

Cutting Tools for the Mill

Tool Material:

High Speed Steel (HSS)



- Use with softer materials (aluminum, plastic)
- Cheaper and more common
- Weighs less and appears brighter
- Can be coated, in which case it will appear golden over the cutting area

Carbide



- Use with harder metals (carbon steel, titanium)
- More expensive and brittle
- Heavier and appears darker (gun metal)
- Can be carbide tipped, in which case it will be a small carbide cutting surface brazed onto an HSS carrier

Cobalt



- For use with stainless steel only
- Similar weight and appearance to carbide, with less shine and blue tint
- Very uncommon in Uldaho Machine Shop
- Ask Russ if you think you need it

Endmills:

Center Cutting vs Non-Center Cutting

Center Cutting



- There is no hollowed out center
- Allows the user to plunge, drill or ramp into a cut
- Greatest variety of applications
- More expensive to manufacture

Non-Center Cutting



- Hollowed out center
- Cannot plunge into materials
- Cheaper to produce

Number of Flutes

2-Flute



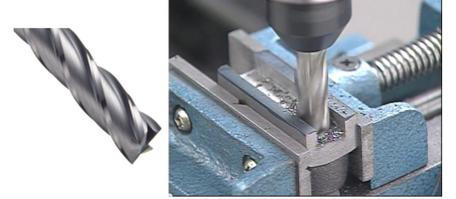
- Cutting surfaces spaced wider
- Better for plastics and soft metals, like aluminum
- Slightly higher feed rate
- More stress on each cutting surface

4-Flute



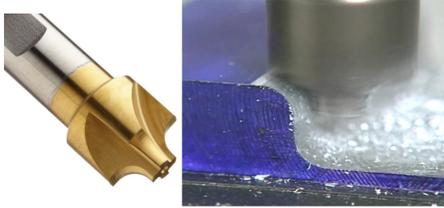
- Cutting surfaces closer together
- Better for harder metals, like steels
- Slightly lower feed rate
- Distributes stress across more cutting surfaces

Square Endmill



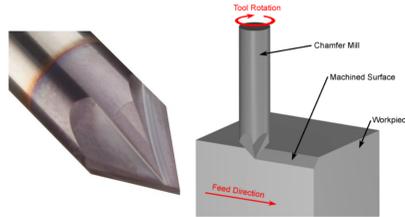
- Side profile of endmill has square tip
- Used for cutting square edges, such as channels, pockets, and facing operations
- Most common endmill type
- Refer to "Feeds and Speeds" chart for RPM and feed rate

Radius Mill



- Side profile of endmill inner-radius tip
- Used for cutting filleted outside edges
- Specified by endmill diameter and cut radius
- Refer to "Feeds and Speeds" chart for RPM and feed rate (based on endmill diameter)

Chamfer Mill



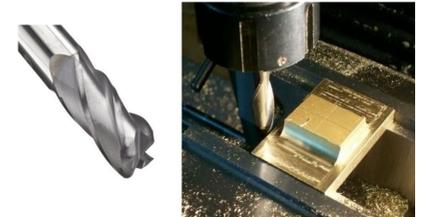
- Side profile of endmill has pointed tip
- Used for cutting chamfered edges or specific angled surface facing
- Specified by endmill diameter and cutting angle
- Refer to "Feeds and Speeds" chart for RPM and feed rate (based on endmill diameter)

Ball End Endmill



- Side profile of endmill has rounded tip with diameter equal to endmill diameter
- Used for cutting filleted inside edges, spherical holes, or rounded 3-D surface facing
- Refer to "Feeds and Speeds" chart for RPM and feed rate (based on endmill diameter)

Bull End Endmill



- Side profile of endmill has tip with rounded edge and flat end
- Used for cutting filleted inside edges tangent to flat surfaces
- Specified by endmill diameter and tip radius
- Refer to "Feeds and Speeds" chart for RPM and feed rate (based on endmill diameter)

Facing Tools:

Fly Cutter



- For removing large amounts of material in a radial plane or surfacing large areas
- Using set screws, set diameter of cut
- Operate at 50% of RPM and feed rate indicated by "Feeds and Speeds" chart

Facing Mill



- For facing a large surface to near-mirror finish or planing large areas quickly
- Select facing tool (HSS vs. Carbide)
- Refer to "Feeds and Speeds" chart by outer diameter of facing tool
- Some can be operated at higher feed rate. Ask a mentor or Russ

Stub Arbor:

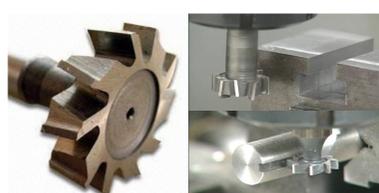
Stub Arbor



- For mounting thin slot cutters and large diameter dovetail cutters
- Specified by arbor diameter
- Remove locknut and washer from end, slide cutter onto arbor, aligning slot on tool with key on arbor, and replace washer and locknut
- Tighten until tool is immovable, but without causing deflection

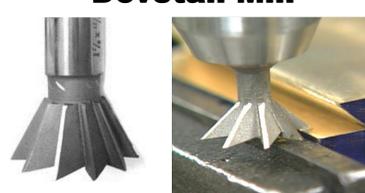
Slot Cutters:

T-Slot Cutter



- Cut side slots, full t-slots, and keyways straighter than an endmill
- Before employing t-slot cutter, remove as much material as possible with an endmill
- Determine thickness and width of slot or keyway to be cut
- Select cutter with appropriate dimensions
- Operate slot cutter at 70% of speed indicated by "Feeds and Speeds" chart

Dovetail Mill



- For cutting dovetail side cut or full dovetail cuts
- Specified by major diameter and cut angle
- Operate at 70% of RPM and feed rate indicated by "Feeds and Speeds" chart.

Thin Slot Cutter



- For cutting thin side slots or keyways
- Determine thickness and depth of slot to be cut
- Select cutter with appropriate dimensions
- Mount cutter to appropriate stub arbor (see below)
- Operate slot cutter at 70% of speed indicated by "Feeds and Speeds" chart