

Side-Cutting (HSM)

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 (mm/min). Adjust the spindle speed and/or feed rate based on your cutting conditions.

End Mill Series – **HSAM2**

Material		Recommended Cutting Values – Side Cutting HSM (Light)									
Group	Material Description	Width of Cut, a _e	Depth of Cut, a _p	Parameter	Tool Diameter (mm)						
					3	6	10	12	16	20	25
N	21-22 Aluminum-Wrought Alloy	0.05D	2.0D	Vc, SMM	1006	1006	1006	1006	1006	1006	1006
				Fz, MMPT	0.053	0.14	0.267	0.356	0.381	0.419	0.495
				n, RPM	106740	53370	32022	26685	20014	16011	12809
				Vf, MMPM	17080	22367	25621	28467	22876	20131	19033
	23-25 Aluminum-Cast Alloy	0.05D	2.0D	Vc, SMM	366	366	366	366	366	366	366
				Fz, MMPT	0.053	0.14	0.267	0.356	0.381	0.419	0.495
				n, RPM	38834	19417	11650	9708	7281	5825	4660
				Vf, MMPM	6214	8138	9321	10357	8323	7324	6924
	26-28 Copper and Copper Alloys (Bronze/Brass)	0.05D	2.0D	Vc, SMM	564	564	564	564	564	564	564
				Fz, MMPT	0.043	0.114	0.216	0.292	0.33	0.356	0.406
				n, RPM	59842	29921	17953	14961	11220	8976	7181
				Vf, MMPM	7752	10260	11628	13110	11115	9576	8755
	29.1 Non-Metallic Materials (Duroplastic)	0.05D	2.0D	Vc, SMM	1021	1021	1021	1021	1021	1021	1021
				Fz, MMPT	0.086	0.229	0.432	0.584	0.635	0.699	0.813
				n, RPM	108331	54166	32499	27083	20312	16250	13000
				Vf, MMPM	28066	37147	42100	47465	38695	34051	31699

NOTE: All cutting data are target values.

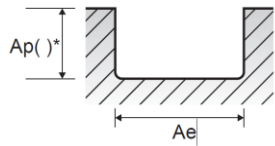
Maximum recommended depth shown.

Finish cuts typically require reduced feed rates and/or higher spindle speed, with a radial depth of cut, a_e of (2%)XD or less.

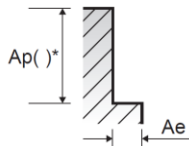
Reduce speed and feed recommendations for materials harder than listed.

Reduce cut depth and feed by 50% for long-flute or long-reach tools.

Above recommendations are based on ideal conditions. Adjust parameters accordingly for smaller taper machining centers or less rigid conditions. HSM = high speed machining.



Slotting



Side Cutting

Tech Tips: The tables above are based on common machining calculators.

We realize that shops may not have the RPM capability shown in the tables.

To adapt the tables to the machining conditions available, use the following calculation:

$$(\text{Recommended Feed MMPM} / \text{Recommended RPM}) \times \text{Available RPM} = \text{MMPM}$$



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					3	6	10	12	16	20	25
N	21-22 Aluminum-Wrought Alloy	0.5D	1.5D	Vc, SMM	610	610	610	610	610	610	610
				Fz, MMPT	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				n, RPM	64723	32361	19417	16181	12136	9708	7767
	23-25 Aluminum-Cast Alloy	0.5D	1.5D	Vc, SMM	244	244	244	244	244	244	244
				Fz, MMPT	0.025	0.076	0.114	0.152	0.168	0.191	0.254
				n, RPM	25889	12945	7767	6472	4854	3883	3107
	26-28 Copper and Copper Alloys (Bronze/Brass)	0.5D	1.5D	Vf, MMPM	1973	2959	2663	2959	2441	2219	2367
				Vc, SMM	351	351	351	351	351	351	351
				Fz, MMPT	0.02	0.051	0.102	0.127	0.14	0.152	0.178
	29.1 Non-Metallic Materials (Duroplastic)	0.5D	1.5D	n, RPM	37242	18621	11173	9311	6983	5586	4469
				Vf, MMPM	2270	2838	3405	3547	2927	2554	2384
				Vc, SMM	625	625	625	625	625	625	625
				Fz, MMPT	0.038	0.102	0.191	0.254	0.279	0.305	0.356
				n, RPM	66314	33157	19894	16579	12434	9947	7958
				Vf, MMPM	7580	10106	11370	12633	10422	9096	8489

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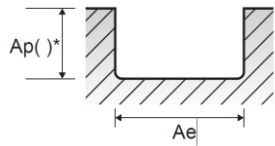
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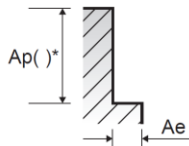
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Slotting



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Material			Recommended Cutting Values – Slotting									
Group	Material Description	Width of Cut, a _e	Depth of Cut, a _p	Parameter	Tool Diameter (mm)							
					3	6	10	12	16	20	25	
N	21-22 Aluminum-Wrought Alloy	1.0D	1.0D	Vc, SMM	488	488	488	488	488	488	488	
				Fz, MMPT	0.025	0.076	0.114	0.152	0.168	0.191	0.254	
				n, RPM	51778	25889	15533	12945	9708	7767	6213	
	23-25 Aluminum-Cast Alloy	1.0D	1.0D	Vc, SMM	183	183	183	183	183	183	183	
				Fz, MMPT	0.025	0.076	0.114	0.152	0.168	0.191	0.254	
				n, RPM	19417	9708	5825	4854	3641	2913	2330	
	26-28 Copper and Copper Alloys (Bronze/Brass)	1.0D	1.0D	Vf, MMPM	1480	2219	1997	2219	1831	1665	1775	
				Vc, SMM	268	268	268	268	268	268	268	
				Fz, MMPT	0.02	0.051	0.102	0.127	0.14	0.152	0.178	
	29.1 Non-Metallic Materials (Duroplastic)	1.0D	1.0D	n, RPM	28436	14218	8531	7109	5332	4265	3412	
				Vf, MMPM	1733	2167	2600	2708	2235	1950	1820	
				Vc, SMM	503	503	503	503	503	503	503	
				Fz, MMPT	0.038	0.102	0.191	0.254	0.279	0.305	0.356	
				n, RPM	53370	26685	16011	13342	10007	8005	6404	
				Vf, MMPM	6100	8134	9150	10167	8388	7320	6832	

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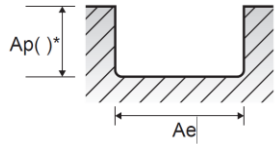
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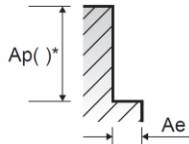
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Speeds and Feeds



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

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

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

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

Cutting Speed (m/min)
$v_c = \frac{\pi \cdot D_{tool} \cdot n}{1000}$

Spindle Speed (rev/min)
$n = \frac{v_c \cdot 1000}{\pi \cdot D_{tool}}$

Material Removal Rate (mm ³ /min)
$MMR = \frac{a_p \cdot a_e \cdot v_f}{1000}$

Metric

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