



Micromill Pro  
CNC Machine  
User's Manual

UK  
CA | CE  
approved

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**DEFOR®**

## 1 : Notes



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# 1: Warning Notices

## Warranty Disclaimer.

The Warranty on your Mill will be invalidated if any modifications are made to the machine or any additional ancillary equipment fitted, or any adjustments are made to the controlling devices without prior notification from Denford Limited. Please refer to the information held in your separate Warranty pack, for specific details.

Any portable appliance testing (PAT) carried out on this equipment must comply fully with the instructions outlined later in this chapter.

## Maintenance Disclaimer.

Always obtain permission from the person responsible for machinery in your establishment, before accessing the electrical control panel or Mill machine casings to carry out any maintenance work. All work must be carried out by personnel suitably qualified for each maintenance task, to avoid damage to the machine systems and injury to the maintenance personnel. Denford Limited cannot accept responsibility for any damage, injury and/or loss that may occur through incorrect maintenance of your Mill.

## Use of Machine.

Your Micromill is designed for machining resistant materials such as wax, plastics, acrylics and non-ferrous metals such as aluminium. In each case, the appropriate tooling, speeds and feeds should be used as recommended by the material supplier. Information should also be sought from suppliers regarding the safety specification of the materials to be cut. Only use water based soluble oil cutting fluids, do not use parafinic or potentially explosive cutting fluid.

Your Micomill is not intended for use with any ferrous metals, MDF or hard woods which may react with the machine lubricants causing oxidation of the machine surfaces, or with any materials which may contain known carcinogens. Do not attempt to use your Micromill CNC machine for manual operations. Do not machine any toxic, radio-active or volatile materials.

**Use of the machine for any purpose other than those for which it is designed may result in injury, and may also invalidate the warranty.**

The machine should only be used under constant supervision, to help guard against, and respond to, any unforeseen hazard such as fire or explosion. First aid and firefighting equipment (CO<sub>2</sub> Extinguisher) should be located nearby in a clearly signed and prominent position.

# 1: Warning Notices



## Sound Level Disclaimer.

The Noise Level test published in this manual is for the machine and any essential equipment such as dust extraction equipment, and complies with the relevant standards. It cannot make provision for noise resulting from the cutting process, since this is a variable, depending on such factors as material, cutting data and tooling.

Any ancillary equipment supplied by Denford will also comply with the relevant standards. However, when used jointly with the machine in a machining environment, the combined sound levels emitted may require that Personal Protection Equipment, such as ear defenders, be used. Other factors, such as high ambient noise levels and nearby machinery and equipment can also increase the sound levels.

It may be possible to reduce the sound levels by changing the machining process and/or repositioning the machine and/or its ancillary equipment.

If, under these circumstances, it is felt that the sound level is still unacceptably high, then independent advice should be sought and complied with.

If you have any doubts and/or questions regarding the use, specification, servicing, or features of your machine, please contact Denford Customer Services.

Denford Limited reserves the right to change the specification and/or operating features regarding this CNC machine without notice or documentation.



## Portable Appliance Testing.

### In-Service Testing

This is the testing carried out as a routine to determine whether the equipment is in a satisfactory condition.

In-Service testing will involve the following:

- Preliminary inspection
- Earth continuity tests (for Class 1 equipment)
- Insulation testing (for Class 1 equipment)

Electrical testing should be performed by a person who is competent in the safe use of the test equipment and who knows how to interpret the test results obtained. This person must be capable of inspecting the equipment and, where necessary, dismantling it to check the cable connections.

# 1: Warning Notices

## Portable Appliance Testing (continued).

If equipment is permanently connected to the fixed installation, e.g. by a flex outlet or other accessory, the accessory will need to be detached from its box or enclosure so that the connections can be inspected. Such work should only be carried out by a competent person.

### Preliminary inspection

Formal visual inspections should only be carried out by persons competent to do so.

- Cables located so as to avoid damage
- Means of disconnection/isolation readily accessible
- Equipment positioned to avoid strain on cord
- Equipment is being operated with the covers in place
- Indiscriminate use of multi-way adaptors and trailing sockets is avoided
- Identify signs of overheating
- Identify signs of damage to insulation
- Check the correct size fuse is fitted (10A)
- Check the flexible cable connections and anchorage.

**Before carrying out the following tests ensure the machine is disconnected from any external equipment or supplies.**

**Ensure Ethernet (RJ45) and USB (if applicable) connections are removed prior to testing.**

### Earth continuity Test (Class 1 equipment)

The test should be carried out at 25A for a period of 5 – 10 Seconds

The reading should be less than  $0.1 + R$  (where R is the resistance of the lead)

### Insulation Resistance Test (Class 1 equipment)

The applied test voltage connected between Live/Neutral and Earth should be 500VDC

The insulation Resistance should be greater than 1M Ohms

# 1: About this Manual

Using this manual	<p>This manual provides information describing how to transport, site, setup and operate the basic functions of your Denford Mill CNC machine, including any operational features of hardware specific to the Denford Mill series.</p> <p>This manual does not provide any information regarding the software packages used. Please refer to the help section within the appropriate software.</p> <p>Please note that the Electrical Diagrams for your Mill are not included in this manual - they are delivered separately in the standard equipment box supplied with your CNC machine.</p> <p>If you have any doubts and/or questions regarding the specification, servicing, or features of your Mill, please contact Denford Customer Services. Denford Limited reserves the right to change the specification and/or operating features regarding this CNC machine without notice or documentation.</p>
Disclaimer	<p>Please note that due to the nature of hardware and software developments, the specifications and features of this product can change without notice. The information contained in this manual is correct at the date of printing only - February 2023. No liability can be accepted by Denford Limited for loss, damage or injury caused by any errors in, or omissions from, the information supplied in this manual.</p>
Screenshots	<p>Please note that any screenshots are used for explanation purposes only. Any numbers, wording, window or button positions may be different for the configuration of the CNC machine control software being used to control your Mill.</p>
Language	<p>This manual is written using European English.</p>
Contact	<p>Any comments regarding this manual should be marked for the attention of our technical authoring team and referred to the following e-mail address: <a href="mailto:customerservices@denford.co.uk">customerservices@denford.co.uk</a></p>



# 1: Introducing your Micromill Pro

Congratulations on your purchase of a Micromill Pro CNC machine. In this manual you will learn how to setup and use your Machine correctly and safely.



Your Mill is a full three axes CNC Milling machine. Suitable for all levels of education and training, it is manufactured to meet industrial standards. Your Mill is the ideal partner for intensive 3D applications. Your Micromill Pro is designed with you in mind - making the processes involved both safe and easy to use.

## Main Features:

- Designed specifically for Education and Training.
- Manufactured to industrial standards.
- Programming via International Standards Organisation format (ISO).
- CE & UKCA approved for safety.
- Capable of cutting common resistant and prototyping materials, including Wax, Plastics, Acrylics and Aluminium.
- Links to various CAD/CAM software packages.
- Totally enclosed high visibility interlocked guard.
- Feedrate and Spindle Speed override controls.
- Dust extraction ready.

# 1: Before Beginning to Setup

Before beginning to set up your Micromill Pro, please check your separate order documentation, making sure that all items have been delivered to your establishment. Any missing or damaged items should be reported to Denford Customer Services as soon as possible.

The following equipment is supplied as standard with your Mill CNC machine :

- Micromill Pro CNC machine. Note that the precise specification of your CNC machine will depend on any options selected at the time of ordering (see below).
- Work Holding Package (including Datum Plate, Miteebite Clamps and Tee-Nuts).
- 1 x Set of imperial allen/hex keys.
- 1 x Set of metric allen/hex keys.
- 3 x Toolholders.
- 3 x Cutters.
- 1 x Micromill Pro warranty pack (UK Machines only).
- 1 x CD-ROM containing Denford VR CNC Machine Control Software and manuals, and Machine user's manual.
- 1 x CD-ROM containing VR CNC Machine Control Software Security Key.
- 1 x RJ45 Ethernet cable.
- 1 x USB to RJ45 adaptor.
- 1 x Mains Cable.
- 1 x Spare fuse pack.

The following optional equipment may also be supplied with, or ordered for, your machine:

- Additional Software: CAD/CAM, Offline CNC Machine Control.
- CNC Machine Control software security keys.
- Machine work bench and PC workstation.
- Vacuum for dust collection.
- Additional work holding systems.
- Various tooling packages.

## 2: Safety Features and Precautions

### Safety Features Overview.

The following safety features are standard on your Machine:-

- Emergency stop button.
- Manually operated, totally enclosed guard door with interlock switch.
- Option to check CNC programs using toolpath graphics, prior to machining.
- Automatic tool retraction and spindle stop for tool changing.

### Safety Precautions.

Safety is very important when working with all forms of machinery but particularly when working with CNC equipment, due to the hazardous voltages, speeds and forces that exist in the hardware. Follow the rules below at all times, when using your machine.

General Safety Precautions :

- Wear clothing suitable for machine operation and follow the safe working procedures in place at your establishment. When emptying the dust extraction system base unit or cleaning down the machine, wear suitable respiratory protective equipment. Other personal protective equipment, such as eye protection, overalls and gloves should also be considered.
- Do not place any objects so that they interfere with the guards or the operation of the machine.
- Never try to clean the machine if any part of it is rotating or in motion.
- Always secure the work on the table or in a fixture or vice.
- Ensure that the correct cable for the power source is used.
- Ensure the mains power is switched off (and unplugged) before starting any maintenance work on the machine. Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine. When isolating the machine always ensure that all power sources have been disconnected. Post a notice informing others not to use the machine whilst undergoing maintenance.
- Hazardous voltages can still exist immediately after switching the machine off. Always wait at least 10 minutes before accessing the CNC machine electronics.
- If power fails turn off the mains power switch immediately and unplug the machine from the mains power socket.
- Correct maintenance is an essential part of the safe use of this machine (see the Maintenance section for further details).
- Observe caution when handling machine tooling, particularly with regard to hot and/or sharp cutters. Consider wearing protective gloves.
- When an emergency stop is required, press the circular red emergency stop button, located on the right side of the CNC machine front panel.
- Visually check door and window for signs of cracks or chips. Any damage should be reported immediately to Denford and a suitable replacement obtained without delay.
- Regularly check door gas springs and/or hinges for correct operation and inform Denford of any deterioration.
- Lubricate the required machine areas at the intervals specified in this manual, to prevent the axes from seizing (see the Maintenance section for further details).

## 2: Safety Features - Emergency Stop



The emergency stop button is located on the right front panel of the CNC machine. To activate an emergency stop, press the button fully in until it clicks.

A circular, red emergency stop button is located on the right front panel of your Mill, as shown above. When pressed, it has the effect of stopping all axes movements and bringing the spindle to a controlled stop. The guard interlock switch will also close. When the safety guard door is in its closed position, this will prevent access to the working area of the CNC machine.

To activate an emergency stop, press the button in until it clicks. The emergency stop button will continue to cut all power to the machine drives and keep the interlock switch closed, until the release sequence is performed.

To release a closed emergency stop button, turn the button clockwise until it springs back out.

After releasing an emergency stop, you will need to reset any CNC control software messages and home the CNC machines axes.

Check the emergency stop button is released before attempting to power up the Mill.

## 2: Safety Features - Interlock Guard

### Note

A closed safety guard door cannot be opened when:

- The machine is switched off (ie, not in use). To release the interlock guard switch, supply power to the machine.
- The emergency stop button is fully pressed in. To release the lock, push in and turn the emergency stop button counter-clockwise until it springs back out to its ready position.
- Machining is taking place. The interlock guard switch will release when the machining operations have been completed

### Warning



Danger of serious injury!

Do not let unauthorised personnel use the machine when the guard lock feature is disabled. Ensure the guard lock feature is switched back on as soon as possible. Under no circumstances must the safety switch actuator be removed (or a spare or replacement actuator, or other device be used) to defeat the safety interlocking system.

### Note

When the guard lock feature is disabled, the machine spindle will not operate. Ensure this is enabled before operation.

An interlock guard switch is fitted to the front machine door. The switch unit itself is attached behind the lower machine panel, accessible from beneath the front of the machine. The lock must be manually released to enter the working area when the 24 volt circuit has failed and the door is clamped electrically. An override facility is provided on the interlock guard switch, allowing temporary removal of the guard lock feature. For manual interlock release, the power supply must be switched off.



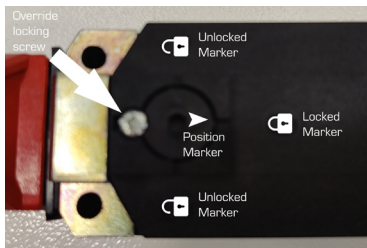
Left: The interlock guard switch unit (circled) is located behind the lower front machine panel.

1) Working beneath the front edge of the machine, locate the interlock guard switch unit.

2) Using a small flat or crosshead screwdriver, loosen the manual override locking screw until the circular black plastic lock screw can be turned (refer to photograph below).

3) Using a 3mm allen key, turn the circular black plastic lock screw one quarter turn to switch off the guard lock feature. If in doubt refer to the lock/unlock symbols embossed on the casing surface.

4) If necessary, tighten the manual override locking screw slightly. If you need to leave the machine, post a warning note informing users that the safety guard door lock is not operating.



Above: Looking directly at the face of the interlock guard switch

## 2: General Swarf Precautions



### General Swarf Safety Precautions.

Obtain "material safety data sheets" from your material suppliers and enforce the recommended precautions. Be aware that certain materials could contain known carcinogens. Please consult your materials supplier for further details.

Swarf particles that remain inside the working area of the Mill after a part has been machined, should be removed using a dust pan and brush or a specifically designed swarf and lubricants vacuum.

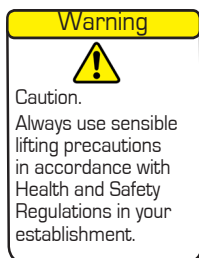
Never used a compressed airline for this purpose.

When cleaning down the machine, wear suitable personal protective equipment, such as respiratory protection, eye protection, overalls and gloves should also be considered.

swarf particles on the floor can cause slipping. This should be monitored by the operator and removed before becoming a hazard.



# 3: Unpacking and Lifting your CNC Machine



If your CNC machine has been supplied inside a delivery box, cut the top of the box open and remove any packaging carefully. To obtain better access to the machine, remove all the sides from the delivery box. Your Micromill Pro weighs 70 kg. for bench mounting.

With the bench mounting unit a suitable method of transportation must be used as the unit is not fitted with wheels: for example secure machine on a pallet and transport using a pallet truck.

If lifting by crane, suitable certified slings must be used as shown in following the illustration.



Denford advise manual lifting of this machine with 2 people, one at each side. Account should be taken of the non-uniform distribution of the weight of the machine. It is generally heavier at the rear side. The use of suitably rated lifting bars through the hollow sections under the machine may assist in lifting the machine.

Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment. Particularly in the case of manual lifting be aware of the danger of trapping.

Ensure that your CNC machine is both secure and balanced before lifting. Do not tip the machine whilst lifting.

All lifting equipment must be certified as being suitable for the loads involved.

# 3: Choosing a Site for your CNC Machine

Site your machine in a well ventilated room. If the Mill is supplied for bench mounting it should be sited on a bench of sturdy construction to take the weight of the machine and of a height which enables comfortable operating and programming to take place.

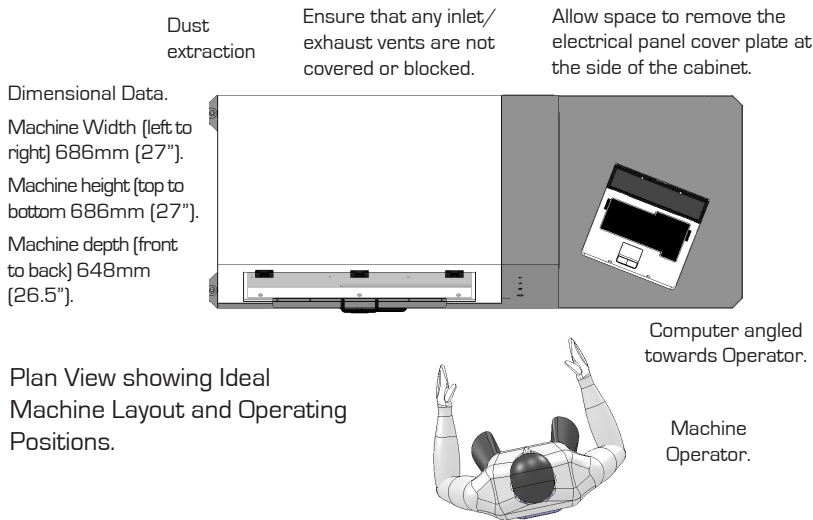
If the Mill is supplied with a Denford Duo Machine Bench, the adjustable corner feet should be wound down to contact the floor to help minimise noise and vibration.

Ideally, the user will operate the machine when standing at its front, with a clear view of both the machine working area (through the transparent guard window) and the personal computer being used as the controller unit (which should be angled towards the user), as shown in the diagram below.

Sufficient room should also be provided for effective maintenance to be carried out around the machine itself. In particular, leave enough space for removal of the large plate covering the electronics at the right hand side of the cabinet. Positioning the PC on a movable workstation may allow easier access to the various vents, connectors and switches on the machine cabinet, when required.

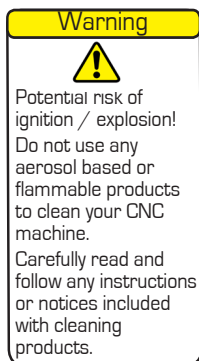
Position any vacuum pumps used with the dust extraction at the rear, or under, the machine table. The use of a centralised extraction system or, where possible locating the extraction unit in a separate room, will help in noise reduction. If non-hazardous materials are being cut, and the extraction unit is not employed, then noise level will be significantly reduced, particularly if the cover on the side of the machine is secured in the closed position. Again, if a vacuum pump is being used in conjunction with a vacuum work holding feature, remote location would assist in noise reduction.

Do not place the machine in a position which allows any of the cabinet vents to be covered. Ensure all cables, pipes and flexes are routed to avoid the possibility of users tripping over them.





# 3: Removing Protective Coatings and Packaging

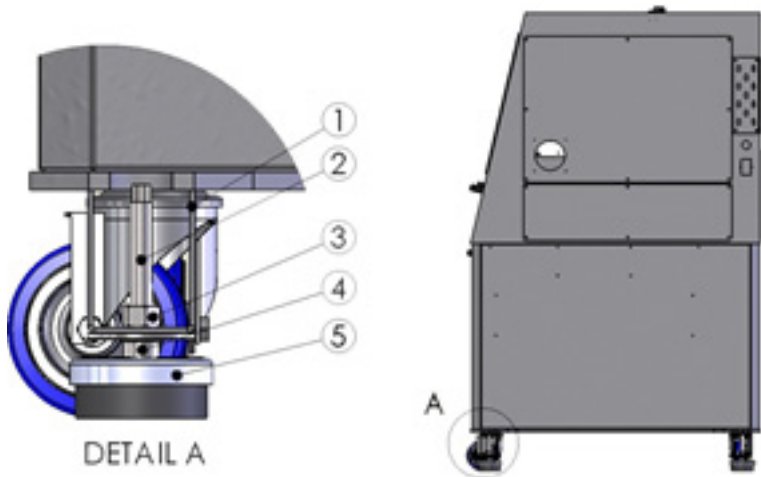


Once your Mill has been sited and connected electrically, the protective coatings and transit packaging must be removed to prepare the machine for running:

- 1) The protective plastic sheeting on the guard door and window must be removed prior to cleaning them with an antistatic cleaner.
- 2) Tie-wraps may be used in the working area of the machine, to prevent movement of components during transit. Additional items from your order may also be supplied packaged inside the working area.
- 3) To gain entry to the working area of the machine, power must be supplied to the machine, in order to release the switch unit that locks the safety guard door. Note that the switch unit will also remain locked when the emergency stop button is fully pressed in.

Warning - Aerosol based or flammable products must not be used to clean your CNC machine. To avoid the potential risk of ignition / explosion, ensure that any trapped solvent vapours can exit fully from any enclosed areas on the CNC machine. Wait at least 1 hour before attempting to operate the CNC machine.

### 3: Adjusting anti-vibration feet



This only applies if your machine is supplied on one of the Denford Duo machine benches.

Note: the anti-vibration feet are intended to be used as steadies and not for jacking the machine/base off its wheels. The wheels must always remain in contact with the floor.

These instructions are for siting the machine and also for when the machine is in transit.

1. Remove the hexagon bolt [2] and lock nut [3] from foot assembly
2. Compress support platform [4] into foot [5] sufficiently to allow the foot assembly to be positioned under the base bracket [1]
3. Re-fit hexagon bolt and locknut to foot assembly.
4. While preventing the foot assembly from rotating, turn the hexagon bolt clockwise with a 9mm a/f spanner until the support platform contacts the underside of the base bracket and the foot contacts the floor. Turn the hexagon bolt another 2 full turns.
5. Using a 9mm a/f spanner to prevent the hexagon bolt from rotating, turn the locknut clockwise with a 19mm a/f spanner to lock the bolt.

## 4: Switching the Micromill On

### Note

The safety guard cannot be opened until the Mill is powered up to release the interlock guard switch.

### Warning



Do not connect cables between any electrical hardware with the mains power switched on, since this could seriously damage components inside your CNC machine.

### Warning



Never attempt to access the electronic hardware systems of the machine with the mains power switched ON.

Note that hazardous voltages can still exist immediately after switching off the power.

If the machine has previously been switched on, wait at least 10 minutes before attempting to open the electrical panel cover plate.

Many electronic components are sensitive to electrostatic damage - ensure components and/or personnel are suitably earthed to minimise this risk.

Follow these instructions to switch on your Mill:

- 1) Check the Ethernet cable is fitted securely between the Mill cabinet (located above or near the power cord) and either the RJ45 socket on your computer or into the supplied RJ45 to USB adaptor which is then fitted to your laptop or computer.
- 2) Check that all access panels are in position and securely fastened.
- 3) Check that all inlet/exhaust vents are clear from obstructions.
- 4) Check the flexible hose from your separate dust collection vacuum system is securely fitted to the connection hole, located at the top of the left side viewing window.
- 5) Check that the guard door is fully closed.
- 6) Plug the Mill mains supply cable into an available power socket. Switch the power socket on.
- 7) The on/off power switch is located on the right-hand panel of the Mill cabinet. To switch machine on depress the left-hand side of switch. The switch will illuminate when power is being supplied to the machine.  
If the Mill does not begin its power-up routine, switch off the mains power and check all connections and fuses.
- 8) Switch on the machine controller PC and start the CNC machine control software.  
Establish a communication link between your machine controller and PC - for help please contact technical support +44 (0) 1484 728000.

## 4: Switching the Micromill Off

### Warning



Never attempt to access the electronic hardware systems of the machine with the mains power switched ON.

Note that hazardous voltages can still exist immediately after switching off the power.

If the machine has previously been switched on, wait at least 5 minutes before attempting to open the electrical panel cover plate.

Many electronic components are sensitive to electrostatic damage - ensure components and/or personnel are suitably earthed to minimise this risk.

### Warning



Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine.

When isolating machine always ensure that all power sources have been disconnected.

Follow these instructions to switch off your Denford Mill off:

- 1) Wait for the Mill to fully complete any machining or processing of any operational instructions.
- 2) Open the safety guard door and remove any finished parts from the working area.
- 3) Close the safety guard door.
- 4) Close down the communication link between the CNC control software and the Mill, then exit the CNC control software, as described in your separate CNC Control Software User's Manual.
- 5) Shut down and switch off the machine controller personal computer.
- 6) Power down the Mill by depressing the right-hand side of the red on/off mains power switch. The on/off switch is mounted on the right-hand cabinet panel, Note that cutting the machine power will trigger the closing of the interlock guard switch. This will lock a closed safety guard door in position, preventing access to the machine working area. The interlock guard switch will automatically reopen when power is next supplied to your Mill.
- 7) Switch off the mains power socket.

## 4: Homing the Machine Axes (Home Mode)

### Note

The sequence of events required to home the Mill will depend on the type of CNC machine control software being used - please refer to your separate CNC Machine Control Software User's Manual for specific details.

Immediately after establishing a communication link between the CNC control software and the Mill, all three axes of the CNC machine must be homed. The process is commonly referred to as homing the machine, or datuming each of the three machine axes.

When a communication link is first established between the Mill and the CNC machine control software, or when the CNC machine "loses" position, the software will not know the true position of the machine head in relation to the three machine axes.

### Note

The CNC machine control software Jog and Auto Modes will not become available until the machine has been configured by homing all three machine axes.

Homing the CNC machine defines:

- The machine datum, by physically driving the machine head to a fixed zero reference point.
- The constraints of three dimensional co-ordinate grid system used for plotting any programmed movements, effectively the working envelope of the CNC machine.

### Note

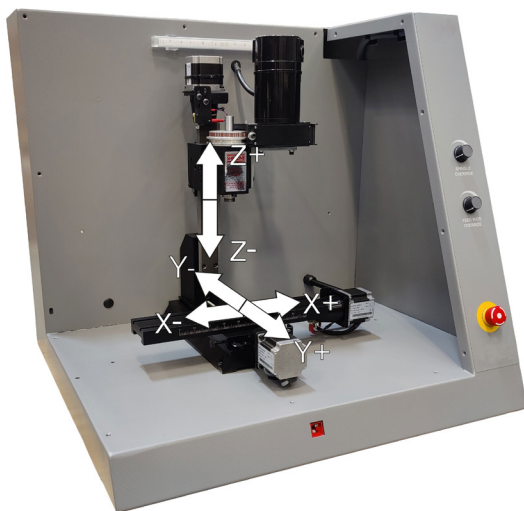
The machine datum position is set by Denford and can never be moved, since it defines the physical movement capability of the CNC

After homing the machine, the zero position of the three dimensional co-ordinate grid system is referred to as the machine datum. You can find the position of the machine datum by switching the co-ordinate display in your CNC control software to read Machine Co-ordinates. The position of the machine datum is achieved when the X, Y and Z panels of the co-ordinate display all read zero.

In addition to homing the CNC machine after it has first been switched on, we also recommend homing the CNC machine after loading or configuring any offsets.

## 4: Manual Control - Axis Definitions (Jog Mode)

Jog mode is used for manually controlling the CNC machine, moving the three machine axes, changing tools, operating optional equipment and configuring any offsets.



### Axis Definitions.

**X Axis** - The X axis slides run at 90 degrees to the Y and Z axes, horizontally left and right, when viewed from the front of the machine.

Minus [-] X movements run towards the left end of the machine and positive [+] X movements run towards the right end of the machine.

Jog Keys to move axis - arrow keys left and right

**Y Axis** - The Y axis slides run at 90 degrees to the X and Z axes, horizontally forwards and backwards, when viewed from the front of the machine.

Minus [-] Y movements run towards the front of the machine and positive [+] Y movements run towards the back of the machine.

Jog Keys to move axis - arrow keys up and down

**Z Axis** - The Z axis slides runs at 90 degrees to the X and Y axes, vertically up and down, when viewed from the front of the machine.

Minus [-] Z movements run down, towards the floor of the machine and positive [+] Z movements run up, away from the floor of the machine.

Jog Keys to move axis -Page up and Page down

## 4: Machine Operators Panels

### Note

Feedrate override changes will only be registered when an actual spindle speed or feedrate is being applied by the CNC control software.

### Spindle Speed and Feedrate Override Controls.

The spindle speed and feedrate of the Micromill Pro can be manually overridden during a machining operation, using the potentiometer controls fitted to the operators panel. The spindle speed can be overridden between 50% and 120%.

The feedrate can be overridden between 0% and 150%.

To increase the spindle speed or feedrate, rotate the appropriate control clockwise.

To decrease the spindle speed or feedrate, rotate the appropriate control counterclockwise.

The degree of adjustment applied to each value is displayed in the CNC control software.

### Warning



Depending on ancillary equipment supplied with machine there may be more than one power supply to the machine.

When isolating machine always ensure that all power sources have been disconnected.

### Mains Power Switch.

To supply power to the CNC machine, depress left-hand side of the switch immediately above the power inlet socket. To cut power to the CNC machine, depress right-hand side of switch.

Do not cut the mains power when machining or processing of any operational instructions is taking place. Note that cutting the machine power will trigger the closing of the interlock guard switch. This will lock a closed safety guard door in position, preventing access to the machine working area. The interlock guard switch will automatically reopen when power is next supplied to your Mill.

### Note

Activating an emergency stop will also trigger the interlock guard switch. This will prevent a closed safety guard door from being opened.

### Emergency Stop Button.

The emergency stop button is a circular red push button. Pressing the emergency stop button has the effect of stopping all axes and spindle movements immediately. To activate an emergency stop, press the button in fully until it clicks. The emergency stop button will remain closed (continuing to cut all power to the machine drives) until the release sequence is performed. To release a closed emergency stop button, push and turn the button clockwise until it springs back out, then wait 10 seconds for the machine systems to reset, unlocking the safety guard door.

## 5: Performing a Tool Change

### Warning



Never open the safety guard door and enter the working area when the spindle or machine axes are moving.

### Note

When two or more tools are used in the same CNC file:

Your new tool **MUST** be refitted to Mill motor and machine head in exactly the same position used when originally configuring its Z tool offset value.

### Performing a Manually Requested Tool Change.

To ensure that the machine is always aware of which tool is fitted to the spindle at any one time it is recommended that if you wish to change tool that you do it via the machine control software. When a tool change is requested the machine will automatically move to the tool change position as it would do in the Automatic tool change detailed in the next chapter.

### Performing an Automatically Requested Tool Change during the running of a CNC program.

On reading a tool change operation line in your CNC program, all three machine axes will move to their tool change positions, via an intermediate point, if programmed.

At this point, the software will pause the CNC program and a message window will be displayed, prompting you to manually change tools.

Always wait for the spindle and machine axes to stop moving, before attempting to open the safety guard door.

Replace the current tool number with the tool number specified in the software message window (the tool profiles allocated to each tool number may be listed at the beginning of your CNC program).

Close the safety guard door and clear the software message window to resume your machining.



# 5: Performing a Tool Change

## Standard Tool Change System.

The tool change system, supplied as standard with your Micromill Pro, comprises four elements:

- i) The spindle with attached threaded shaft, configured to allow fitment of the cutting tool and quick change tool holder assembly.
- ii) The quick change tool holder - a 6mm tool holder body which threads directly onto the spindle threaded shaft. All tools supplied in the standard tooling package have 6mm shanks.
- iii) The cutting tool. (See recommendations below).
- iv) Special Tooling - 2 off locking bar.

Bear in mind the following recommendations when choosing tools:

- a) Only use fully sharpened tools, and make sure that they are securely locked in the spindle.
- b) Never use bent or damaged tools, chipped tools, or tools that are not perfectly balanced.
- c) Always make sure that the mating surfaces of tools are perfectly clean and dent free before fitting the tool in the tool holder.
- d) Never use tools at speeds in excess of that punched on them or specified by their manufacturer.
- e) Always ensure that the following essential requisites are met before using any tool at high speed:
  - The tool must be of compact, short, and lightweight design.
  - The tool must be a precision instrument, and any inserts must be held in to a high degree of security.
  - The tool must be balanced and must mate symmetrically with the tool holder.
  - The cutting surfaces of the tool must be located near its centre of rotation.

In general, the recommended balance rating for tools run at speeds over 6000 RPM is G2.5 (ISO 1940 standard).

Maximum permissible values for vibrations measured on electros spindles must fall within classes I-K according to ISO 2372 - VDI 2056 standards.



# 5: Performing a Tool Change

i) Spindle



ii) Tool Holder



iii) Cutting Tool



iv) Locking Bars



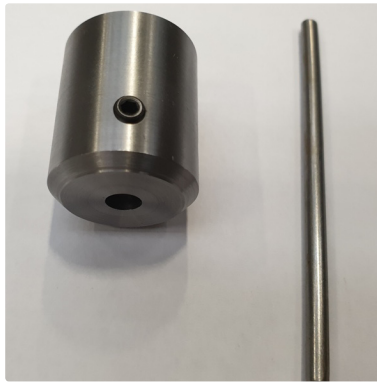
# 5: Setting Tools in the Spindle Motor

## Fitting the Quick Change Toolholder

Tools required:

- 2 x Locking Bars (supplied).

The toolholder system supplied with the MicroMill Pro consists of a 6mm toolholder body and a locking bar. The tools supplied in the standard tooling package all have 6mm mounting shanks.



Screw the toolholder body to the spindle nose and finger tighten.



## 5: Setting Tools in the Spindle Motor

### Fitting the Quick Change Toolholder Cont.

Once the toolholder is fitted and finger tight, note the two holes in both the spindle nose and the toolholder.



Insert two locking bars into the holes as shown, one is provided with the Quick Change Toolholder and one supplied in the tooling package. Use the upper bar to stop the spindle rotating and the lower to tighten up the toolholder.

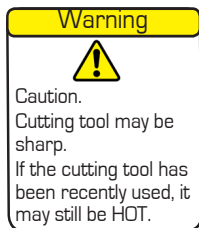


## 5: Setting Tools in the Spindle Motor

### Fitting a tool to the Tool Holder

Tools required:

- Allen Key (supplied).



Fit the chosen tool to the toolholder adjust the tool length protruding from the toolholder to suit the job to be undertaken. It is good practice to maintain at least 30% of the tool length in the toolholder. With the appropriate hex key tighten the locking screw to clamp the tool in position.

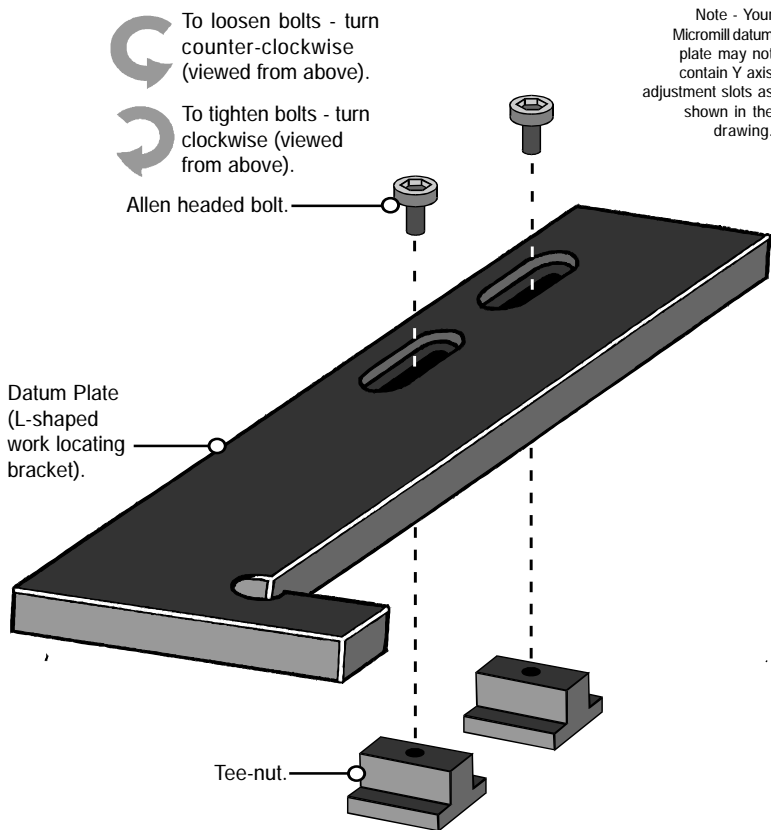


If a toolchange is programed midway through a CNC program, It is good practice to set another toolholder up with the correct tool and tool protrusion. This way it is simply a matter of unscrewing the toolholder from the spindle and replacing with the second tool.

# 6: Option - Datum Plate

The datum plate is an L shaped bracket, used for helping to remove and replace work in identical positions on the machine table. This allows projects to be configured using the same workpiece and tool offsets, since the billet can always be placed accurately in position on the machine table - hence the name "datum" plate - since a datum is a point [co-ordinate] from which a series of measurements are taken.

The plate is fixed against the machine table using two tee nut assemblies. The tee nuts slide along the two T shaped channels that run horizontally along the machine bed - these trap the datum plate in position when the allen headed bolts are tightened.



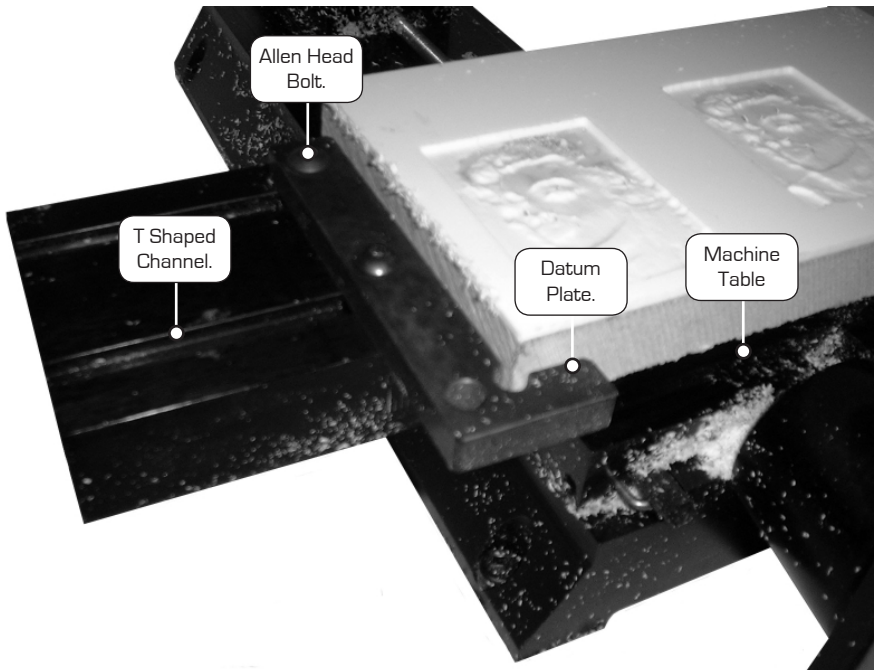
## 6: Fitting and Removing the Datum Plate

### Removing the Datum Plate.

Using a 5/32" allen [hex] key, loosen the two allen headed bolts fixing the datum plate to the machine table. Do not completely remove the bolts at this stage, since this will make removal of the individual tee nuts more difficult. Slide the entire datum plate assembly to a free end of the machine table, release the tee nuts from their respective channels and withdraw the datum assembly.

### Fitting the Datum Plate.

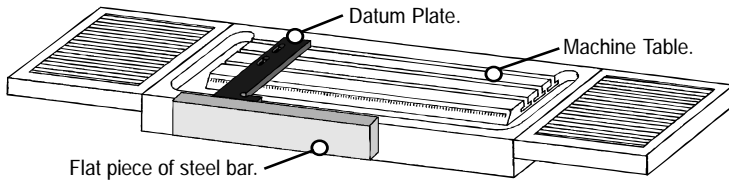
Loosely assemble the two allen headed bolts and tee nuts on the datum plate. Move the datum plate assembly to a free end of the machine table, then carefully align each tee nut with the channels in the machine table. Slide the assembly to the approximate position required. Using a 5/32" allen [hex] key, tighten each of the allen headed bolts, by turning each bolt in a clockwise direction until they just begin to grip the datum plate to the table surface. It must still be possible to move the datum plate, since final adjustments will be required to align the plate exactly "square" with respect to the edges of the machine table - exactly parallel to the direction of the X and Y machine axes.



## 6: Setting the Datum Plate

The following diagrams illustrate the various methods that can be used when positioning the datum plate square with respect to the machine table (ie. the edges of the datum plate run exactly parallel with the X and Y machine axes). Each method varies according to the level of position accuracy required.

### Datum Plate Setting Method 1.

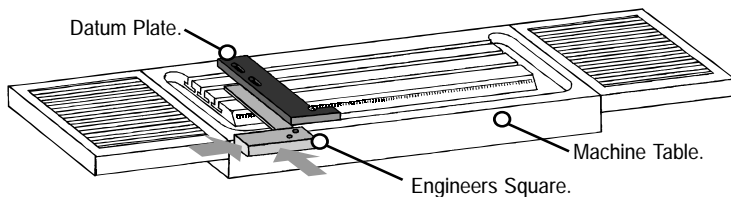


Please note that this method can only be used on datum plates that contain slots allowing a degree of Y axis movement.

This method is useful if the front face of the datum plate can be positioned exactly level with the front edge of the machine table.

Use the true flat face of a section of material, such as a piece of flat steel bar. Press the steel bar firmly against the front edge of the table and adjust the datum plate so its front face also touches the surface of the steel bar. Note that although this method is quick, it is also fairly inaccurate. Tighten the allen headed bolts.

### Datum Plate Setting Method 2.

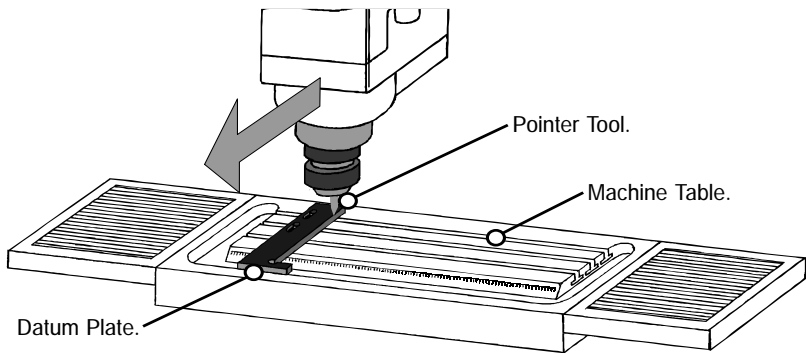


To obtain a better degree of accuracy, use an engineers square lined up against the front edge of the machine table. Adjust the datum plate so it touches the engineers square and tighten the allen headed bolts. This method has the added advantage of allowing the datum plate to be fixed further into the middle of the machine table.



## 6: Setting the Datum Plate

### Datum Plate Setting Method 3.



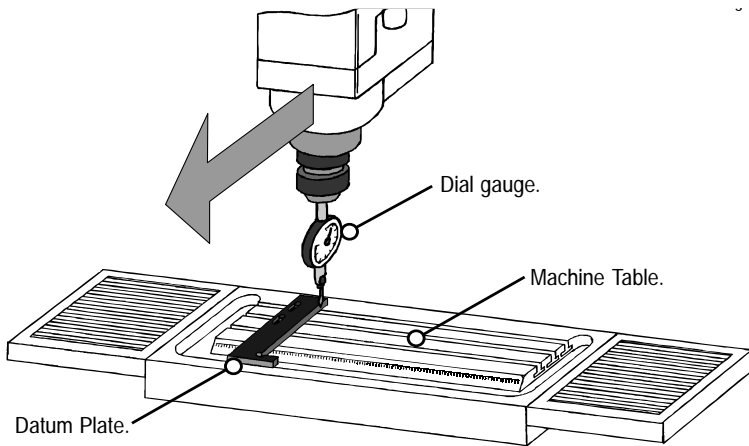
Set up the machine so a pointer is held in place of the cutting tool. Align the pointing tool so it is positioned slightly above one of the 2 edges of the datum plate, which run parallel with the Y axis.

Start with the pointer near the back of the datum plate edge you have chosen. Move the pointer towards the front of the datum plate, checking that the tip of the pointer is still lined up exactly over the edge you have chosen. If the pointer does not align, readjust the position of the datum plate. Keep repeating these steps, moving the pointer forwards and backwards along the datum plate edge, until a suitable degree of accuracy has been obtained.

For a final check, the pointer can be moved above and along one of the datum plate edges which run parallel to the X axis. Finally, tighten the allen headed bolts to fix the datum plate firmly in place.

## 6: Setting the Datum Plate

### Datum Plate Setting Method 4.



Set up the machine so a dial gauge is held in place of the cutting tool. Align the dial gauge so it is positioned along one of the 2 sides of the datum plate, which run parallel with the Y axis.

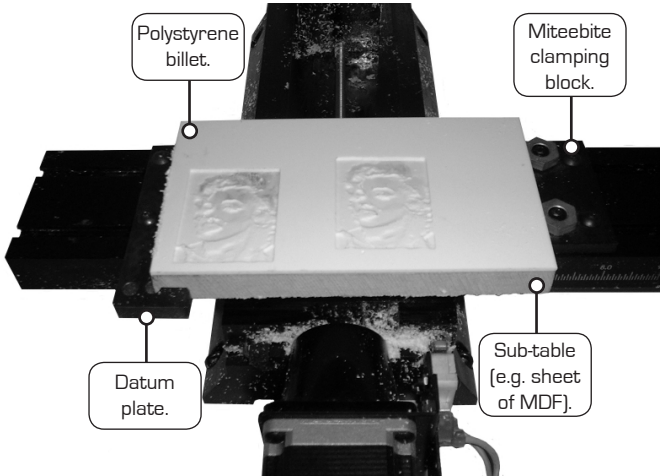
Start with the dial gauge near the back of the datum plate edge you have chosen. Move the dial gauge towards the front of the datum plate, checking that the values indicated on the dial gauge do not alter. If the values do alter, readjust the position of the datum plate until the values are constant. Keep repeating these steps, moving the dial gauge forwards and backwards along the datum plate edge, until a suitable degree of accuracy has been obtained. Finally, tighten the allen headed bolts to fix the datum plate firmly in place.

# 6: Option - Miteebite Clamps

Miteebite clamps are a quick and versatile method of securing most pieces of work to the machine table. In the example shown below, a miteebite clamping block has been used with a datum plate to clamp a polystyrene billet taped onto a sheet of MDF (medium density fibreboard). This MDF is used as a sub-table - a safety measure to prevent damage occurring to the machine table itself, should a problem occur when milling.

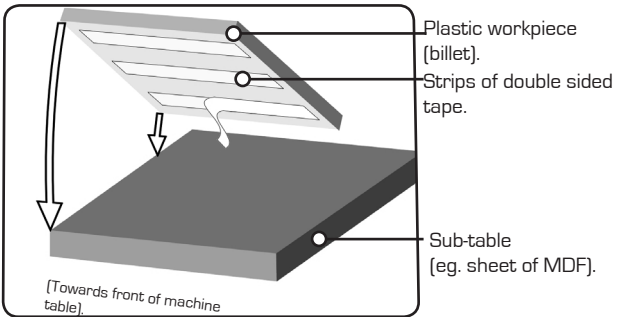
**Tape Tip**

Use plastic type double sided tape, which can be removed from your billet without tearing. If your billet material comes supplied with a protective film, affix the tape to this film, then simply tear off the film once machining has been completed. Avoid using tissue type double sided tape, which is a strip of tissue with a thin coating of glue each side - this type is very difficult to remove from your billet once it has been machined.

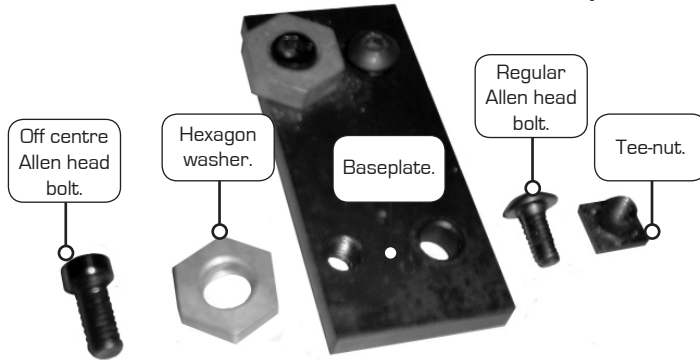


## Loading the Billet.

The actual workpiece, such as a sheet of plastic, would be held in place on the sub-table using double sided tape. The billet is usually positioned with its front and left-hand edges aligned with the front and left-hand edges of the sub-table, as shown below.



## 6: How does a Miteebite Clamp Work



A complete Miteebite clamping block consists of a rectangular metal baseplate containing four holes, two tee nut and allen headed bolt assemblies and two hexagon washer and allen headed bolt assemblies

(note that the hex holes on these bolts are machined "off centre").

### Assembly.

- 1) From under the baseplate, fit the two tee nuts into the two larger diameter holes. From the top, loosely screw the two regular allen headed bolts into the tee nut threads, using a 5/32" allen [hex] key.
- 2) Fit the off centre allen headed bolts into the hexagon washers - note the flanges inside the hexagon washers that allow the bolts to seat correctly.
- 3) From the top of the baseplate, using a 5/32" allen [hex] key, screw the bolt and washer assemblies into the two remaining holes until they are almost tight.
- 4) To fit the clamping block to the Micromill, align the two tee nuts with the two channels at the end of the machine table, then slide the whole assembly along the table until the hexagon washers touch the edge of your billet.

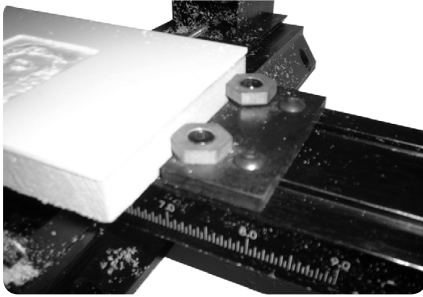
### How does the Assembly work?

The hexagon washer spins freely around the off centre bolt head. The bolt behaves in a similar way to a cam when rotated. If the allen key hole is facing towards the edge of your billet, the hexagon washer is slack against the work [ie. the miteebite is open]. If the bolt is then turned through 180 degrees so that the allen key hole is now facing away from the edge of the billet, then the hexagon washer will be tight against the work [ie. the miteebite is closed].

Continual turning of the bolt is unnecessary, since the full range of movement for the hexagon washer is covered in a single 360 degree rotation of the bolt. In this respect, the hexagon washer will not tighten further if the bolt is continually turned clockwise.

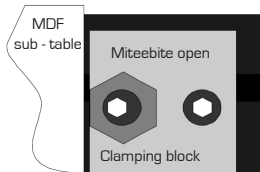
The two tee nut and bolt assemblies are used to fix the clamping block in position on the Micromill, using the two channels cut into the machine table.

## 6: Using Miteebite Clamps

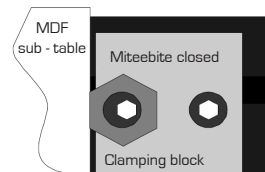


The example used in the description below explains the fitting procedure for a temporary MDF sub-table, onto which a high impact polystyrene sheet can be attached using double sided tape.

Set the datum plate into position, then place the temporary MDF sub-table onto the machine table, so it is located correctly against the edges of the datum plate. Set the two hexagon washers so that the off-centre allen key holes are closest to the edge of the billet (ie. the miteebites are open).



Right: Hexagon washer set in closed position.  
Left: Hexagon washer set in open position.



Next, slide the clamping block along the machine table until the flats (not the points) of both hexagon washers touch the MDF sub-table. Tighten the two allen bolt tee nut assemblies to fix the clamping block in firmly in position on the machine table. At this stage, it should still be possible to remove the sub-table.

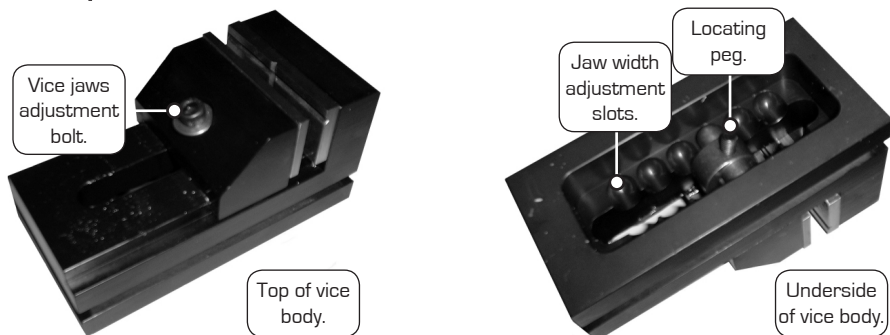


Use a 5/32" allen (hex) key to tighten (turn clockwise) or loosen (turn counter-clockwise) any of the bolts.

To lock the temporary MDF bed firmly in place, turn the hexagon washer bolts 180 degrees, so the off-centre allen key holes face away from the edge of the billet (ie. the miteebites are closed). The sub-table should now be held firmly on the machine table. Now that the miteebites have been set, the sub-table can be continually withdrawn from the machine table, then replaced, always to the same position.

This is an advantage for jobs involving the repeat milling of pieces of work, such as a small production run or a college class/group project.

## 6: Option - Table mounted Manual Vice

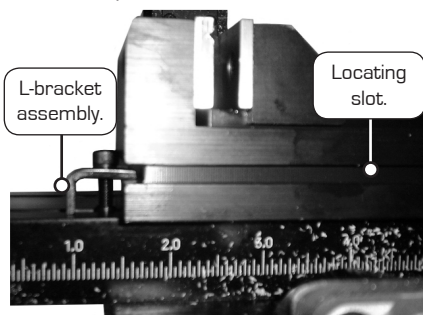


The table mounted manual vice is designed to clamp a billet securely during the running of a CNC program.

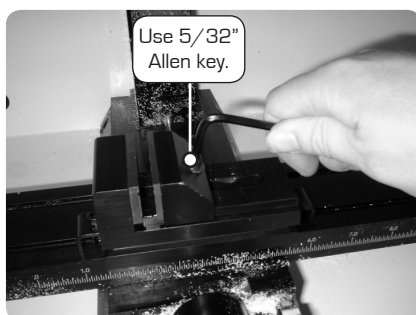
### Positioning the Vice Body.

The vice body itself is secured to the machine table using two allen headed bolts, tee nuts and L section bracket assemblies. Slide the tee nuts from each bracket assembly into the channels cut into the machine table. Place the vice body on the machine table, then fit the L shaped brackets into the groove running around the perimeter of the vice body.

Position one bracket at each end of the vice. Using a 5/32" allen (hex) key, tighten each bracket leaving enough play to finely adjust the position of the vice. If necessary, use additional tools such as an engineers square, to help set the vice exactly "square" with respect to the edges of the machine table, then fully tighten the L shaped brackets.



Fixing the Vice Body to the Machine Table

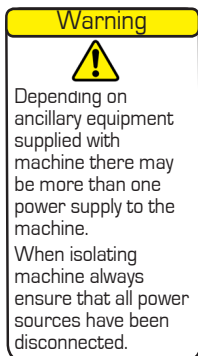
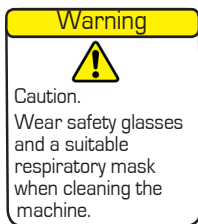


Opening and closing the Vice Jaws

### Operating the Vice.

To open and close the vice jaws, use a 5/32" allen (hex) key with the bolt mounted on the top of the vice jaw. Turn the bolt clockwise to tighten (close the vice) or counter-clockwise to loosen (open the vice). If sufficient movement is unavailable between the vice jaws, loosen the bolt further so the locating peg under the vice body can be moved to the next slot (see the diagram at the top of the page), then retighten the bolt.

# 7: Planning Procedure for Maintenance



When carrying out any maintenance, pay special attention to the following items, ensuring safe and correct working procedures in accordance with Health and Safety Regulations in your establishment:

- Before starting any maintenance work, define the task and obtain the information relevant to carry out the maintenance. Also, define the time period needed to complete the task, to obtain the correct tools and order any spare parts, if required.
- During the maintenance work period, display a suitable notice stating that the machine is under maintenance and should not be used until the notice is removed.
- Safety must be a priority when carrying out any maintenance work. Covers and safety guards that are removed during the maintenance work must be replaced after the task is completed.
- All work must be carried out by suitably qualified personnel.
- Never attempt to access the electronic hardware systems of the machine with the mains power switched ON.
- Hazardous voltages can still exist immediately after switching off the power. If the machine has previously been switched on, wait at least 10 minutes before attempting to open the electrical panel access plate.
- When replacing electrical components, ensure the new parts are of suitable replacement specification.
- All work completed on the machine, whether progressive, or preventative, should be logged to ensure a complete service record is available for future referral. We recommend the maintenance logs at the end of the maintenance section are used to log any maintenance tasks undertaken.
- When maintenance work has been completed, check that the replaced or serviced parts work correctly, before allowing general operation of the machine.



# 7: Maintenance Schedule

## Every Day (and, if necessary between components)

- Clear dust or swarf from working area of machine and ensure that the surfaces of the spindle, tool housing and tool are clean - do not use compressed air.
- Lubricate the slideways and leadscrews - see p41.

## Every Week

- Clean the machine thoroughly.
- Check all exposed screws and nuts for tightness.
- Visually check door for signs of cracks or chips. Any damage should be reported immediately to Denford and a suitable replacement obtained without delay.

Door Part Number MT2/0620

## Every Two Months

- Check the condition of any electrical connections.
- Check and thoroughly clean all components of the tooling system.
- Check all cables for kinks and breaks.
- Check door hinges for correct tension and adjust if necessary.

If, after fully hand tightening the centre screw of all hinges with an appropriate tool, the door falls when released from a position 15 degrees forward of vertical, new hinges should be obtained and fitted without delay.

Denford part Number BI01229

## Every Three Months

- Clean microswitches - see p39.
- Check security of Spindle motor mounting bolts.
- Check and adjust spindle drive belt.
- Check the slides for wear.
- Check and adjust gib strips.



# 7: Lubrication Areas on the Micromill

## Warning



Caution.

Wear safety glasses and a suitable respiratory mask when cleaning the machine.

## Warning



Never open the safety guard door and enter the working area when the spindle or machine axes are moving.

## Warning



Caution.

If the cutting tool has been recently used, it may still be HOT.

## Warning



Risk of Ignition or Explosion!  
Denford recommends that aerosol based cleaning and lubrication products should NOT be used on parts of the CNC machine, since these products may cause potentially explosive vapours to build-up in enclosed areas of the working area.

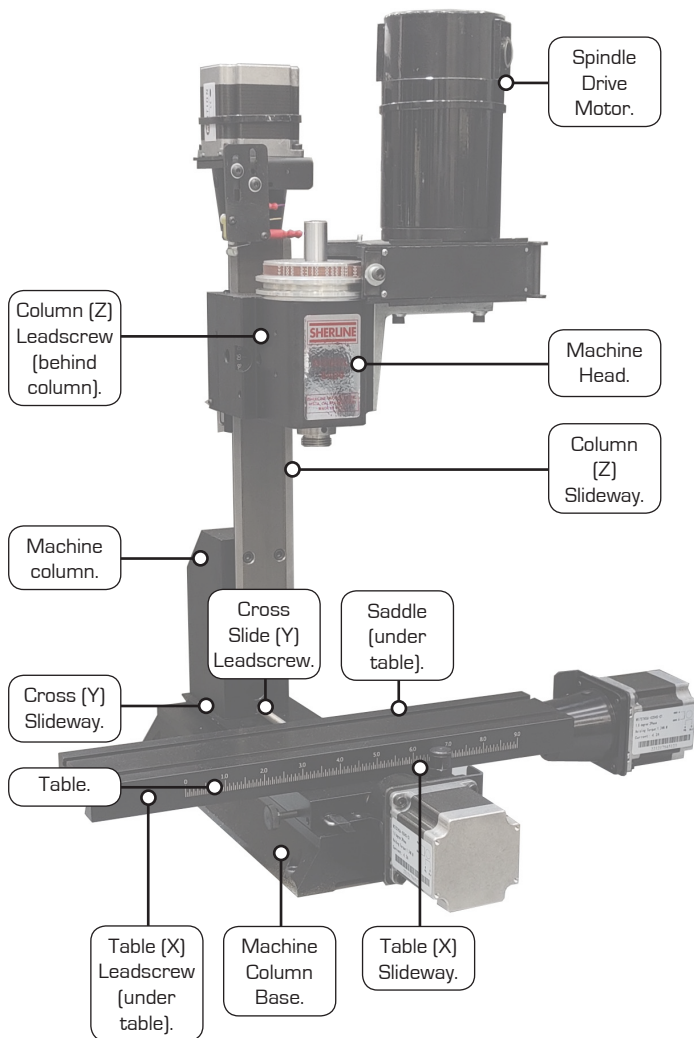
The following items on the machine should be oiled daily, using a light machine oil, sewing machine oil or 3 in 1 oil:

A) Slideways.

B) Leadscrews.

The photo below labels each area which requires daily lubrication.

Your mill is encased in a cabinet. For illustration purposes, this photo shows a view of the mill column and slideways without the cabinet.



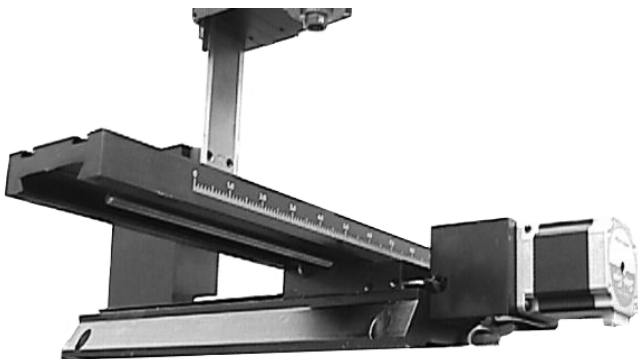
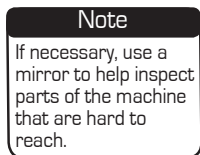
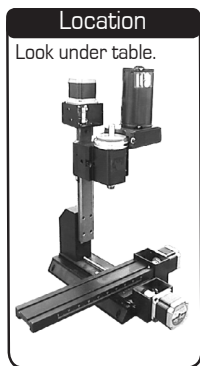
# 7: Lubrication of Leadscrews and Slideways

## Table (X Axis) Leadscrew and Slideway Lubrication.

Run the machine table fully to the right, to gain access to the table slide leadscrew and slideway. The leadscrew and slideway is located under the machine table. Using a pump action oilgun, pump oil directly onto the exposed surface of the leadscrew and the two slideways.

Run the saddle fully to the left, to gain access to the opposite end of the leadscrew and slideways. Pump oil directly onto the remaining surface of the leadscrew and slideways.

Finally, run the table left and right along the X axis, to distribute the oil along the full length of the leadscrew and slideways.



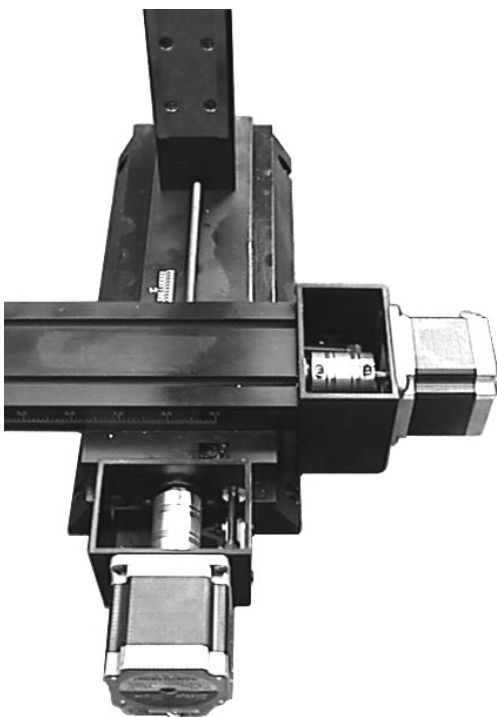
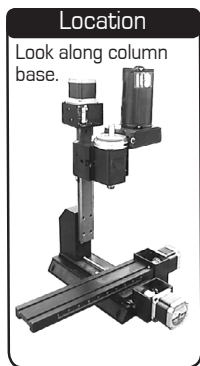
## 7: Lubrication of Leadscrews and Slideways

### Cross Slide (Y Axis) Leadscrew and Slideway Lubrication.

Run the saddle back towards the machine column, to gain access to the front section of the cross slide leadscrew and slideway. Pump oil directly onto the exposed surface of the leadscrew and slideway.

Run the saddle forwards, to gain access to the opposite end of the cross slide leadscrew and slideway. Pump oil directly onto the remaining surface of the leadscrew and slideway.

Finally, run the saddle forwards and backwards along the Y axis, to distribute the oil along the full length of the leadscrew and slideway.



# 7: Lubrication of Leadscrews and Slideways

## Column (Z Axis) Leadscrew and Slideway Lubrication.

Run the machine head fully up, to expose the bottom of the table slideways. Using a pump oilcan (with a flexible nozzle), directly lubricate the exposed surfaces of the two table slideways, reach around the back of the column, then pump oil directly onto the surface of the leadscrew.

Run the machine head fully down, to expose the top of the table slideways. Directly lubricate the remaining exposed surfaces of the two table slideways and the leadscrew.

Run the machine head fully along the Z axis to distribute the oil along the slideways and leadscrew.

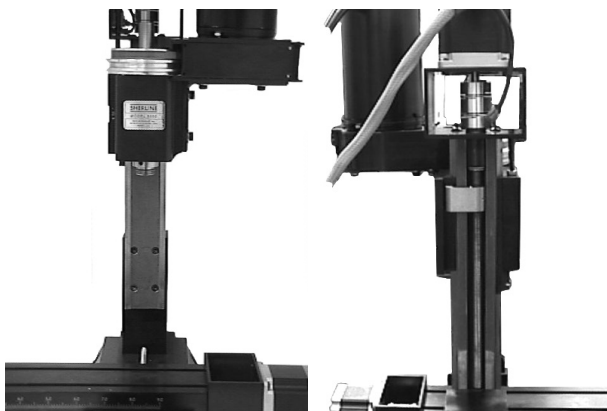
### Location

Look at the sides and rear of column.



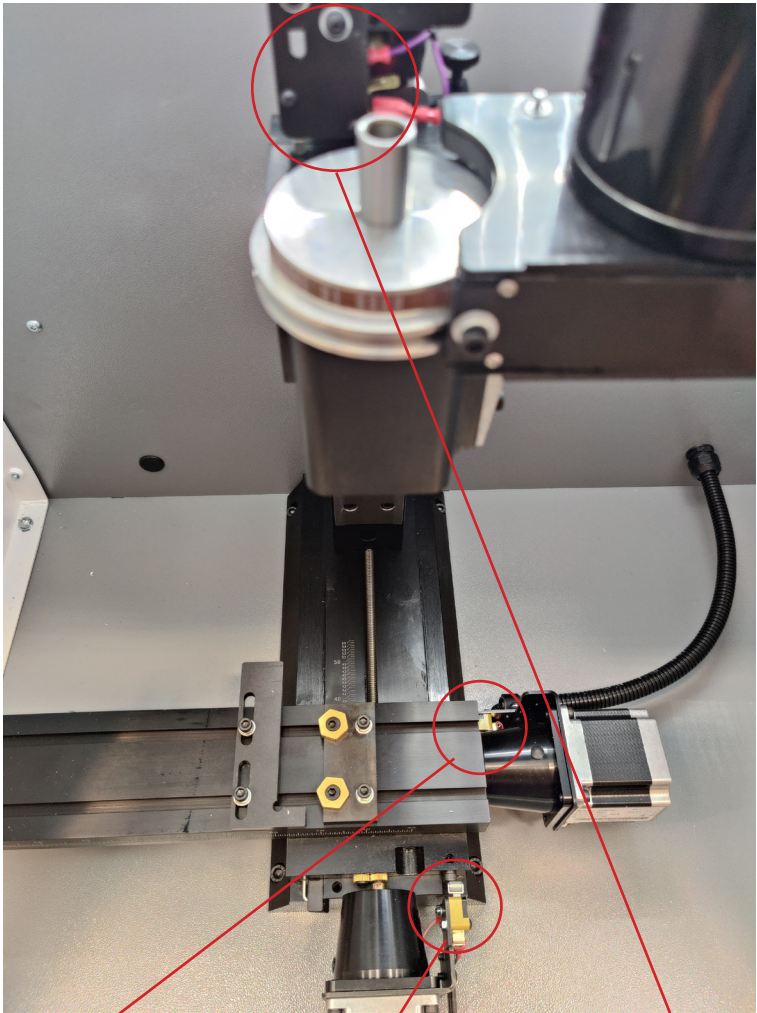
### Note

If necessary, use a mirror to help inspect parts of the machine that are hard to reach.



# 7: Cleaning the Datum Microswitches

Using a soft bristled brush, carefully clean dust and debris away from the microswitch.



X Axis Switch  
located right side of  
machine

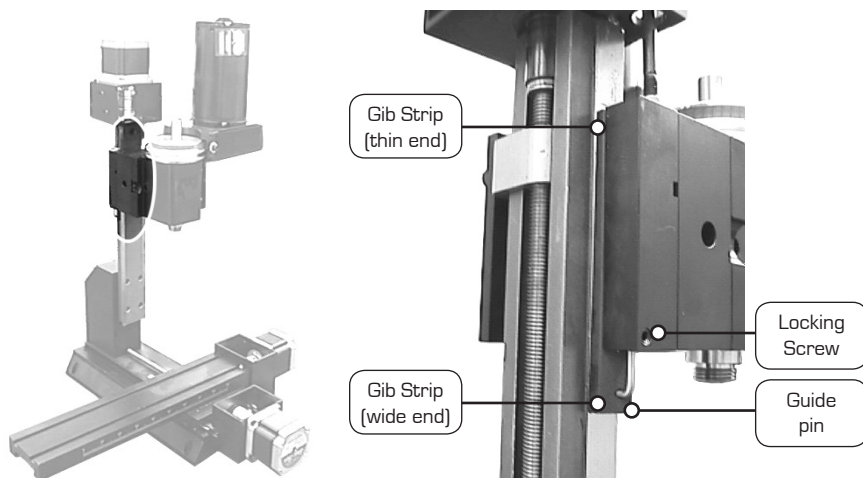
Y Axis Switch  
located front of  
machine

Z Axis Switch  
located top of  
machine

## 7: Gib Strip Adjustment

A gib strip is an angled section of metal or plastic, tapered along its length, which is fitted to one side of a machine slide. One gib strip is fitted to each of the three machine slides on your Micromill.

Essentially, driving one of these wedges further along a slide will gradually decrease the amount of free play in the axis. The photo below shows a gib strip fitted to the Z axis of a Micromill machine column.



During the day-to-day use of your Micromill, wear will occur in each of the gib strips. This wear is normal and if checked regularly will not affect the performance of your machine.

Denford recommends that the gib strips be checked annually. Any slack present in the slides should be rectified, by adjusting the gib strips, as described on the following pages.

### Checking the Condition of the Gib Strips.

As the gib strips wear down, varying degrees of free play will become noticeable in each of the three machine axes.

You can quickly judge the slack available in each slide, by holding the table, saddle, and machine head at their extreme ends. Try to move, or wobble them from side to side, across the width of the slide. Any excessive movement will indicate that the slide in question requires adjustment.

To accurately assess the condition of each slide, Denford recommends the use of a dial gauge.

Note that a slight degree of movement will always be present in every slide. If there is no free movement whatsoever, then the slides would be too tight to move.

# 7: Gib Strip Adjustment

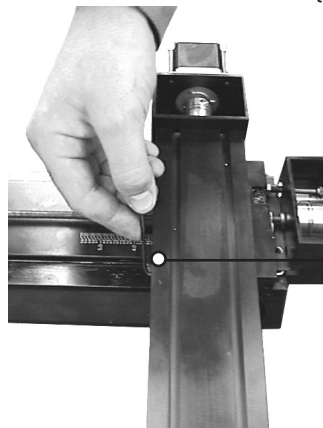
## Location

Look at the back of machine saddle.



## X Axis Gib Strip Adjustment Method:

1) Release the gib strip locking screw, positioned on the back of the machine saddle (shown below).

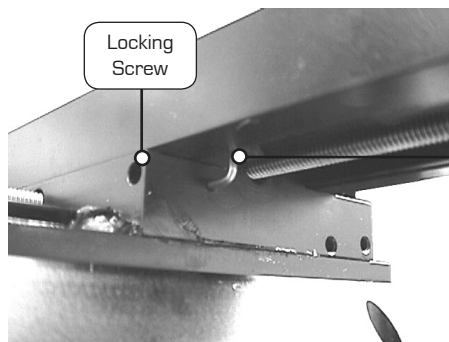


Turn anticlockwise to release or clockwise to tighten locking screw (when viewing the face of the locking screw).

2) Push the wider end of the gib strip further into its channel to eliminate the free play in the sideways. The gib strip is accessed by reaching under the machine table (see below). Remember that a slight degree of movement must be left in the slide to allow the slide to move.

## Location

Look under machine table.



Locking Screw

Gib strip and guide pin

3) Tighten the gib strip locking screw.

4) Move the machine table left and right across the saddle, to ensure that the movement is smooth.

5) If the movement is not smooth, adjust the gib strip by repeating steps 1) to 3). Run the machine table again to assess the smoothness of movement.



# 7: Gib Strip Adjustment

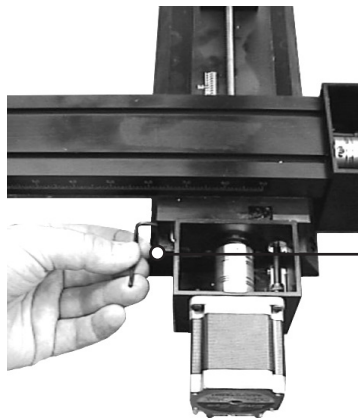
## Location

Look at the left side of machine saddle.

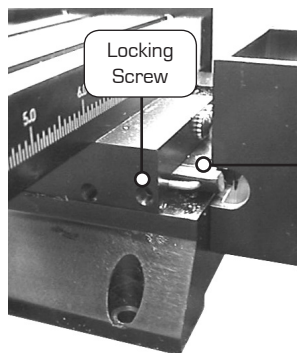


## Y Axis Gib Strip Adjustment Method:

1) Release the gib strip locking screw, positioned on the left side of the machine saddle (shown below).



2) Push the wider end of the gib strip further into its channel to eliminate the free play in the sideways. The gib strip is accessed from the front of the machine table (see below). Remember that a slight degree of movement must be left in the slide to allow the slide to move.



3) Tighten the gib strip locking screw.

4) Move the machine table front and back, to ensure that the movement is smooth.

5) If the movement is not smooth, adjust the gib strip by repeating steps 1) to 3). Run the machine table again to assess the smoothness of movement.

## Location

Look at front of machine saddle.





# 7: Gib Strip Adjustment

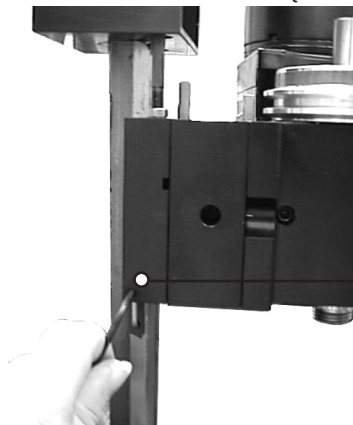
## Location

Look at the left side of machine head.



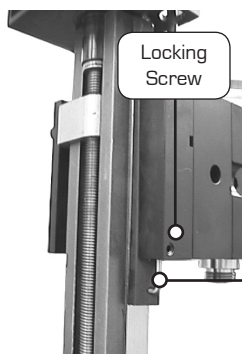
## Z Axis Gib Strip Adjustment Method:

1) Release the gib strip locking screw, positioned on the left side of the machine head (shown below).



Turn anticlockwise to release or clockwise to tighten locking screw (when viewing the face of the locking screw).

2) Push the wider end of the gib strip further into its channel to eliminate the free play in the sideways. The gib strip is accessed from the front of the machine table (see below). Remember that a slight degree of movement must be left in the slide to allow the slide to move.



Locking Screw

Gib strip and guide pin

3) Tighten the gib strip locking screw.

4) Move the machine head up and down, to ensure that the movement is smooth.

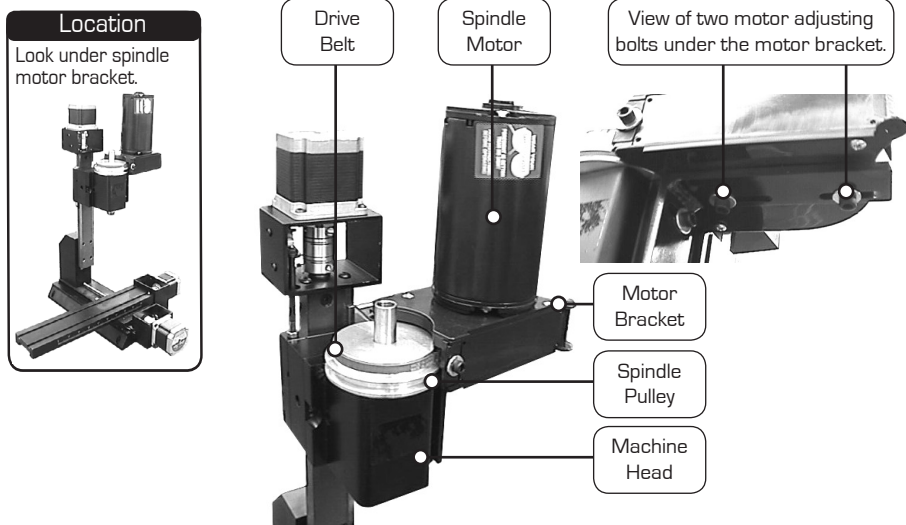
5) If the movement is not smooth, adjust the gib strip by repeating steps 1) to 3). Run the machine table again to assess the smoothness of movement.

## Location

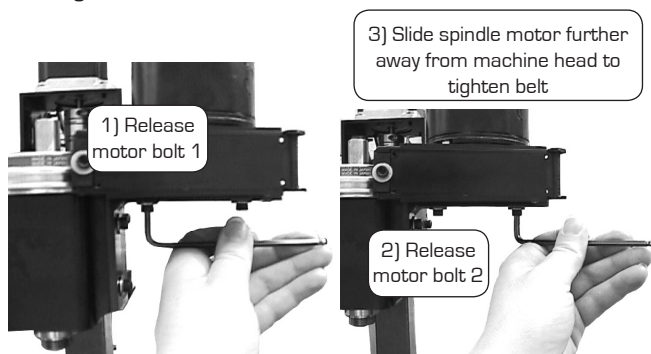
Look at back of machine head.



## 7: Spindle Belt Drive Adjustment

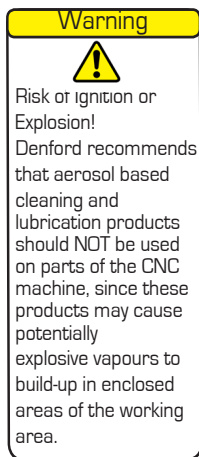


The drive belt from the motor to the machine spindle may become slack from time to time, due to constant use. To adjust the tension, release the two bolts holding the motor. Slide the motor further away from the spindle until slack in the drive belt has been eliminated, then tighten the two bolts holding the motor.



Turn anticlockwise to release or clockwise to tighten the bolts holding the spindle drive motor in position (when directly viewing the face of the bolt from beneath the bracket).

## 7: Maintenance of the Quick Change Tooling System



### Every Day.

Before each use of the quick change tooling system, check that the internal threads of the tool holder are clean.

### Every Six Months.

Biannually thorough cleaning and lubrication of the spindle collar and quick change tool holders is recommended. Under more intensive use, check and service the components on a weekly basis:

- Spindle collar - Check the condition of any exposed surfaces, particularly the external threads. Using a light machine oil, lubricate the spindle collar components, then check the operation of the mechanism.
- Tool holders - Check the condition of any exposed surfaces, particularly the internal threads. Strip down the tool holder components, clean any dust and debris by wiping surfaces with a soft cloth, then lubricate the components with a thin coating of light machine oil. Check the condition of the components, then reassemble the tool holder.

## 7: Maintenance of the Manual Vice

### Every Week.

Weekly thorough cleaning and lubrication of the table mounted (optional) manual vice is recommended. Using a light machine oil (or similar) in a pump action oilcan, lubricate all moving parts and screws on the vice, paying particular attention to the vice slideways.

Under more intensive use, check and service the components on a daily basis.

# 8: Maintenance Log

Date of maintenance work.	Name of personnel carrying out the maintenance.	Details of maintenance work completed.

# 8: Maintenance Log

Date of maintenance work.	Name of personnel carrying out the maintenance.	Details of maintenance work completed.



# 9: Technical Support

Denford Limited provides unlimited telephone and e-mail Technical Support on this CNC machine to registered users. On-site visits by our engineers may be chargeable. Please refer to the information held in your separate Warranty pack, for specific details.

Before contacting Denford for support, please read your hardware and software manuals and check the Denford websites for support.

Internet (access technical support and FAQ sections):

[www.denfordata.com/bb](http://www.denfordata.com/bb)

When you request support, please be at your CNC machine, with your hardware and software documentation to hand. To minimise delay, please be prepared to provide the following information:

- CNC Machine Serial Number (from the machine ID panel).
- Registered user's name / establishment name.
- The CNC machine control software name and version number (from the "Help/About" menu option).
- The wording of any error messages that appear on your computer screen, if applicable.
- A list of the steps that were taken to lead up to the problem.
- A list of any maintenance work that has been carried out on the CNC machine.

Address:	Denford Limited, Armytage Road, Brighouse, West Yorkshire, HD6 1QF, UK.
Telephone:	+44 (0) 1484 728000
E-mail:	technical@denford.co.uk
Times:	Monday to Thursday 8.30am - 4.30pm GMT Friday 8.30am - 1.00pm GMT



# 10: Specification of the Micromill Pro

## Safety Features:

- Manual operation, totally enclosed, interlocked, safety guard door.
- Emergency stop button.
- Toolpath graphics to verify part programs prior to machining.

## Mechanical Details:

- Travel X axis 228mm [8.9"].
- Travel Y axis 130mm [5.1"].
- Travel Z axis 160mm [6.3"].

## Dimensions:

- Machine width 685mm [27"].
- Machine height 688mm [27.1"].
- Machine depth - door closed 655mm [25.8"].

## Weights:

- Machine weight 70 KG [154 lb].

## Electrical Details:

- Mains supply required:  
220/240V, 50Hz, 8A. or 110V @ 50/60Hz 10A.
- Spindle motor: 75W
- Spindle Speeds: 0 - 2,500RPM.
- Axis stepper motors

## Performance:

- Rapid traverse rate up to 600 mm/min [23.6 in./min]
- Max Feed traverse rate up to 600 mm/min [23.6 in./min]



## Declaration of Conformity

The responsible person and person  
authorised to compile the Technical File

Mr Stephen Oddy

Business Name:

Denford Ltd

Address:

Armytage Road  
Brighouse  
W Yorkshire  
HD6 1QF  
United Kingdom

Declares that the Machinery Described:

Make:

Denford Ltd

Models:

Micromill Pro & Microturn Pro  
Manufactured from January 1<sup>st</sup> 2023

We hereby declare that the product  
described above, to which this declaration of  
conformity refers to, is in conformity with  
the essential requirements of the following  
standards:

Supply of Machinery (Safety) Regulations 2008  
BS EN 19085-1 :2021  
BS EN 19085-3 :2021  
The Electromagnetic Compatibility Regulations 2016  
RoHS Directive:2011/65/EU  
ISO 13849-1:2015(EN)

Signature of responsible person

A handwritten signature in black ink, appearing to read "S. Oddy".

Position:

Managing Director

Date:

7<sup>th</sup> December 2022





## Declaration of Conformity

The responsible person and person  
authorised to compile the Technical File

Mr Stephen Oddy

Business Name:

Denford Ltd

Address:

Armytage Road  
Brighouse  
W Yorkshire  
HD6 1QF  
United Kingdom

Declares that the Machinery Described:

Make:

Denford Ltd

Models:

Micromill Pro & Microturn Pro  
Manufactured from January 1<sup>st</sup> 2023

We hereby declare that the product  
described above, to which this declaration of  
conformity refers to, is in conformity with  
the essential requirements of the following  
standards:

Machinery Directive: 2006/42/EC  
EN 19085-1 :2021  
EN 19085-3 :2021  
EMC Directive:2014/30/EU  
RoHS Directive:2011/65/EU  
ISO 13849-1:2015(EN)

Signature of responsible person



Position:

Managing Director

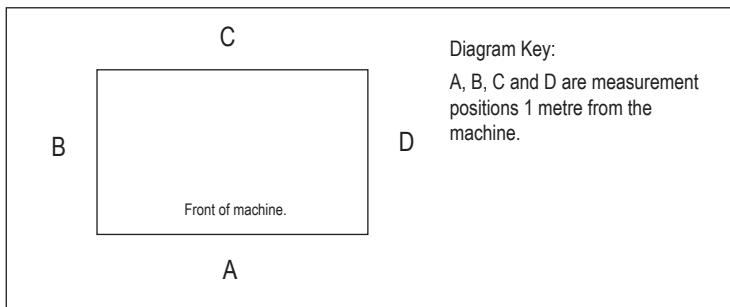
Date:

7<sup>th</sup> December 2022

# 10: Micromill Pro Noise Level Test Results

Test Report No: NL-MM1-02.  
 Machinery Manufacturer: Denford Limited.  
 Machinery Type/Model: Micromill Series.






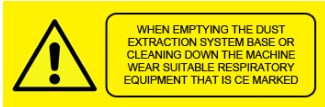



Equipment:  
 Meter ref. Standard ST805  
 Denford Micromill CNC milling machine - 1 off.



Test Conditions:  
 Ambient background noise: <60 dB  
 (A).  
 All values are measured in dB (A).

Test Results	Sound Levels dB(A)			
	Position			
Condition	A	B	C	D
Drives Only – 80mm/min	61	61	60	60
Drives and spindle -2000 rpm	65	64	61	64
Drives and spindle -1500 rpm	64	63	62	63
Drives and spindle -1000rpm	64	63	63	63
Drives and spindle - 500 rpm	62	61	60	61
Spindle only – 2000 rpm	<60	<60	<60	<60

# 10: Labels used in Manual or on Machine

Label	Description & Location
	Description - Earth Label Location - Electrical Cabinet
	Description - Protected Earth label Location - Electrical Cabinet
	Description RJ45 / Ethernet Connection label Location - Right hand side of machine
	Description - Refers to an immediately impending danger. If the danger is not avoided, it could result in death or severe (crippling) injury. Please consult the manual where this symbol is displayed. Location - Machine
	Description Refers to a possibly dangerous situation. If it is not avoided, it could result severe injury. Location - Machine Manual and machine
	Description - PPE warning label Location - Right hand side of machine
	Description - Safety warning Location - Right hand side of machine
	Description - PAT Testing Label Location - Right hand side of machine
	Description - Hazardous Voltage Warning Location - Machine

# 11: Glossary

BILLET .....	A small, usually rectangular, bar of wood or metal in an intermediate stage of manufacture.
CAD .....	Computer Aided Design - the use of a wide range of computer based tools that assist engineers, architects and other design professionals in their design of "real world" objects.
CAM.....	Computer Aided Manufacture - software that is capable of creating tool cutter paths in a number of different axes for different CNC systems. Usually taking the design input from CAD system.
CNC.....	Computer Numerical Control - a computerised system of hardware and software, which controls the movement of a machine tool.
DRIVE .....	The controller unit for a disk system.
DRY RUN .....	An operation used to test how a CNC program will function without driving the machine itself.
DWELL .....	A programmed time delay.
EDIT .....	The mode used for altering the content of a CNC program via the Desktop Tutor or qwerty keyboard.
END OF BLOCK SIGNAL .....	The symbol or indicator ( ; ) that defines the end of a block of data. The equivalent of the PC [return] key.
ERROR .....	The deviation of an attained value from a desired value.
G-CODE .....	The programming language understood by the machine controller.
FEEDRATE .....	The rate, in mm/min or in/min at which the cutting tool is advanced into the workpiece. For milling and drilling, the feedrate applies to the reference point on the end of the axis of the tool.
FILE .....	An arrangement of instructions or information, usually referring to work or control settings.
FORMAT .....	The pattern or way that data is organised.
FNC .....	FANUC Miller file, extension ".fnc". Contains G and M codes describing the machine and cutting operations.
G CODE .....	A preparatory code function in a CNC program that determines the control mode.
HARDWARE .....	Equipment such as the machine tool, the controller, or the computer.
HOME .....	Operation to send the axes of the CNC machine to their extreme limits of movement. Defines the co-ordinate based grid system of the CNC machine. Commonly referred to as homing the machine, or sending the machine to its home position.
INCREMENTAL .....	Incremental programming uses co-ordinate movements that are related from the previous programmed position. Signs are used to indicate the direction of movement.
INPUT .....	The transfer of external information [data] into a control system.
INTERFACE .....	The medium through which the control/computer directs the machine tool.

# 11: Glossary

JOG CONTROL .....	Manual movement mode for the machine axes, using very small pre-defined movements, called jog steps. One stepped movement is applied per movement using the machine offset facility. key/button press.
M CODE .....	A miscellaneous code function in a CNC program used to indicate an auxiliary function (ie, coolant on, tool change etc.).
MACHINE DATUM .....	A fixed zero reference point set by the machine manufacturer. The machine datum is used to define the co-ordinate based grid system of the CNC machine. All machining co-ordinates originate from this point. However, this point can be temporarily moved
MACHINE OFFSET .....	The workpiece offset file used with VR and real CNC machines.
MDI .....	Manual Data Input - A method used for manually inserting data into the control system (ie, Desktop Tutor, qwerty keyboard etc.).
MODAL .....	Modal codes entered into the controller by a CNC program are retained until changed by a code from the same modal group or cancelled.
NC .....	Numerical control.
OFFSET .....	Combination of two types of file, the workpiece offset and the tool offset. Used to describe the workpiece datum, a zero reference used on the CNC machine to ensure machining occurs in the correct place on the billet. Offsets are used to shift parts of the three dimensional co-ordinate based grid system, used by the CNC machine.
PART DATUM .....	Used as a zero reference point in a CNC file. All machining co-ordinates originate from this point.
PART PROGRAM .....	A list of coded instructions which describes how the designed part, or component, will be manufactured. The part program is also referred to as the CNC file, program, or G and M code program.
PC .....	Personal computer.
POST PROCESSOR .....	A file or setting that contains instructions for a CAM system, detailing how to create CNC code that can be understood by a particular CNC system (e.g. VR CNC Milling).
PROGRAM .....	A systematic arrangements of instructions or information to suit a piece of equipment.
RAPID TRAVERSE .....	Fast movement of the cutting tool through the 3 machine axes between cutting settings.
REFERENCE POINTS .....	The machine has 3 reference points used in setting the limits of movement for its slides (axes).
REMOVEABLE MEDIA .....	A computerised storage medium that is not permanently attached to the system, e.g. Floppy Disk, Flash Memory Card, USB Memory Key, CD/DVD disc.
SPINDLE MOTOR .....	The removable cutting head (motor). Also referred to as the machine head.
RPM .....	Revolutions per minute (rev/min) - a measure of spindle speed.
SLIDES .....	The 3 machine axes - see axis.
SPINDLE SPEED .....	The rate of rotation (velocity) of the machine head / cutting tool, measured in RPM.

# 11: Glossary

SOFTWARE .....	Programs, tool lists, sequence of instructions etc...
TOOL OFFSET .....	When machining, allowances must be made for the size of tools being used, since they all differ in length. The tool offset is the amount the Z value must be moved (or offset), so that all the different cutting tool tips used line up with each other, so they can all be used by one CNC file. See OFFSET.
TRAVERSE .....	Movement of the cutting tool through the 3 machine axes between cutting settings.
TXT .....	Standard Windows text only file, extension ".txt".
WORK (WORKPIECE) .....	The actual material being machined. The work is sometimes referred to as the billet or stock.
WORKPIECE DATUM .....	Used as a zero reference point on the real billet. All machining co-ordinates originate from this point, when offset files are used.
WORKPIECE OFFSET .....	A file containing X, Y and Z values that can shift the entire three dimensional co-ordinate based grid system, used by the CNC machine. See OFFSET.
WORD .....	A combination of a letter address and digits, used in a CNC program (ie, G42, M04 etc.).
VIRTUAL REALITY.....	A fully interactive, three dimensional, computer based simulation of a real world object or event.
Z TOOL OFFSET .....	See Tool Offset

## 12: Notes

Use this page to make a note of any parts of the software you have changed or configured, for example, common tooling set-ups, machine parameters, changes to installation paths or passwords etc.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.