

Bridgeport 101



Safety

- Don't wear gloves
- Don't wear long sleeves or 'dangly' clothing
- Wear eye protection
- Wear closed shoes (no sandals, crocs, etc) Steel toe isn't a bad idea.

What to do WHEN something breaks

- Shut everything down as soon as possible
- Report the breakage
 - https://dallasmakerspace.org/wiki/Machine_Shop_Tasks
 - Supplies/Replacement tooling
 - Maintenance
 - Email: machineshop@dallasmakerspace.org

Noise

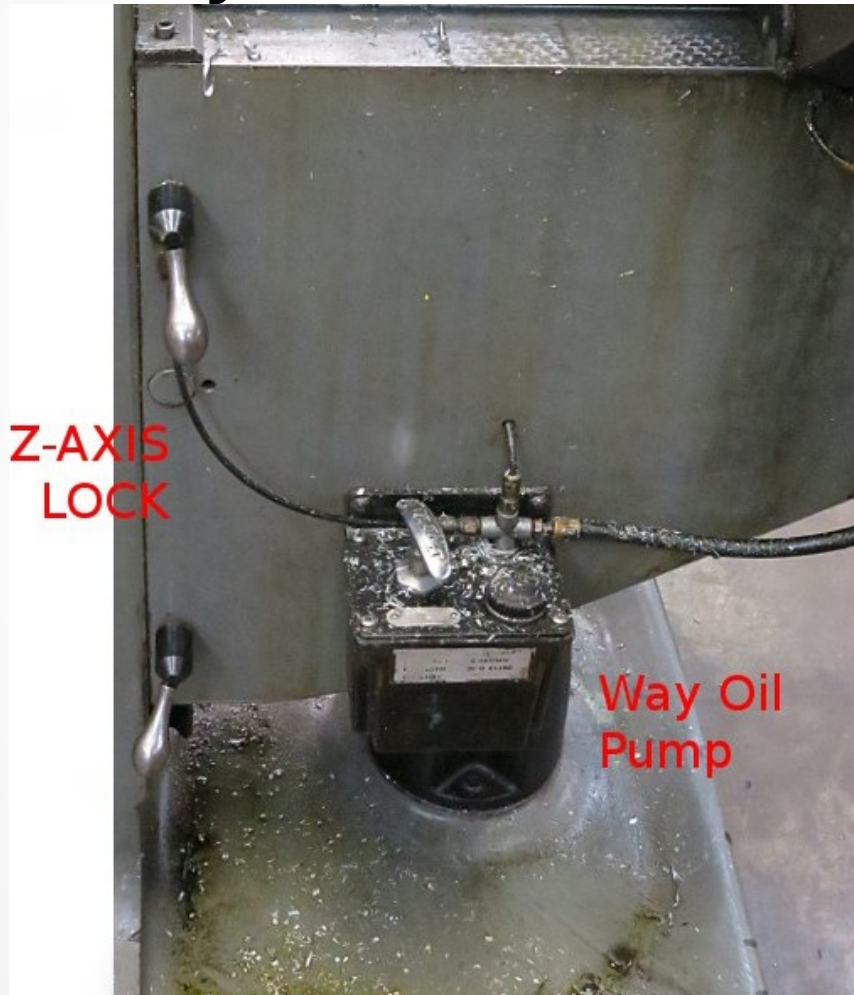
- If it doesn't sound right, then STOP
- Metalworking when done properly is MUCH quieter than woodworking.

Basic Rules

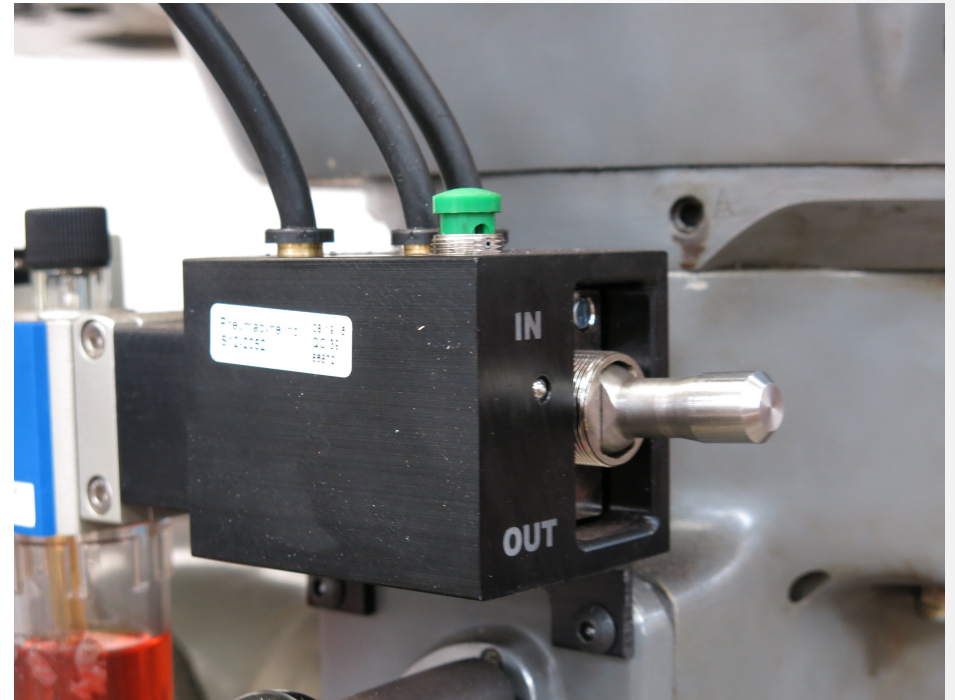
- Clean up your mess!
- Put the tools back where they belong!
- If you don't know, ask!

Controls

- Oil the ways

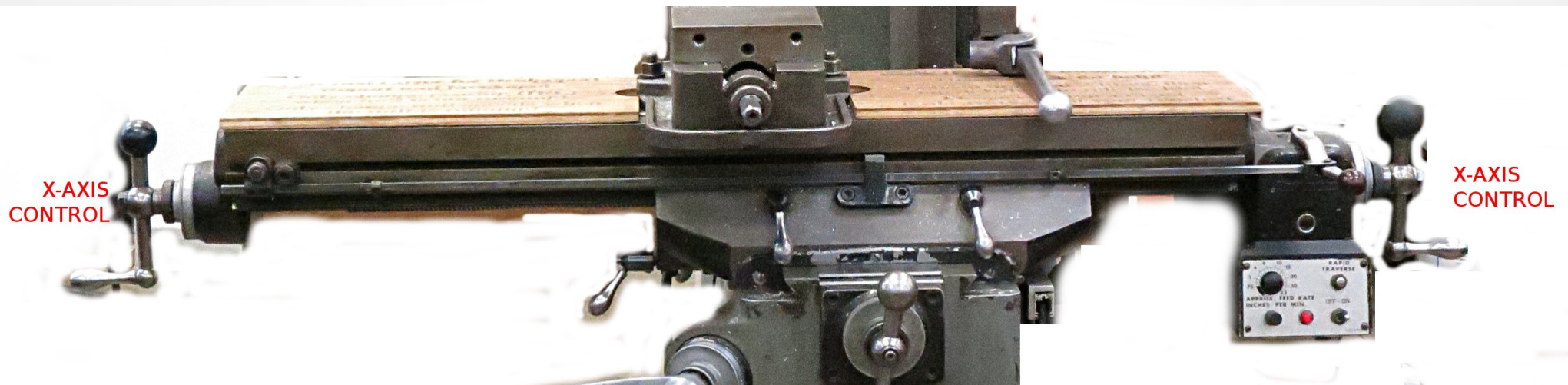


Controls



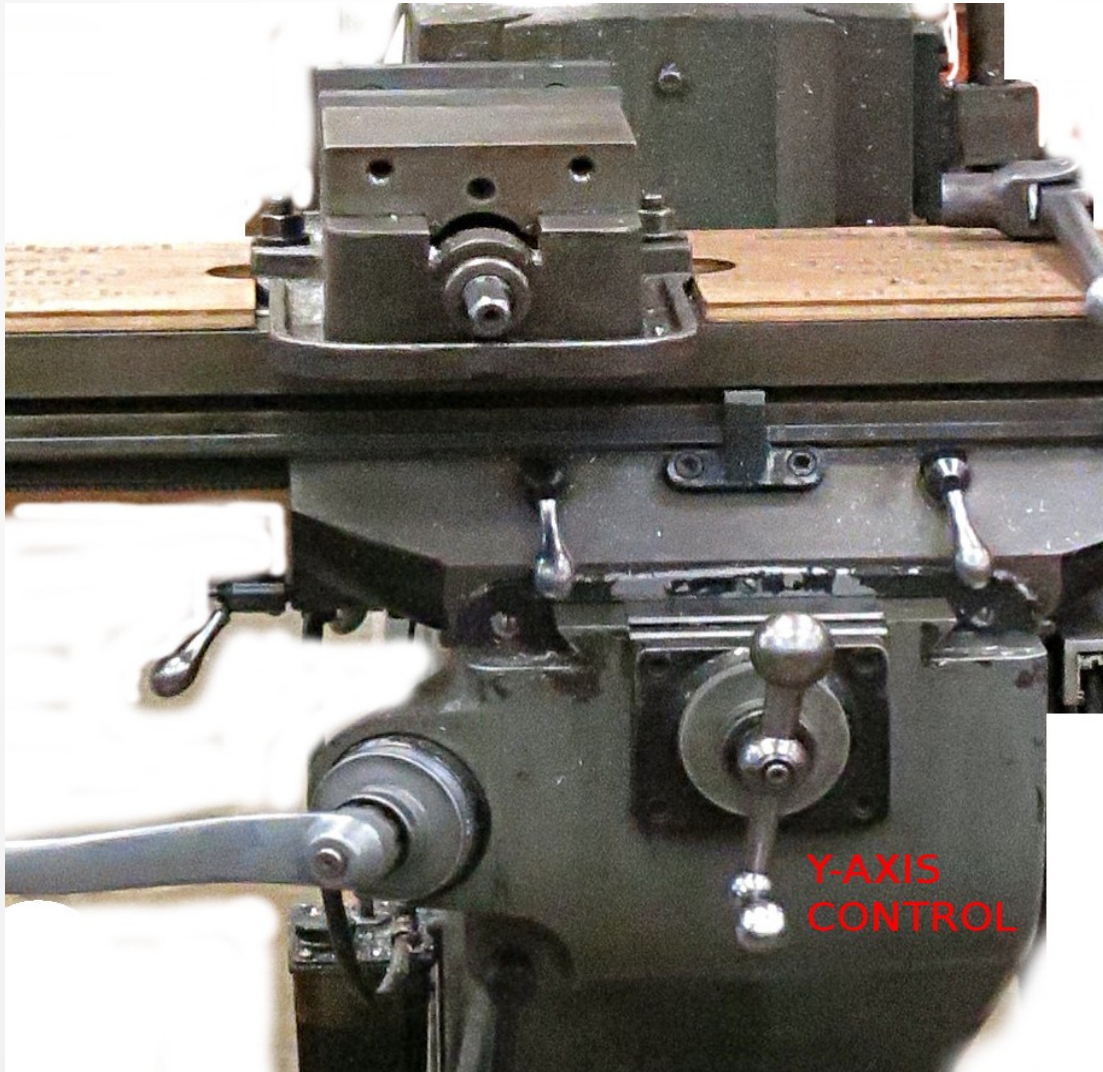
Controls

- X motion control and locks



Controls

- Y motion control and locks



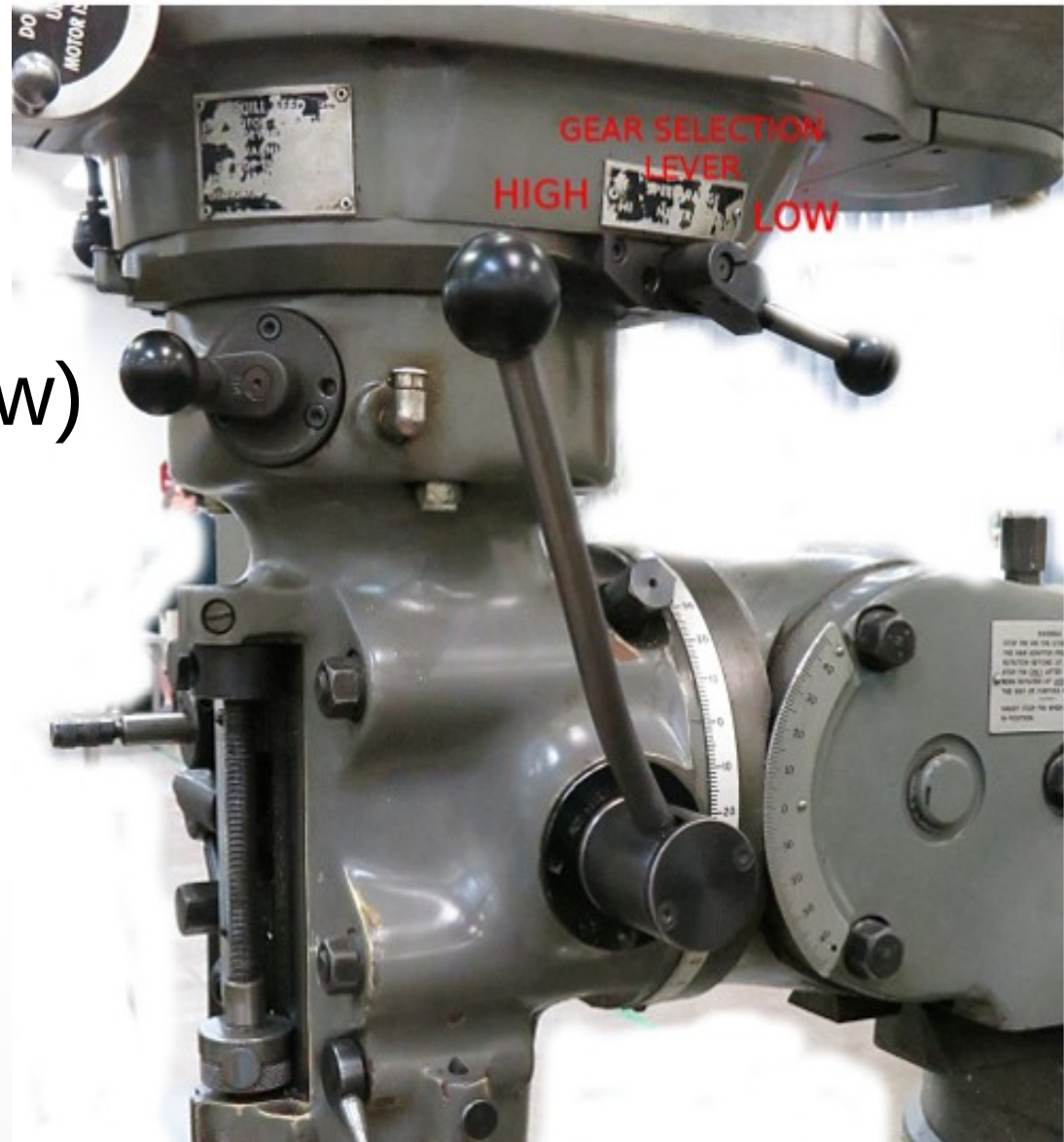
Controls

- Z motion control and locks



Controls

- Quill Controls
- Motor Control
 - Gearing (High / Low)
Only when off
 - Brake
 - Speed Control
Only when on



DRO

- Avoid backlash
- Only on X & Y coordinates
- Need to use dial indicator or other means for Z-axis

Power feed

- Make sure x-axis IS NOT LOCKED
- Make sure vise and Z-axis handle will not conflict
- If you hear a grinding noise, STOP

Cutting Fluid

- You should always use, except when cutting brass or cast iron.
- Type is a personal choice

Cutting speeds

- Complete chart is in Machinery Handbook
- The numbers in such charts are the absolute MAXIMUM you use when everything is done correctly

Cutting speeds

- Such perfection is really only achievable with CNC, so when using a manual machine start at about $2/3$ of the values in the charts

Cutting speeds

- The speeds are provided as 'surface feet per minute'
- Convert to RPM with the following

$$\text{SFM} * 12 / (\text{Pi} * \text{diameter of cutting tool})$$

which can be approximated by

$$\text{SFM} * 4 / \text{diameter of cutting tool}$$

Checking Machine

- Checking TRAM
- Check if Vice is square

TRAM

- How square is the Mill Spindle to the bed of the mill?
- Fixing requires experience and time
- Checking if 'good enough'
- Most important when using Face Mill

Face Mill



Checking Vice

- Run indicator across vice jaw (or back) to ensure vice is square



Milling Vice



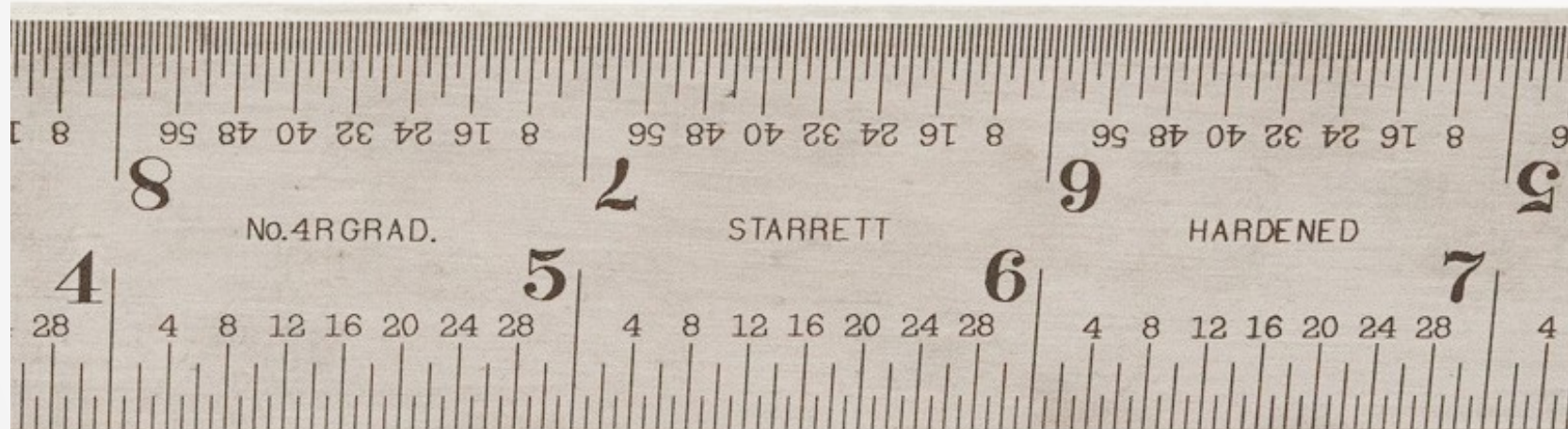
Checking Vice

- Should do every time you use, unless precision or operation doesn't require it.

Measurement Tools

- Scales (rulers)
- Combination Square
- Calipers
- Micrometers
- Dial Indicators

Scales



Combination Square



Calipers

- Measures to 6"/150mm
- Accurate to a few 0.001"/01mm



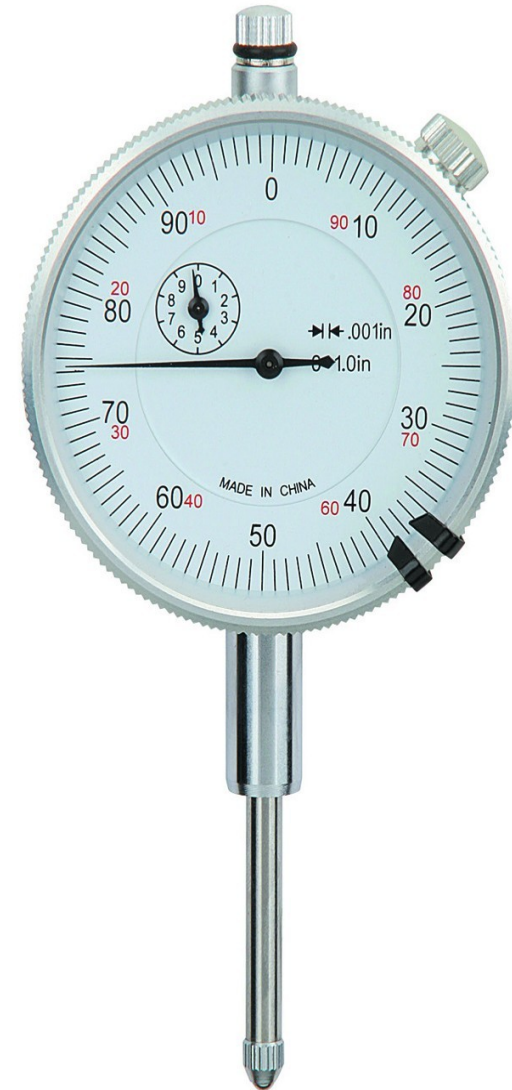
Micrometers

- Small range
- Accurate to a few 0.0001”
- Takes practice to achieve accuracy



Dial Indicators

- Can be used to measure Z-axis travel
- Typically 1" range, with 0.001" precision



Drilling Operations

- If the part isn't moving, ie the tool is plunging into the piece you're drilling
- Use Quill or Z-Axis, depending up level of control and precision required
- Used for drill bits, reamers, counterbores, etc.

Drill chuck



Drill bits



Reamers



Counterbores



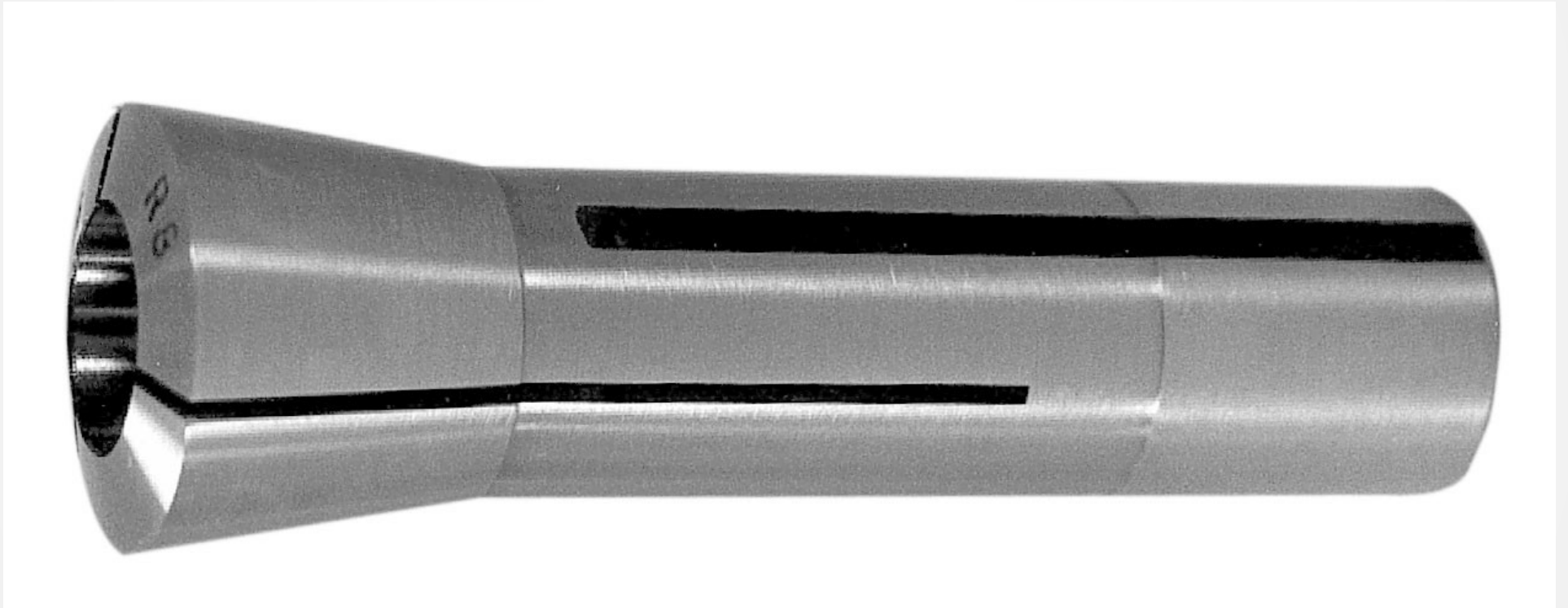
Countersink



Milling Operations

- If you're moving the table in the X or Y direction you're **MILLING**
- Only hold bits in a collet
- End mills, face mills, etc...

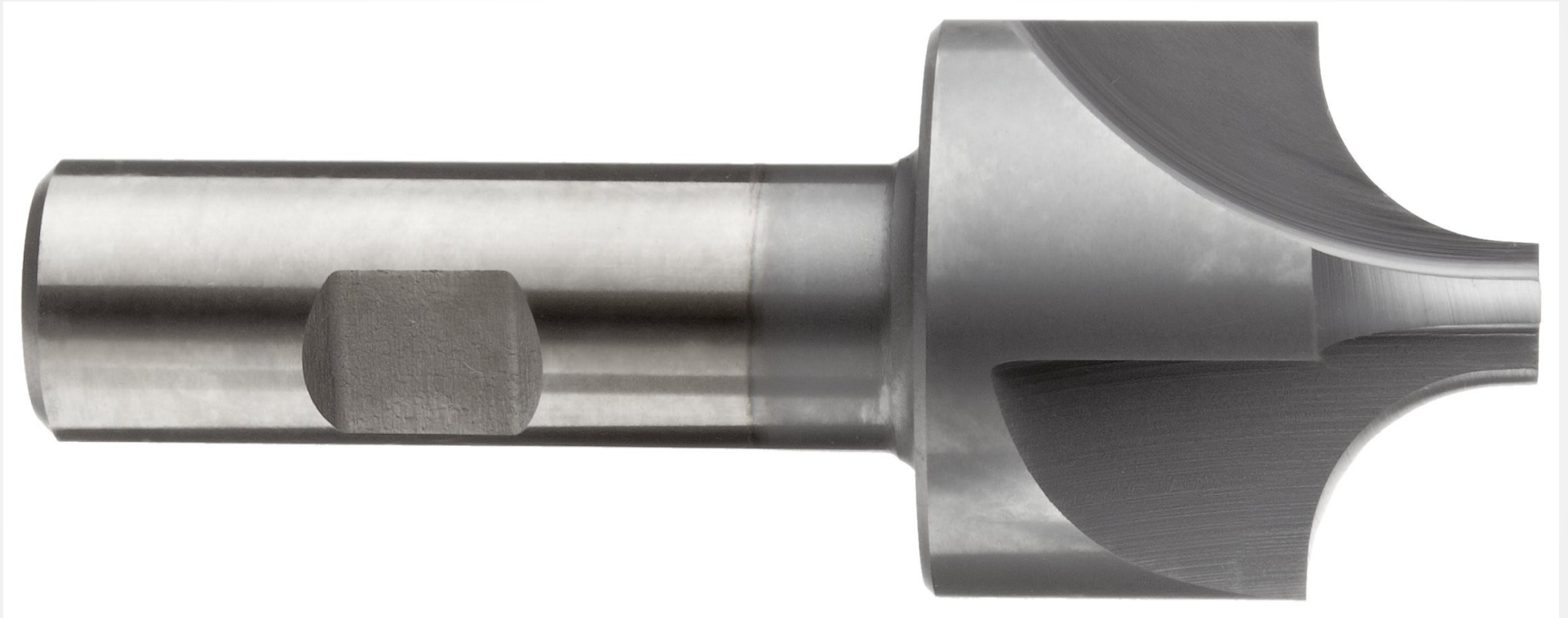
R8 Collet



End mills



End Mills



End Mills



End mills

- Know if your end mill is center cutting and why
- Come in a wide variety of styles
- 2/3 flute for aluminum, 4 flute for steel or cast iron

Face Mill



Face Mill

- Used for surfacing the top of a workpiece
- Can't get into corners typically

Holding Parts

- Vice is most versatile
- Thin parts require special treatment
- Can use clamping set on bed

Clamping Set



Locating Parts

- Need to determine origin point
- Center finder for holes
- Edge finder for parts

Locating Parts - Origin

- The plans determine the origin
- No plans? You decide.

Finding hole

- Use Center Finder
- Center Punch



Edge Finder

- $\leq 1000\text{RPM}$
- Subtract rod

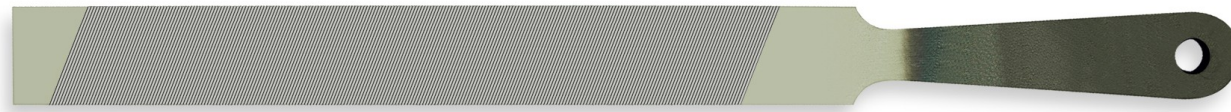


Post Operations

- Deburring
- Cleaning

Deburring

- Files



- Deburring Tool



Cleaning

- Torrent Parts Washer
- Parts can change size after initial milling