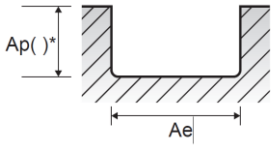
Speeds and Feeds

1) Select your material in the ISO colored chart with respect to material description.
2) Start with a middle/average value for spindle speed, n (RPM) and feed rate, V_f (in/min). Adjust the spindle speed and/or feed rate based on your cutting conditions.

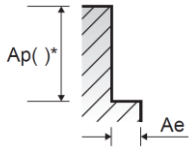
End Mill Series – HTPM

Material			Recommended Cutting Values – Slotting and Side Cutting															
Group		Material Description	Width of Cut, a_e		Depth of Cut, a_p		Parameter	Cutting Diameter (in)												
ISO	VDI 3323		Side	Slotting	Side	Slotting		1/8	5/32	3/16	7/32	1/4	9/32	5/16	11/32	3/8	7/16	1/2	5/8	3/4	1
P	1-4	Non-Alloy Steel	0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	500	500	500	500	500	500	500	525	550	550	550	550	550	550
							Fz, IPT	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0026	0.0025
							n, RPM	15249	12200	10166	8714	7625	6778	6100	5834	5616	4811	4210	3368	2806	2105
							Vf, IPM	12.01	15.37	17.61	18.53	19.21	22.95	25.94	29.86	33.59	32.2	31.16	28.11	28.73	21.21
	5	Low Alloy Steel	0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	350	350	350	350	350	350	350	370	385	385	385	385	385	385
							Fz, IPT	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0018	0.0021	0.0026	0.0025
							n, RPM	10727	8581	7151	6129	5363	4767	4291	4089	3912	3353	2934	2347	1956	1467
							Vf, IPM	8.45	10.81	12.39	13.03	13.51	16.14	18.24	20.93	23.41	22.44	21.71	19.59	20.02	14.78
	6-7		0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	500	500	500	500	500	500	500	525	550	550	550	550	550	550
							Fz, IPT	2	0.0003	0.0004	0.0005	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0026	0.0025
							n, RPM	15249	12200	10166	8714	7625	6778	6100	5834	5616	4811	4210	3368	2806	2105
							Vf, IPM	12.01	15.37	17.61	18.53	19.21	22.95	25.94	29.86	33.59	32.2	31.16	28.11	28.73	21.21
	8-9		0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	350	350	350	350	350	350	350	370	385	385	385	385	385	385
							Fz, IPT	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0018	0.0021	0.0026	0.0025
							n, RPM	10727	8581	7151	6129	5363	4767	4291	4089	3912	3353	2934	2347	1956	1467
							Vf, IPM	8.45	10.81	12.39	13.03	13.51	16.14	18.24	20.93	23.41	22.44	21.71	19.59	20.02	14.78
	10-11.1	High Alloy Steel, and Tool Steel	0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	210	210	210	210	210	210	210	220	230	230	230	230	230	230
							Fz, IPT	0.0001	0.0002	0.0003	0.0004	0.0004	0.0006	0.0007	0.0009	0.0011	0.0012	0.0013	0.0015	0.0018	0.0018
							n, RPM	6418	5134	4278	3667	3209	2852	2567	2445	2343	2008	1757	1406	1171	879
							Vf, IPM	3.03	4.85	5.39	5.49	5.56	6.74	7.68	8.86	9.96	9.33	8.86	8.19	8.3	6.23

NOTE: Feed to be reduced by approximately 50% if LOC (length of cut) is over 3XD.
The above recommendations are based on ideal conditions; for smaller taper machining centers or less rigid conditions, please adjust parameters accordingly on diameters greater than 1/2".
In profile operations, engaging more than 2XD, reduce the radial depth of cut, a_e by 50%-60%.
Finish cuts typically require reduced cutting feeds and speeds; also, it is recommended the radial depth of cut, a_e should not exceed (2%)XD.



Slotting



Side Cutting

Speeds and Feeds

1) Select your material in the ISO colored chart with respect to material description.
2) Start with a middle/average value for spindle speed, n (RPM) and feed rate, V_f (in/min). Adjust the spindle speed and/or feed rate based on your cutting conditions.

End Mill Series – HTPM

Material			Recommended Cutting Values – Slotting and Side Cutting															
Group		Material Description	Width of Cut, a_e		Depth of Cut, a_p		Parameter	Cutting Diameter (in)												
ISO	VDI 3323		Side	Slotting	Side	Slotting		1/8	5/32	3/16	7/32	1/4	9/32	5/16	11/32	3/8	7/16	1/2	5/8	3/4	1
M	12-13	Stainless Steel	0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	485	485	485	485	485	485	485	485	485	485	485	485	485	485
							Fz, IPT	0.0002	0.0002	0.0004	0.0004	0.0005	0.0007	0.0009	0.0011	0.0013	0.0014	0.0015	0.0018	0.0022	0.0022
							n, RPM	14852	11882	9901	8487	7426	6601	5941	5401	4951	4243	3713	2970	2475	1857
							Vf, IPM	9.36	11.23	14.03	14.7	15.2	18.48	20.58	23.81	26.51	24.39	22.8	21.05	21.44	16.08
	14.1		0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	350	350	350	350	350	350	350	350	350	350	350	350	350	350
							Fz, IPT	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0011	0.0015	0.0019	0.002	0.0022	0.0024	0.003	0.003
							n, RPM	10635	8508	7090	6077	5317	4727	4254	3867	3545	3039	2659	2127	1772	1329
							Vf, IPM	8.37	10.72	14.51	14.83	15.07	17.12	18.76	23.14	26.8	24.64	23.03	20.77	21.49	16.12
	14.2		0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	310	310	310	310	310	310	310	310	310	310	310	310	310	310
							Fz, IPT	0.0002	0.0003	0.0005	0.0006	0.0007	0.0009	0.0011	0.0015	0.0019	0.002	0.0022	0.0024	0.003	0.003
							n, RPM	9535	7628	6356	5448	4767	4238	3814	3467	3178	2724	2384	1907	1589	1192
							Vf, IPM	7.51	9.61	13.01	13.3	13.51	15.35	16.82	20.75	24.02	22.09	20.65	18.62	19.02	14.26
K	15-20	Grey Cast Iron	0.5D	1.0D	1.5D (1.2D)	1.0D (0.8D)	Vc, SFM	365	365	365	365	365	365	365	385	405	405	405	405	405	405
							Fz, IPT	0.0002	0.0004	0.0006	0.0007	0.0008	0.0011	0.0013	0.0016	0.0019	0.0021	0.0023	0.0026	0.0032	0.0031
							n, RPM	11216	8972	7477	6409	5608	4985	4486	4290	4115	3527	3087	2469	2058	1543
							Vf, IPM	10.6	14.13	16.48	17.16	17.66	21.19	24.02	27.7	31.11	29.44	28.19	25.28	26.25	19.2
S	31-35	Heat Resistant Super Alloys	0.25D	1.0D	1.0D	0.5D	Vc, SFM	85	85	85	85	85	85	85	85	85	85	85	85	85	85
							Fz, IPT	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006	0.0007	0.001	0.0013	0.0014	0.0015	0.0017	0.0021	0.002
							n, RPM	2598	2078	1732	1484	1299	1154	1039	945	866	742	649	520	433	325
							Vf, IPM	2.05	2.29	2.18	2.34	2.45	2.82	3.11	3.87	4.5	4.15	3.89	3.52	3.68	2.66
	36-37	Titanium Alloys	0.35D	1.0D	1.0D	0.5D	Vc, SFM	190	190	190	190	190	190	190	190	190	190	190	190	190	190
							Fz, IPT	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.001	0.0013	0.0017	0.0018	0.002	0.0022	0.0027	0.0027
							n, RPM	5806	4645	3871	3318	2903	2581	2323	2111	1935	1659	1452	1161	968	726
							Vf, IPM	3.66	5.12	6.71	7.05	7.32	8.33	9.14	11.14	12.8	12.02	11.43	10.06	10.36	7.89

NOTE: Feed to be reduced by approximately 50% if LOC (length of cut) is over 3XD.
The above recommendations are based on ideal conditions; for smaller taper machining centers or less rigid conditions, please adjust parameters accordingly on diameters greater than 1/2".
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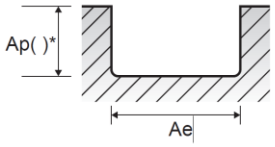
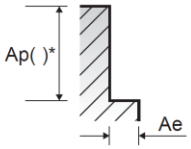


Slotting



Side Cutting

Speeds and Feeds

Feed Rate, Per Revolution (in/min)
$v_f = f_n \cdot n$

Feed Rate, Per Tooth (in/min)
$v_f = f_z \cdot n \cdot Z$

Feed Per Revolution (in/rev)
$f_n = \frac{v_f}{n}$

Feed Per Tooth (in)
$f_z = \frac{v_f}{n \cdot Z}$

Cutting Speed (ft/min)
$v_c = \frac{\pi \cdot D_{tool} \cdot n}{12}$

Spindle Speed (rev/min)
$n = \frac{v_c \cdot 12}{\pi \cdot D_{tool}}$

Material Removal Rate (in^3/min)
$MMR = a_p \cdot a_e \cdot v_f$

Inch

Symbol	Definition	Unit
v_f	Feed rate	*in/min*
f_n	Feed per revolution	*in/rev*
f_z	Feed per tooth	*in*
v_c	Cutting speed	*ft/min (SFM)*
n	Spindle speed	*rev/min (RPM)*
D_{tool}	Tool cutting diameter	*in*
MMR	Material removal rate	*(in^3/min)*
a_e	Radial depth of cut	*in*
a_p	Axial depth of cut	*in*
Z	Number of teeth/flutes	