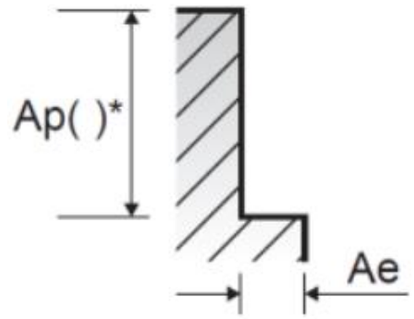
Side Cutting

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

End Mill Series - HSAM3

Material			Recommended Cutting Values - Side Cutting									
Group		Material Description	Width of Cut, a_e	Depth of Cut, a_p	Parameter	Cutting Diameter (mm)							
ISO	VDI 3323					3	4	6	8	10	12	16	20
N	21	Aluminum-Wrought Alloy	Ø3 - Ø10 = 0.25D Ø12 - Ø20 = 0.5D	1.0D	Vc, SMM	310	415	625	650	820	985	985	820
					Fz, MMPT	0.002	0.002	0.003	0.005	0.005	0.006	0.008	0.009
					n, RPM	10080	10080	10080	7960	7960	7960	5970	3980
					Vf, MMPM	36	43	60	71	82	102	94	75
	22		Ø3 - Ø10 = 0.25D Ø12 - Ø20 = 0.5D	1.0D	Vc, SMM	310	415	625	650	820	985	985	820
					Fz, MMPT	0.002	0.002	0.003	0.005	0.005	0.006	0.008	0.009
					n, RPM	10080	10080	10080	7960	7960	7960	5970	3980
					Vf, MMPM	36	43	60	71	82	102	94	75
	23	Aluminum-Cast Alloy	Ø3 - Ø10 = 0.25D Ø12 - Ø20 = 0.5D	1.0D	Vc, SMM	205	270	405	425	435	640	640	535
					Fz, MMPT	0.002	0.002	0.003	0.004	0.005	0.006	0.008	0.009
					n, RPM	6550	6550	6550	5170	5170	5170	3880	2590
					Vf, MMPM	23	28	39	46	53	66	61	48
	24		Ø3 - Ø10 = 0.25D Ø12 - Ø20 = 0.5D	1.0D	Vc, SMM	205	270	405	425	435	640	640	535
					Fz, MMPT	0.002	0.002	0.003	0.004	0.005	0.006	0.008	0.009
					n, RPM	6550	6550	6550	5170	5170	5170	3880	2590
					Vf, MMPM	23	28	39	46	53	66	61	48



Side Cutting

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 12mm. In profile operations, engaging more than 2XD, reduce the radial depth of cut, ae by 50%-60%. Finish cuts typically require reduced cutting feeds and speeds; also, it is recommended the radial depth of cut, ae should not exceed (2%)XD.

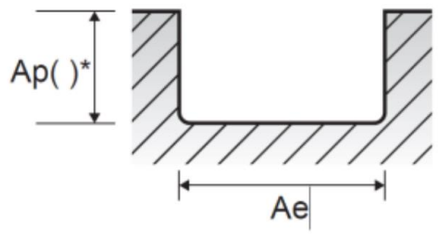
Slotting

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

End Mill Series - HSAM3

Material			Recommended Cutting Values - Slotting									
Group		Material Description	Width of Cut, a_e	Depth of Cut, a_p	Parameter	Cutting Diameter (mm)							
ISO	VDI 3323					3	4	6	8	10	12	16	20
N	21	Aluminum-Wrought Alloy	1D	0.5D	Vc, SMM	310	415	625	655	820	985	985	820
					Fz, MMPT	0.001	0.002	0.002	0.004	0.004	0.005	0.006	0.008
					n, RPM	10080	10080	10080	7960	7960	7960	5970	3980
					Vf, MMPM	28	35	48	55	66	82	74	63
	22		1D	0.5D	Vc, SMM	310	415	625	655	820	985	985	820
					Fz, MMPT	0.001	0.002	0.002	0.004	0.004	0.005	0.006	0.008
					n, RPM	10080	10080	10080	7960	7960	7960	5970	3980
					Vf, MMPM	28	35	48	55	66	82	74	63
	23	Aluminum-Cast Alloy	1D	0.5D	Vc, SMM	200	270	405	425	530	640	640	535
					Fz, MMPT	0.001	0.002	0.002	0.004	0.004	0.005	0.006	0.008
					n, RPM	6550	6550	6550	5170	5170	5170	3880	2590
					Vf, MMPM	18	23	31	36	43	53	48	41
	24		1D	0.5D	Vc, SMM	200	270	405	425	530	640	640	535
					Fz, MMPT	0.001	0.002	0.002	0.004	0.004	0.005	0.006	0.008
					n, RPM	6550	6550	6550	5170	5170	5170	3880	2590
					Vf, MMPM	18	23	31	36	43	53	48	41



Slotting

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 12mm. In profile operations, engaging more than 2XD, reduce the radial depth of cut, ae by 50%-60%. Finish cuts typically require reduced cutting feeds and speeds; also, it is recommended the radial depth of cut, ae should not exceed (2%)XD.

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 (cm^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	*(cm^3/min)*
a_e	Radial depth of cut	*mm*
a_p	Axial depth of cut	*mm*
Z	Number of teeth/flutes	