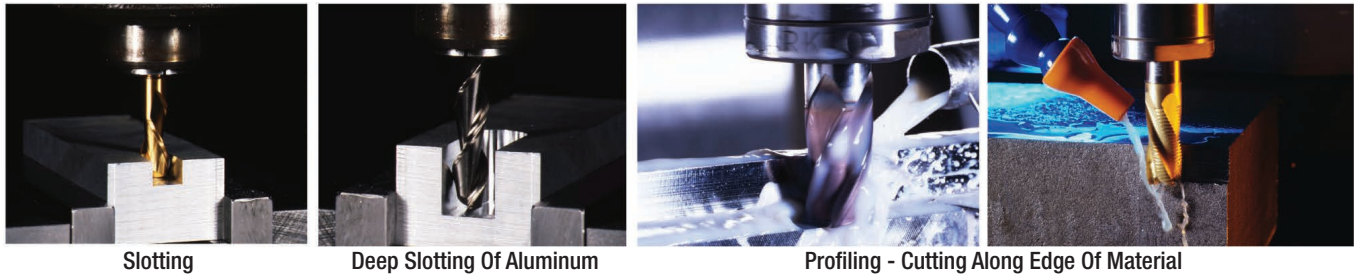


An end mill is a “shaping tool.” It is a rotary cutting tool with sharp edges and helical or straight flutes for the passage of chips and admission of cutting fluid. Common types of milling include: Slotting, Pocketing, Profiling, Contouring.

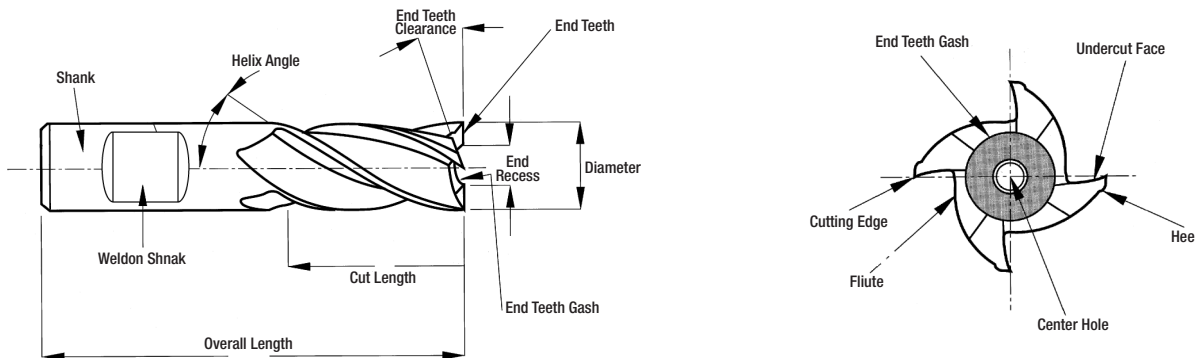


Slotting

Deep Slotting Of Aluminum

Profiling - Cutting Along Edge Of Material

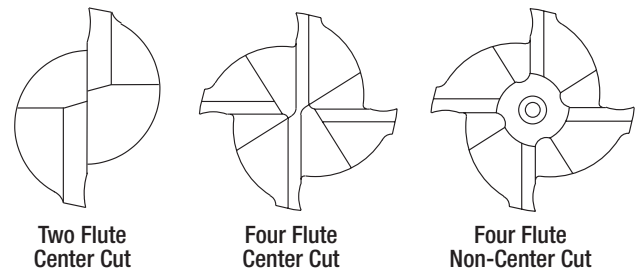
Anatomy & Nomenclature



- > Most end mills have Weldon flat shanks - flats ground onto the shanks secure end mill in collet
- > Flutes are grooves that run along the body - provide a pathway for chip removal and allows coolant to reach cutting edges
 - Two flute end mills can all plunge-cut and are often used for slotting applications
 - Four flute (multi-flute) end mills are often chosen for profiling
- > Length of Cut (LOC) - the maximum usable cutting depth
- > Helix angle determines the rate at which chips are carried away from the cut

Types Of End Cut

- > Center Cutting - Able to “plunge-cut” or drill into material
- > Non Center Cutting - End cutting edges do not meet in center, tool cannot plunge-cut
- > Ball Nose - Used to create compound curved shapes (i.e. molds)



Two Flute Center Cut

Four Flute Center Cut

Four Flute Non-Center Cut

Material & Coating Types

- > End mills are made from High Speed Steel (HSS), Cobalt Steel, or Carbide
- > High Speed Steel is the least expensive material, used for milling carbon steel, cast iron and non-ferrous materials
- > Cobalt (i.e. M42) offers greater wear resistance to abrasion and heat
- > Solid carbide is significantly harder than both HSS and cobalt providing greatest wear resistance & longest tool life
- > Significant productivity gains are realized with carbide end mills, as they can be run at higher speeds and feeds
- > End mills are often coated i.e Titanium Nitride (TiN), Titanium Carbo-Nitride (TiCN) - for further enhanced performance

General Milling Recommendations

- > A liberal supply of cutting fluid or coolant should be used
- > Follow recommended feeds and speeds