

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 – 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 | V _c , SMM | 488 | 488 | 488 | 488 | 488 | 488 | 488 |
| | | | | F _z , 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 | V _c , SMM | 183 | 183 | 183 | 183 | 183 | 183 | 183 |
| | | | | F _z , 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 | V _f , MMPM | 1480 | 2219 | 1997 | 2219 | 1831 | 1665 | 1775 |
| | | | | V _c , SMM | 268 | 268 | 268 | 268 | 268 | 268 | 268 |
| | | | | F _z , 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 |
| | | | | V _f , MMPM | 1733 | 2167 | 2600 | 2708 | 2235 | 1950 | 1820 |
| | | | | V _c , SMM | 503 | 503 | 503 | 503 | 503 | 503 | 503 |
| | | | | F _z , MMPT | 0.038 | 0.102 | 0.191 | 0.254 | 0.279 | 0.305 | 0.356 |
| | | | | n, RPM | 53370 | 26685 | 16011 | 13342 | 10007 | 8005 | 6404 |
| | | | | V _f , MMPM | 6100 | 8134 | 9150 | 10167 | 8388 | 7320 | 6832 |

NOTE: All cutting data are target values.

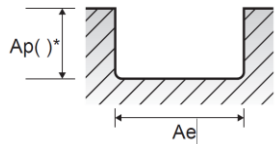
Maximum recommended depth shown.

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.

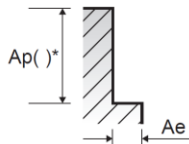
Reduce speed and feed recommendations for materials harder than listed.

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.



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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| 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 | |