

Tormach CNC

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Safety

When using the CNC machine, the following safety precautions should be taken:

- All doors should be closed prior to and remain closed while the spindle is turned on
- All limbs should be outside enclosure when table is under automatic movement
- Should there be adequate reason to reach into the enclosure while a rotary tool is active, DO NOT WEAR GLOVES. Remove or pull back long sleeves.
- E-stop is located under the computer tray toward the front left. Know where it is prior to running the machine, and do not hesitate to use it if you get the feeling you should.
- Safety glasses should be worn while working inside the enclosure, such as while putting material into the vise, or cleaning up chips.

Operation

Startup procedure:

- Turn on lights by powering on the power strip located on top of the machine, toward the rear right hand side.
- Turn on the machine by rotating the power switch inside of the enclosure, to the rear right of the machine.
- Twist the E-stop button located under the keyboard tray.
- Press the green button located under the keyboard tray, next to the e-stop.
- Click "Reset" button on the computer.

Refilling coolant:

- Coolant should be mixed with water. Resulting solution should contain 4-6% coolant.
- Coolant levels should be tested/confirmed using the refractometer. Ensure the tank has been decently mixed and pull a sample using the pipette. Put the sample on the prism of the refractometer, and look through the eye piece.
- If coolant supply is running low, more can be ordered from Tormach under part# 31750.

Shutdown:

- On the computer, select "Exit".
- Press the E-stop button.
- Confirm shutdown on computer.
- Turn off the machine by rotating the power switch inside of the enclosure, to the rear right of the machine.
- Turn off lights by powering off the power strip located on top of the machine, toward the rear right hand side.

Reference Files/Pre-written Code

Please add any standard code or other reference files at /home/aleph/shared-j/Documents/R&D/Tormach_CNC/

- Contains code for facing using the Superfly tool, which FreeCAD Path workbench struggles with. Use it stand-alone or copy paste into FreeCAD generated programs.
- Contains and should be updated with current tool table for use with FreeCAD. If you update the tool table on the machine while using it, please update the file. Please import the file any time you are creating a program in FreeCAD to ensure it is accurate to current offsets.

Using FreeCAD Path workbench to create programs

When using FreeCAD Path workbench to generate programs for the CNC, most things will be handled by the linuxcnc post-processor. However, a few additional things will be needed:

- Every occurrence of a M6 command (tool change) needs to be amended with "G43 H" and then the tool number as listed for the T value earlier in the line. For example, the line should read "M6 T3 G43 H3" T and H values should always match.
- Every occurrence of a M6 command should be followed with an M8 command (coolant on).
- Every occurrence of a M6 command except the first should be preceded with an M9 command (coolant off).
- Postamble section should have a M9 command (coolant off) added to the beginning.

Speeds and Feeds and Cut sizes

These are a work in progress, provided here for reference. Feeds in FreeCAD are done in mm/s, while the machine conversational uses mm/m.

T1 - 1/2" (12.7mm) End Mill	
Speed (RPM)	3,000
Horizontal Feed (mm/s)	12
Horizontal Feed (mm/m)	720
Vertical Feed (mm/s)	
Step down (mm)	1

T3 - Superfly (76.20mm diameter)	
Speed (RPM)	3,000
Horizontal Feed (mm/s)	3
Horizontal Feed (mm/m)	200
Step down (mm)	0.5

T7 - 1/8" (3.18mm) End Mill	
Speed (RPM)	3,000
Horizontal Feed (mm/s)	5
Horizontal Feed (mm/m)	300
Vertical Feed (mm/s)	1
Step down (mm)	1

T8 - 1/4" (6.35mm) End Mill	
Speed (RPM)	3,000
Horizontal Feed (mm/s)	6
Horizontal Feed (mm/m)	360
Vertical Feed (mm/s)	1
Step down (mm)	1

T13 - 2mm End Mill	
Speed (RPM)	3,000
Horizontal Feed (mm/s)	3
Horizontal Feed (mm/m)	180
Vertical Feed (mm/s)	0.5
Step down (mm)	0.5

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