

Speeds and Feeds



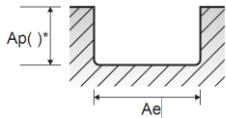
- 1) Select your material in the ISO colored chart with respect to material description.
- 2) Start with a middle/average value for spindle speed, n (RPM) and feed rate, V_f (mm/min). Adjust the spindle speed and/or feed rate based on your cutting conditions.

End Mill Series – **FPCHH**

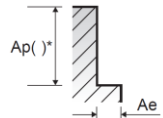
Material			Recommended Cutting Values – Slotting											
Group		Material Description	Width of Cut, a_e	Depth of Cut, a_p	Parameter	Tool Diameter (mm)								
ISO	VDI 3323					4	6	8	10	12	14	16	20	25
P	1-4	Non-Alloy Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338
					Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060
					n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304
	Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291	
	Vc, SMM				234	231	239	226	229	241	249	226	251	
	Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023	
	5	Low Alloy Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338
					Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060
					n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304
	Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291	
	Vc, SMM				234	231	239	226	229	241	249	226	251	
	Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023	
	6-7	High Alloy Steel, and Tool Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338
					Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060
					n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304
	Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291	
	Vc, SMM				234	231	239	226	229	241	249	226	251	
	Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023	
	8-9	High Alloy Steel, and Tool Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338
					Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060
					n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304
	Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291	
	Vc, SMM				234	231	239	226	229	241	249	226	251	
	Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023	
10	High Alloy Steel, and Tool Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338	
				Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060	
				n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304	
Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291		
Vc, SMM				234	231	239	226	229	241	249	226	251		
Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023		
11.1	High Alloy Steel, and Tool Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338	
				Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060	
				n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304	
Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291		
Vc, SMM				234	231	239	226	229	241	249	226	251		
Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023		
11.2	High Alloy Steel, and Tool Steel	1.0D	0.5D	Vc, SMM	294	292	289	302	299	302	294	302	338	
				Fz, MMPT	0.030	0.040	0.038	0.045	0.053	0.060	0.067	0.068	0.060	
				n, RPM	15597	11618	9199	8011	6798	6008	5199	4806	4304	
Vf, MMPM				1404	1394	1398	1442	1441	1442	1393	1307	1291		
Vc, SMM				234	231	239	226	229	241	249	226	251		
Fz, MMPT				0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023		

NOTE: All cutting data are target values.
Maximum recommended depth shown.

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



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

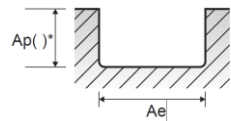
End Mill Series – **FPCHH**

Material			Recommended Cutting Values – Slotting											
Group	Material Description	Width of Cut, a_e	Depth of Cut, a_p	Parameter	Tool Diameter (mm)									
					4	6	8	10	12	14	16	20	25	
M	14.1	Stainless Steel	1.0D	$\varnothing 4\text{--}10:0.25D$ $\varnothing 12\text{--}16:0.15D$ $\varnothing 18\text{--}25:0.1D$	Vc, SMM	158	158	160	158	158	166	153	151	170
					Fz, MMPT	0.013	0.018	0.017	0.020	0.024	0.023	0.023	0.023	0.023
					n, RPM	8382	6287	5093	4191	3592	3302	2706	2403	2165
					Vf, MMPM	327	339	346	335	345	304	249	221	249
S	31-35	Heat Resistant Super Alloys	1.0D	0.05D	Vc, SMM	45	45	41	45	40	40	40	41	47
					Fz, MMPT	0.016	0.020	0.022	0.024	0.022	0.020	0.021	0.023	0.022
					n, RPM	2387	1790	1305	1194	909	796	707	653	598
	36-37	Titanium Alloys	1.0D	$\varnothing 4\text{--}10:0.25D$ $\varnothing 12\text{--}16:0.15D$ $\varnothing 18\text{--}25:0.1D$	Vc, SMM	158	158	160	158	158	166	153	151	170
					Fz, MMPT	0.013	0.018	0.017	0.020	0.024	0.023	0.023	0.023	0.023
					n, RPM	8382	6287	5093	4191	3592	3302	2706	2403	2165
H	40	Chilled Cast Iron	1.0D	0.5D	Vc, SMM	234	231	239	226	229	241	249	226	251
					Fz, MMPT	0.013	0.018	0.016	0.020	0.024	0.024	0.024	0.024	0.023
					n, RPM	12414	9191	7608	5995	5207	4795	4403	3597	3196
					Vf, MMPM	484	496	487	480	500	460	423	345	368

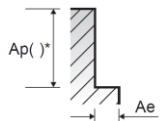
NOTE: All cutting data are target values.

Maximum recommended depth shown.

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Slotting



Side Cutting



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	