Common Tools for Working with Ferrous Metals

Since the tools in the MAE Student Shop are only intended to support machining of non-ferrous materials, this document details common cutting tools used when working with ferrous metals. The descriptions are meant to offer guidance so you can purchase the right tools for your needs. Please ask any additional questions you have.

Turning / Facing Inserts

The lathe uses ***WNMG 43X*** style indexable tungsten carbide cutting inserts. The **X** in the style description refers to the corner radius on the cutting insert. 43**1** means **1**/64″ corner radius; 43**2** means **2**/64″ (or 1/32″) corner radius, etc. Smaller corner radii are better for finishing passes and larger corner radii are better for general turning/roughing operations. WNMG inserts have three cutting edges that can be used (or *indexed*) per side, so they provide excellent value for your turning and facing needs. These inserts are often available with coatings (like TiN) for improved heat resistance, which helps the tools last longer when cutting ferrous metals.

Alternatively, you can purchase ***single point carbide cutting tools***, which have a small ground piece of tungsten carbide brazed to a square steel shank. When ordering these, specify right hand cutting direction and a shank height of ½″ or less. These tools are typically cheaper than buying an insert, but they only have one cutting edge compared to three or six for the WNMG inserts listed above.

Parting / Grooving Inserts

The lathe uses 0.122″ wide ***GTN-3*** style tungsten carbide parting / grooving inserts. These inserts are also available with coatings (like TiN) for improved heat resistance, which helps the tools last longer when cutting ferrous metals.

High Speed Steel Drill Bits

When cutting ferrous metals there are two main choices of drills: normal length (called ***jobber drills***) and short length (called ***screw machine drills***). Jobber drills are used for typical operations (or *jobs*) and are the standard lengths used in the shop. Screw machine drills are shorter and stiffer, which is better when drilling holes which are less than 4 drill diameters deep. Both drills types are available with normal points (which require the use of a center drill and 1/4″ incremental size increases) or ***split points*** (which have a center drill ground into the point and do not require incremental size increases to reach the final hole size). High speed steel drills are also available with cobalt added for additional toughness and heat resistance, as well as coatings (like TiN) for even more heat resistance, which helps the tools last longer when cutting ferrous metals.

Carbide Endmills

When cutting ferrous metals you should order ***4 flute carbide endmills*** (as opposed to 2 flute high speed steel for cutting non-ferrous materials). Carbide endmills are available with coatings (like TiN) for improved heat resistance, which helps the tools last longer when cutting ferrous metals. If

you are performing a significant amount of material removal, it is wise to invest in a roughing endmill and a regular (finishing) endmill. Roughing endmills have tougher edge geometries so they last longer when removing bulk material, but they do not produce as nice of a surface finish as regular endmills.

Threading Taps

When threading ferrous metals you should order 4 flute high speed steel or cobalt taps (NOT the cheaper and weaker carbon steel taps). Threading taps are commonly available in three styles: *taper, plug and bottoming*. ***Taper taps*** are the most common taps used for tapping thru-holes; the first 7-10 threads are typically tapered to help start the thread with less aggressive cutting action (i.e. without chipping the fragile cutting teeth on the tap). ***Plug taps*** are also very common; the first 3-5 threads are typically tapered, requiring more torque than tapered taps, but plug taps can efficiently thread thru and blind holes. ***Bottoming taps***, as the name implies, are used in special cases to thread holes as close as possible to the bottom of a blind hole; only the first 2 threads are tapered. Bottoming taps can only be used after a hole has already been tapped with a taper or plug tap. Taps are available with coatings (like TiN) for improved heat resistance, which is not necessary when tapping at low speeds by hand.

When creating pipe threads in ferrous materials, order both an ***interrupted thread pipe tap*** and a ***tapered pipe reamer*** for the size pipe thread you desire to create. Interrupted thread pipe taps have every other thread relieved (i.e. removed) so the cutting torque is much lower, which is important for tap life and ease of use, since you are rotating the tap by hand.

Bandsaw Blades

Begin by checking the material's hardness using a file (if the file polishes the metal instead of creating a chamfer, the material is too hard to cut on the bandsaw). When cutting ferrous metals you need a bandsaw blade with a relatively high number of teeth per inch (TPI). We recommend quality (Starrett, Lenox, or Morse brand) 10′ x 1/2″ x 0.035″ or 10′ x 3/4″ x 0.035″ bimetal or cobalt steel welded bandsaw blades with 14 to 18 TPI. The ¾″ wide blade is more robust than the ½″.

Sanding Discs

The disc sander uses 12″ aluminum oxide ***pressure sensitive adhesive*** (PSA) backed sanding discs. These sanding discs are available in different grits depending on the type of work being performed. The lower the grit number the coarser the sanding disc. 60 or 80 grit discs are most commonly used.

Common Tooling Vendors

McMaster-Carr // www.mcmaster.com // quality tools; quick delivery out of Atlanta
U S Shop Tools // www.usshoptools.com // good pricing and selection
MSC Direct // www.mscdirect.com // quality and economy tools; quick delivery out of Atlanta
Lakeshore Carbide // www.lakeshorecarbide.com // great quality and value
Mari-Tool // www.maritool.com // great quality and value