

# Build Your Own CNC Mill Workshop

## Level I – Assembly and Operation of a CNC Mill

### 3-Day Workshop

The Build Your Own CNC Mill Workshop is designed to help prepare instructors for the increasing demand in providing a skilled labor force to the manufacturing industry. Knowledge and understanding of CNC milling fundamentals are essential for individuals who are interested in working in industrial manufacturing settings. Learning how to build and operate a CNC mill will greatly expand an instructor's ability to provide cutting edge educational opportunities for their students. This workshop will provide a vast overview of CNC milling technology, fundamental skills of operation of hardware and control software, as well as an introduction to DeskProto CAM Generating software.

#### Day 1 – Assembly of the CNC Mill

- Introduction to CNC Milling
- Sub-assemblies
  - Controller housing
  - XY-table platform base
  - Stepper motor drivers
- Assembling the base
- Y- stage assembly
  - Motor and lead screw
  - Alignment and slide test
- X-table assembly
  - Extrusions and plastic parts
  - Alignment and slide test
  - motor, and lead screw
- Z-stage assembly
  - Vertical axis components
  - Alignment and slide test
  - Motor and lead screw
- Controller wiring
  - Stepper motors and drivers
  - XYZ limit switches
  - On/Off switch, E-Stop, and power supply
- Mounting the spindle
- Mechanical systems test

#### Day 2 – Basic CNC Operation

- Safety precautions
- CNC Mill Tooling
  - End Mill bits
  - Milling terminology and techniques
- Cutting tool fundamentals
  - Size and shapes of cutting tools
  - Rotational direction
  - Climb vs. Conventional milling
  - Various Material Stock
  - Chip formation
- Feeds and Speeds Calculator
- G-Code - CNC Mill Movements
  - Coordinate system
  - CNC Motion control
  - Setting zero positions
  - Tool and fixture offsets
- Creating a simple G-Code program
- Dry pass testing of G-Code
- Various milling exercises
  - Testing G-Code programs

#### Day 3 – DeskProto CAM Software

- Overview of DeskProto CAM Software Manual
- Software installation and interface overview
- Software menus and command functions
- Operational Procedures
  - Project flow chart
  - Part geometry
  - Material holding
  - 2D Operations
  - Z-Grid and Toolpath generation
- Running simulations
- Running CAM NC program
- Various CAM practice exercises
  - Custom nameplate activity
  - Complex face curve activity
- Suggested practice exercises
- Online resources available for additional background and information
- Review of materials presented
  - Question and answer session