7D	0.3D	SFM (Vc)	110	95	85	85	95	90	85	95	90	90	85	90
					IPT (fz)	.0002	.0003	.0004	.0004	.0005	.0007	.0009	.0010	.0012	.0014	.0016	.0017
					RPM	4400	2900	2100	1700	1430	1100	870	730	620	540	480	430
					IPM (FEED)	3	3	3	3	3	3	3	3	3	3	3	3
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.7D	0.3D	SFM (Vc)	180	160	145	140	155	145	140	155	145	150	145	155
					IPT (fz)	.0003	.0005	.0008	.0012	.0016	.0026	.0033	.0040	.0048	.0052	.0059	.0058
					RPM	7300	4900	3600	2900	2400	1800	1430	1200	1000	920	810	730
					IPM (FEED)	9	10	12	14	15	19	19	19	19	19	19	17
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.7D	0.3D	SFM (Vc)	530	470	445	430	475	450	420	470	440	440	430	445
					IPT (fz)	.0002	.0003	.0004	.0006	.0007	.0010	.0013	.0018	.0022	.0020	.0023	.0026
					RPM	21500	14300	10900	8800	7260	5500	4300	3600	3000	2700	2400	2100
					IPM (FEED)	17	17	17	20	20	22	22	26	26	22	22	22



CARBIDE END MILLS

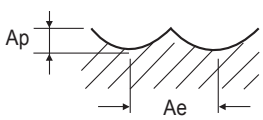
RECOMMENDED CUTTING CONDITIONS

E5250, E5060, E5062, E5252 SERIES TiAlN Coated

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

4 FLUTE BALL NOSE - PLANE

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
P	1-4	Non-alloy steel	0.7D	0.3D	SFM (Vc)	200	175	165	160	175	155	155	175	175	165	160	165
					IPT (fz)	.0003	.0004	.0006	.0008	.0009	.0012	.0014	.0015	.0017	.0020	.0022	.0026
					RPM	8110	5400	4080	3240	2640	1920	1560	1320	1180	1020	900	780
					IPM (FEED)	9	9	9	10	9	9	9	8	8	8	8	8
	5		0.7D	0.3D	SFM (Vc)	170	150	135	130	150	135	130	150	140	135	135	145
					IPT (fz)	.0001	.0002	.0003	.0004	.0004	.0006	.0008	.0009	.0010	.0012	.0014	.0015
					RPM	6840	4560	3240	2640	2270	1680	1320	1140	960	840	740	670
					IPM (FEED)	4	4	4	4	4	4	4	4	4	4	4	4
	6-7	Low alloy steel	0.7D	0.3D	SFM (Vc)	200	175	165	160	175	155	155	175	175	165	160	165
					IPT (fz)	.0003	.0004	.0006	.0008	.0009	.0012	.0014	.0015	.0017	.0020	.0022	.0026
					RPM	8110	5400	4080	3240	2640	1920	1560	1320	1180	1020	900	780
					IPM (FEED)	9	9	9	10	9	9	9	8	8	8	8	8
	8-9		0.7D	0.3D	SFM (Vc)	170	150	135	130	150	135	130	150	140	135	135	145
					IPT (fz)	.0001	.0002	.0003	.0004	.0004	.0006	.0008	.0009	.0010	.0012	.0014	.0015
					RPM	6840	4560	3240	2640	2270	1680	1320	1140	960	840	740	670
					IPM (FEED)	4	4	4	4	4	4	4	4	4	4	4	4
	10	High alloyed steel, and tool steel	0.7D	0.3D	SFM (Vc)	200	175	165	160	175	155	155	175	175	165	160	165
					IPT (fz)	.0003	.0004	.0006	.0008	.0009	.0012	.0014	.0015	.0017	.0020	.0022	.0026
					RPM	8110	5400	4080	3240	2640	1920	1560	1320	1180	1020	900	780
					IPM (FEED)	9	9	9	10	9	9	9	8	8	8	8	8
	11.1		0.7D	0.3D	SFM (Vc)	170	150	135	130	150	135	130	150	140	135	135	145
					IPT (fz)	.0001	.0002	.0003	.0004	.0004	.0006	.0008	.0009	.0010	.0012	.0014	.0015
					RPM	6840	4560	3240	2640	2270	1680	1320	1140	960	840	740	670
					IPM (FEED)	4	4	4	4	4	4	4	4	4	4	4	4
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.7D	0.3D	SFM (Vc)	280	250	230	225	245	225	225	250	230	235	215	240
					IPT (fz)	.0003	.0005	.0008	.0012	.0015	.0026	.0032	.0038	.0048	.0052	.0063	.0059
					RPM	11400	7680	5640	4560	3720	2760	2270	1920	1560	1440	1200	1140
					IPM (FEED)	14	15	18	21	23	29	29	29	30	30	30	27
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.7D	0.3D	SFM (Vc)	825	730	685	650	740	705	660	740	690	685	670	690
					IPT (fz)	.0002	.0003	.0004	.0006	.0007	.0010	.0013	.0018	.0022	.0021	.0024	.0027
					RPM	33600	22320	16800	13200	11280	8640	6720	5640	4680	4200	3720	3240
					IPM (FEED)	26	26	26	31	31	35	35	41	41	35	35	35



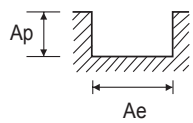
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

EH527 SERIES TiAlN Coated 2 FLUTE - SLOTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-2	Non-alloy steel	1.0D	1.0D	SFM (Vc)	160	160	160	160	155	160	160	155	160	160	160
					IPT (fz)	.0003	.0005	.0006	.0008	.0010	.0013	.0016	.0020	.0022	.0031	.0039
					RPM	7700	5180	3920	3080	2520	1960	1540	1260	1120	980	770
					IPM (FEED)	4	5	5	5	5	5	5	5	5	6	6
	3-4		1.0D	1.0D	SFM (Vc)	140	140	140	135	140	140	135	140	140	140	140
					IPT (fz)	.0003	.0004	.0006	.0008	.0009	.0012	.0015	.0018	.0020	.0030	.0037
					RPM	6720	4480	3360	2660	2240	1680	1330	1120	980	840	672
					IPM (FEED)	4	4	4	4	4	4	4	4	4	5	5
	5		1.0D	1.0D	SFM (Vc)	115	115	115	115	115	115	115	115	115	115	115
					IPT (fz)	.0003	.0004	.0005	.0007	.0008	.0011	.0013	.0016	.0019	.0029	.0036
					RPM	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
					IPM (FEED)	3	3	3	3	3	3	3	3	3	4	4
	6	Low alloy steel	1.0D	1.0D	SFM (Vc)	160	160	160	160	155	160	160	155	160	160	160
					IPT (fz)	.0003	.0005	.0006	.0008	.0010	.0013	.0016	.0020	.0022	.0031	.0039
					RPM	7700	5180	3920	3080	2520	1960	1540	1260	1120	980	770
					IPM (FEED)	4	5	5	5	5	5	5	5	5	6	6
	7		1.0D	1.0D	SFM (Vc)	140	140	140	135	140	140	135	140	140	140	140
					IPT (fz)	.0003	.0004	.0006	.0008	.0009	.0012	.0015	.0018	.0020	.0030	.0037
					RPM	6720	4480	3360	2660	2240	1680	1330	1120	980	840	672
					IPM (FEED)	4	4	4	4	4	4	4	4	4	5	5
	8-9		1.0D	1.0D	SFM (Vc)	115	115	115	115	115	115	115	115	115	115	115
					IPT (fz)	.0003	.0004	.0005	.0007	.0008	.0011	.0013	.0016	.0019	.0029	.0036
					RPM	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
					IPM (FEED)	3	3	3	3	3	3	3	3	3	4	4
	10	High alloyed steel, and tool steel	1.0D	1.0D	SFM (Vc)	160	160	160	160	155	160	160	155	160	160	160
					IPT (fz)	.0003	.0005	.0006	.0008	.0010	.0013	.0016	.0020	.0022	.0031	.0039
					RPM	7700	5180	3920	3080	2520	1960	1540	1260	1120	980	770
					IPM (FEED)	4	5	5	5	5	5	5	5	5	6	6
	11.1		1.0D	1.0D	SFM (Vc)	115	115	115	115	115	115	115	115	115	115	115
					IPT (fz)	.0003	.0004	.0005	.0007	.0008	.0011	.0013	.0016	.0019	.0029	.0036
					RPM	5600	3640	2800	2240	1820	1400	1120	924	798	700	560
					IPM (FEED)	3	3	3	3	3	3	3	3	3	4	4
M	12-14.2	Stainless steel	1.0D	1.0D	SFM (Vc)	230	230	230	230	225	230	230	225	220	230	230
					IPT (fz)	.0002	.0003	.0004	.0004	.0005	.0007	.0009	.0011	.0013	.0014	.0018
					RPM	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120
					IPM (FEED)	4	4	4	4	4	4	4	4	4	4	4
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	1.0D	1.0D	SFM (Vc)	190	180	185	180	180	185	190	175	180	185	185
					IPT (fz)	.0004	.0007	.0009	.0011	.0017	.0022	.0030	.0043	.0048	.0054	.0072
					RPM	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900
					IPM (FEED)	8	8	8	8	10	10	11	12	12	12	13
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	1.0D	1.0D	SFM (Vc)	460	475	460	460	460	460	460	450	465	460	460
					IPT (fz)	.0004	.0006	.0008	.0010	.0013	.0017	.0021	.0026	.0030	.0034	.0042
					RPM	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240
					IPM (FEED)	18	18	18	18	19	19	19	19	19	19	19
	26-28	Copper and Copper Alloys (Bronze / Brass)	1.0D	1.0D	SFM (Vc)	345	345	345	345	345	345	345	345	345	345	345
					IPT (fz)	.0004	.0006	.0008	.0010	.0013	.0017	.0021	.0025	.0029	.0033	.0042
					RPM	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680
					IPM (FEED)	13	13	13	13	14	14	14	14	14	14	14



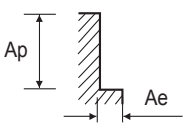
CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

EH540 SERIES — TiAlN Coated — 4 FLUTE - SIDE CUTTING

SFM(Vc) = ft./min.
IPT(fz) = in./tooth
RPM = rev./min.
IPM(Feed) = in./min.

ISO	VDI 3323	Material Description	Ae	Ap	Parameter	Diameter (Ø) 2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	16.0	20.0
P	1-2	Non-alloy steel	0.1D	1.5D	SFM (Vc)	160	160	160	160	155	160	160	155	160	160	160
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0019	.0024	.0030	.0033	.0043	.0055
					RPM	7700	5180	3920	3080	2520	1960	1540	1260	1120	980	770
					IPM (FEED)	13	15	15	15	15	15	15	15	15	17	17
	3-4		0.1D	1.5D	SFM (Vc)	140	140	140	135	140	140	135	140	140	140	140
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0019	.0024	.0029	.0033	.0042	.0052
					RPM	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670
					IPM (FEED)	12	13	13	13	13	13	13	13	13	14	14
	5		0.1D	1.5D	SFM (Vc)	115	115	115	115	115	115	115	115	115	115	115
					IPT (fz)	.0004	.0007	.0009	.0011	.0014	.0018	.0022	.0027	.0031	.0043	.0054
					RPM	5600	3640	2800	2240	1820	1400	1120	920	800	700	560
					IPM (FEED)	9	10	10	10	10	10	10	10	10	12	12
	6	Low alloy steel	0.1D	1.5D	SFM (Vc)	160	160	160	160	155	160	160	155	160	160	160
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0019	.0024	.0030	.0033	.0043	.0055
					RPM	7700	5180	3920	3080	2520	1960	1540	1260	1120	980	770
					IPM (FEED)	13	15	15	15	15	15	15	15	15	17	17
	7		0.1D	1.5D	SFM (Vc)	140	140	140	135	140	140	135	140	140	140	140
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0019	.0024	.0029	.0033	.0042	.0052
					RPM	6720	4480	3360	2660	2240	1680	1330	1120	980	840	670
					IPM (FEED)	12	13	13	13	13	13	13	13	13	14	14
	8-9		0.1D	1.5D	SFM (Vc)	115	115	115	115	115	115	115	115	115	115	115
					IPT (fz)	.0004	.0007	.0009	.0011	.0014	.0018	.0022	.0027	.0031	.0043	.0054
					RPM	5600	3640	2800	2240	1820	1400	1120	920	800	700	560
					IPM (FEED)	9	10	10	10	10	10	10	10	10	12	12
	10	High alloyed steel, and tool steel	0.1D	1.5D	SFM (Vc)	160	160	160	160	155	160	160	155	160	160	160
					IPT (fz)	.0004	.0007	.0010	.0012	.0015	.0019	.0024	.0030	.0033	.0043	.0055
					RPM	7700	5180	3920	3080	2520	1960	1540	1260	1120	980	770
					IPM (FEED)	13	15	15	15	15	15	15	15	15	17	17
	11.1		0.1D	1.5D	SFM (Vc)	115	115	115	115	115	115	115	115	115	115	115
					IPT (fz)	.0004	.0007	.0009	.0011	.0014	.0018	.0022	.0027	.0031	.0043	.0054
					RPM	5600	3640	2800	2240	1820	1400	1120	920	800	700	560
					IPM (FEED)	9	10	10	10	10	10	10	10	10	12	12
M	12-14.2	Stainless steel	0.1D	1.5D	SFM (Vc)	230	230	230	230	225	230	230	225	220	230	230
					IPT (fz)	.0002	.0004	.0005	.0006	.0008	.0010	.0012	.0015	.0018	.0021	.0029
					RPM	11200	7420	5600	4480	3640	2800	2240	1820	1540	1400	1120
					IPM (FEED)	11	11	11	11	11	11	11	11	11	12	13
K	15-20	Grey cast iron Nodular cast iron Malleable cast iron	0.1D	1.5D	SFM (Vc)	190	180	185	180	180	185	190	175	180	185	185
					IPT (fz)	.0007	.0011	.0014	.0018	.0026	.0036	.0045	.0063	.0071	.0083	.0111
					RPM	9100	5880	4480	3500	2940	2240	1820	1400	1260	1120	900
					IPM (FEED)	25	25	25	25	30	32	33	35	36	37	40
N	21-25	Aluminum-wrought alloy Aluminum-cast, alloyed	0.1D	1.5D	SFM (Vc)	460	475	460	460	460	460	460	450	465	460	460
					IPT (fz)	.0006	.0009	.0012	.0015	.0019	.0025	.0031	.0038	.0043	.0050	.0063
					RPM	22400	15400	11200	8960	7420	5600	4480	3640	3220	2800	2240
					IPM (FEED)	53	53	53	53	56	56	56	56	56	56	56
	26-28	Copper and Copper Alloys (Bronze / Brass)	0.1D	1.0D	SFM (Vc)	345	345	345	345	345	345	345	345	345	345	345
					IPT (fz)	.0006	.0009	.0012	.0015	.0019	.0026	.0032	.0038	.0045	.0051	.0064
					RPM	16800	11200	8400	6720	5600	4200	3360	2800	2380	2100	1680
					IPM (FEED)	40	40	40	40	43	43	43	43	43	43	43



CARBIDE END MILLS

RECOMMENDED CUTTING CONDITIONS

PROPERTIES AND APPLICATIONS OF COATINGS

	Titanium Nitride	Titanium Carbonitride	Super TiAlN "F" Coatings	Super TiAlN "E" Coatings
Hardness	82 Rc	92 Rc	92 Rc	95 Rc
Coefficient of Friction Against Dry Steel (.8)	.4	.4	.4	.4
Coating Thickness 3 Microns = .0001	1- 4	1- 4	1- 5	1- 3
Maximum Working Temperature	1100 F	750F	1470 F	1470 F
Coating Color	Gold	Blue - Gray	Violet - Gray	Violet - Gray
Key Characteristics	Good General Purpose	Good Wear Resistance Good Toughness Moderate Heat Resistance	Enhanced Toughness High Heat Resistance	High Hardness Enhanced Toughness High Heat Resistance
Primary Applications	Machining of Iron Based Materials	General Machining of Various Materials	Steel, Cast Iron, Stainless, Nickel Based Alloys, High Temp and Titanium Alloys, High Speed Machining Wet, Dry, or Semi Dry Condition	Hardened Workpieces, Steel, Cast Iron, Stainless, Nickel Based Alloys, High Temp and Titanium Alloys, Machining Wet, Dry, or Semi Dry Condition
YG:TYLON SUPER TiAlN COATED TOOLS CAN BE RUN 20% - 50% FASTER THAN TiN or TiCN ON MOST MATERIALS				