

VMC 1300
CNC Milling Machine
User's Manual



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1: Warning Notices

Warranty Disclaimer.

The Warranty on your CNC machine will be invalidated if any modifications, additional ancillary equipment is 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.

Maintenance Disclaimer.

Always obtain permission from the person responsible for machinery in your establishment before accessing the electrical control panel or 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 milling machine.

Use of Machine.

Your CNC machine is designed for machining a range of resistant materials such as wax, plastic, free cutting alloys, aluminium and steel. In each case, the appropriate tooling, speeds and feeds should be used as recommended by the material supplier.

Your machine is **not** intended for use with MDF or hard woods which may react with the machine lubricants causing oxidisation of the machine surfaces, or with any materials which may contain known carcinogens.

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 (CO₂ 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.

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.



1: Warning Notices

Portable Appliance Testing (continued).

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 (13A)
- 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 USB and RS232 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 CNC machine, including any operational features of hardware specific to the Denford machine 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 machine 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 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.</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 - August 2010. 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 machine.</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: customerservices@denford.co.uk</p>



1: Introducing your VMC 1300 Milling Machine

Congratulations on your purchase of a VMC 1300 CNC Milling Machine. In this manual you will learn how to setup and use your Machine correctly and safely.



Your machine is a full three axes CNC milling machine with a large work area together with rapid traverse rates of up to 5000 mm/min. Suitable for all levels of education and training, it is manufactured to meet industrial standards.

Main Features:

- Designed specifically for Education and Training.
- Manufactured to industrial standards.
- Programming via International Standards Organisation format, incorporating controls such as FANUC.
- CE approved for safety.
- Capable of cutting common resistant and prototyping materials Aluminium, Steel, Brass, Wax, Plastics and Acrylics.
- Links to various CAD/CAM software packages.
- Totally enclosed high visibility interlocked guard.
- Spindle speed and feedrate override controls.



1: Before Beginning to Setup

Before beginning to set up your VMC 1300 Pro CNC machine, 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 VMC 1300 Pro CNC milling machine. Note that the precise specification of your CNC machine will depend on any options selected at the time of ordering.

- 1 x Allen (hex) keys pack.
- 1 x Head spanner.
- 1 x Spare fuse pack.
- 1 x VMC 1300 Pro CNC machine warranty pack.
- 1 x User document pack comprising:-
 - 1 x Commissioning guide.
 - 1 x Denford VR CNC Machine Control Software CD-ROM
 - 1 x VMC 1300 Pro CNC machine manual (Supplied on VR Milling CD-ROM),
 - Any additional OEM product manuals.
- 1 x Datum plate
- 1 x USB cable
- 1 x Mitee bite clamping kit
- 1 x BT30 side lock holder
- 1 x Pull stud for toolholders
- 1 x 6mm dia ball nose cutter

The following optional equipment may also be supplied with your VMC 1300 Milling machine (please refer to your separate order documentation for confirmation):

- Table mounted 6 station automatic tool changer
- Pneumatic vice and guard
- Spray mist coolant
- Universal Machine Bench and PC Workstation.
- 4th Axis Programmable Rotary Fixture



2: Safety Features Overview and Precautions

Safety Features Overview.

The following safety features are standard on your CNC Machine.

- Emergency stop button.
- Manually operated, totally enclosed guard door with interlock switch.
- Option on control software 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 Router.

General Safety Precautions :

- Wear clothing suitable for machine operation and follow the safe working procedures in place at your establishment. When cleaning down machine, or handling tooling, consider additional protective clothing such as respiratory masks, eye protection, gloves and overalls.
- 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 preferably 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 machine always ensure that **all** power sources have been disconnected. Post a notice informing others not to use the machine since it is undergoing maintenance.
- Hazardous voltages can still exist immediately after switching the machine off. Always wait at least 5 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 or cleaning down machine, 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.
- If laser scanner fitted do not stare into laser beam. Refer to Scanner instruction manual for all aspects of safe use of laser.
- 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.



2: Safety Features Overview and Precautions

General Dust Safety Precautions.

Obtain "material safety data sheets" from your material suppliers and enforce the recommended precautions. Be aware that dust particles from certain hardwoods and other materials, such as oak and MDF, could contain known carcinogens: these materials should **not** be used on this machine. Please consult your materials supplier for further details.

Dust particles that remain inside the working area of the machine after a part has been machined, should be removed using a vacuum.

Never use a pressurised airline for this purpose.

When clearing the machine of dust particles wear suitable respiratory protective equipment that is CE marked. Other personal protective equipment, such as eye protection, overalls and gloves should also be considered.

Dust particles on the floor can cause slipping. This should be monitored by the operator and removed before it becomes a hazard.

Launder overalls regularly, provide good washing facilities with hot and cold water, soap and towels and encourage a high standard of personal hygiene.

Failure to adhere to the material safety data sheets, could lead to the following health problems which are among the potential effects associated with exposure to certain dust particles:

- Skin disorders.
- Obstruction to the nose.
- Rhinitis.
- Asthma.
- Nasal cancer.



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 machine, as shown above. When pressed, it has the effect of stopping all axes and spindle movements immediately. 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 continue to keep the interlock switch closed, until the release sequence is performed.

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

After releasing an emergency stop, you may 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 CNC machine.


2: Safety Features - Interlock Guard Switch

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 and the machine controlling software is operating in Jog Mode.

Warning

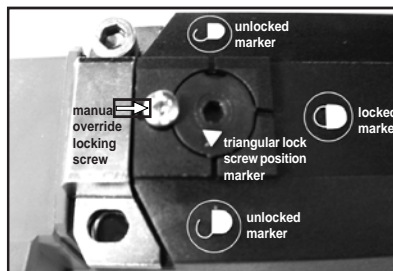
 Danger of serious injury! Do not let unauthorised personnel use the machine when the guard lock feature is disabled. Ensure the guard lock feature is switched back on as soon as possible. Under no circumstances must the safety switch actuator be removed (or a spare or replacement actuator, or other device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

An interlock guard switch is fitted to the top of the machine cover, behind the sliding door. 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.

- 1) Locate the interlock guard switch unit in recess on top of cabinet and behind sliding door.
- 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.



Left: Looking directly at the face of the interlock guard switch unit.

3: Unpacking and Lifting your CNC Machine

Warning



Caution.
Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment.

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 milling machine weighs 353 kg. bench mounted: with floor standing unit it weighs 456 kg.

With the bench mounted 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, slings must be used attached to suitable certified M10 collared lifting eyes, fitted to the holes provided in the column top and in the machine base, as shown in following illustrations.

Note: to gain access for fitting the lifting eyes it is first necessary to remove cabinet lid and front bellows cover on base.

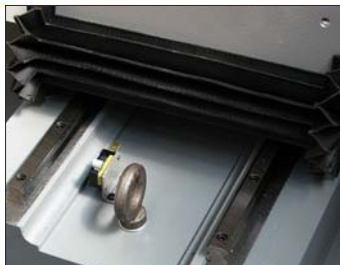
Note: this method can be used with or without the machine cabinet, but **not** with the universal machine bench fitted.

Always use sensible lifting precautions in accordance with Health and Safety Regulations in your establishment.

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

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

Due to the weight of this machine Denford cannot advise manual lifting techniques.



3: Choosing a Site for your CNC Machine

Site your machine in a well ventilated room. This CNC machine can be bench mounted or floor standing, depending on the specification. If it is to be sited on a bench, the bench must be 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 machine is supplied with a Universal 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 rear 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.

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.

Dimensional Data.

Machine Length (left to right) 1300mm (51")

With PC Extension Fitted 1900mm (75")

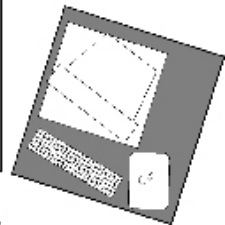
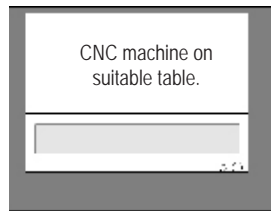
Machine height (top to bottom) 1000mm (39.5")

When Fitted on Base 1765mm (69.5")

Machine depth (front to back) 750mm (29.5")

Allow space to remove the cover plate at the rear of the cabinet.

Computer desk, monitor, keyboard and mouse angled towards Operator.



Plan View showing Ideal Machine Layout and Operating Positions.

Machine Operator.




3: Removing Protective Coatings and Packaging

Once your CNC machine has been sited and connected electrically, the protective coatings and transit packaging must be removed from the working area 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.

Warning - □ X



Potential risk of ignition / explosion!

Do not use any aerosol based or flammable products to clean your CNC machine.

Carefully read and follow any instructions or notices included with cleaning products.




4: Switching the CNC machine On

Note


The safety guard cannot be opened until the Milling machine 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 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.

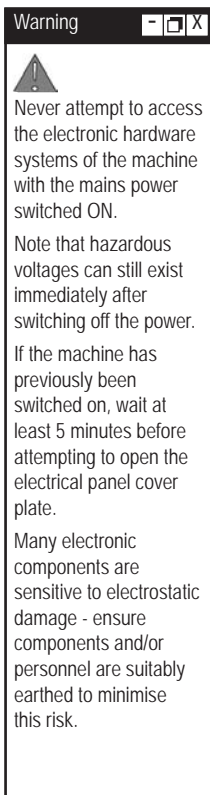
Follow these instructions to switch on your CNC Machine:

- 1) Check the Denford machine link cable is fitted securely between the USB port socket on the machine controller PC and the USB socket, located on the right-hand panel of the machine cabinet.
- 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 that the guard door is fully closed.
- 5) Plug the machine mains supply cable into an available power socket. Switch the power socket on.
- 6) The on/off power switch is located on the right-hand panel of the machine cabinet, immediately above the power socket. Press the front edge of the switch. The switch will illuminate when power is being supplied to the machine.
If the machine does not begin its power-up routine, switch off the mains power and check all connections and fuses.
- 7) Switch on the machine controller PC and start the CNC machine control software.


See the commissioning leaflet for more details
- for help please contact technical support
(01484 728000).



4: Switching the CNC Machine Off



Warning



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

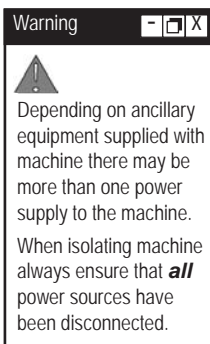
Note that hazardous voltages can still exist immediately after switching off the power.

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.

Follow these instructions to switch off your CNC machine off:

- 1) Wait for the Machine 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 machine, 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 machine by pressing the rear edge of the on/off mains power switch. The on/off switch is mounted on the right-hand cabinet panel immediately above the power socket. The red light will be extinguished.
- 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 machine.
- 7) Switch off the mains power socket.




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.


4: Homing the Machine Axes (Home Mode)

Note 

The sequence of events required to home the milling machine 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.

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.

Note 

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

Immediately after establishing a communication link between the CNC control software and the CNC machine, 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 CNC machine 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.

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.

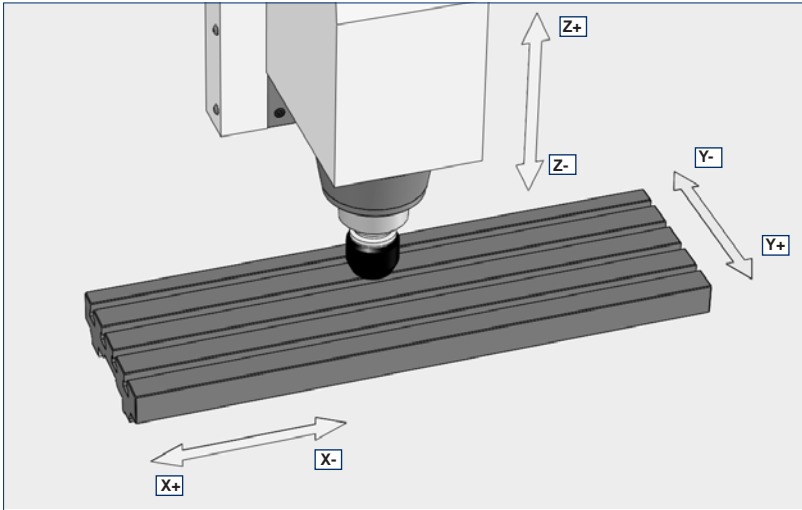
After homing the machine, the zero position of the three dimensional co-ordinate grid system is referred to as the machine datum. You can find the position of the machine datum by switching the co-ordinate display in your CNC control software to read Machine Co-ordinates. The position of the machine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

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 right and left, when viewed from the front of the machine.

Minus (-) X movements run the table towards the right end of the machine and positive (+) X movements run towards the left end of the machine.

Jog Keys to move axis - arrow keys right and left.

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

Minus (-) Y movements run the table towards the back of the machine and positive (+) Y movements run towards the front of the machine.

Jog Keys to move axis - arrow keys up and down.

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

Positive (+) Z movements run the spindle head up, away from the floor of the machine and minus (-) Z movements run down, towards the floor of the machine.

Jog Keys to move axis - Page up and Page down



4: Machine Operators Panels

Spindle Speed and Feedrate Override Controls.

The spindle speed and feedrate of the VMC 1300 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.


Note

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

Mains Power Switch.

To supply power to the CNC machine, press the front edge of the on/off power switch: the switch will illuminate. To cut power to the CNC machine, press the rear edge of the on-off power 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 machine.

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.

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.

Note

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



5: Setting Tools in the toolholders

Refitting a Tool.

Select the correct collet Size for the tool, according to the shank size for example 6mm tool use the 6-7 collet.

Insert the collet into the top section of the toolholder ensuring the collet face is flat to the toolholder face

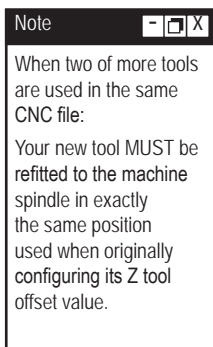


Insert the pull stud to the rear end of the tool holder.



Insert the tool into the holder at the height you require.

5: Performing a Tool Change



Performing a Manually Requested Tool Change.

Before beginning a manual tool change operation, we recommend you home the machine axes. With the axes in the home position, the maximum amount of free space will be available in the working area, allowing easier access to the tooling.

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 home 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 Manual Tool Change

First you must assemble the tool into the correct toolholder and make sure the pull stud is in the end of the toolholder.

The machine must be in the home position to prevent any collisions with the materials being machined.

- 1) Pull the lever towards you and hold the tool in the spindle



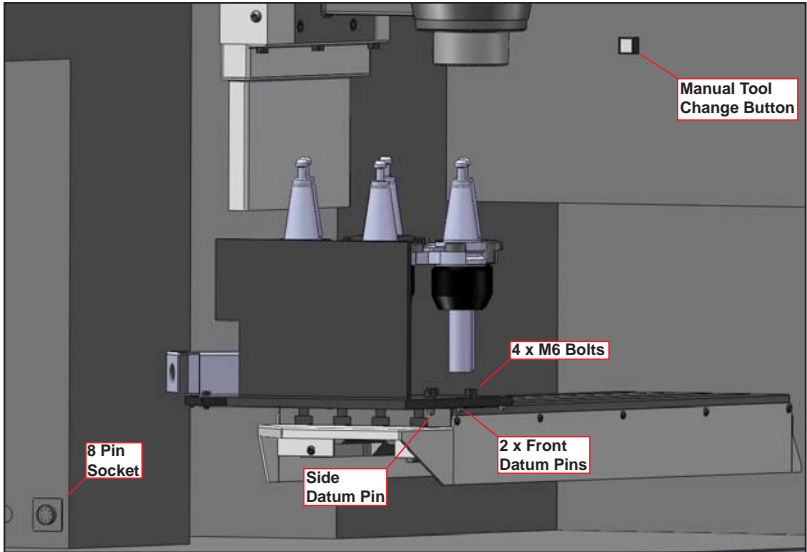
- 2) Release the lever to clamp the tool.



To change the cutting tool in the holder use the two spanners as shown below to unclamp the tool.



6: Auto Tool Changer Option



The VMC 1300 can be supplied with an Auto Tool Changer fitted as an option. With the ATC fitted X axis travel is limited to 250mm. However the ATC can be removed thereby allowing the full 375mm X Axis travel.

To Remove ATC

Before carrying out the following procedure, ensure that all tools and toolholders are removed from the carousel and spindle.

1. Reference the machine axes.
2. Move X axis to X=200.
3. Open machine door.
4. Switch off power to the machine.
5. Disconnect ATC cable from 8 pin socket on side wall of cabinet tool store recess.
6. Remove 4 x M6 bolts.
7. Lift ATC from machine and carefully store until required again.
8. Close door and restart machine.

The machine software will recognise the new soft wired limits and will allow full 375mm of X axis travel.



6: Auto Tool Changer

After removing the Auto Tool Changer, tool changing must be carried out manually as follows:-

To load a tool.

Present tool to spindle with left hand while pressing tool change push button with right hand.

Push tool fully into spindle and release push button. Tool should now be retained in spindle.

To release a tool.

While holding the tool with left hand, press tool change button with right hand to release the tool. Lower tool from spindle and release push button.

To Fit ATC

Before carrying out the following procedure, ensure that there are no tools or toolholders in the carousel or spindle.

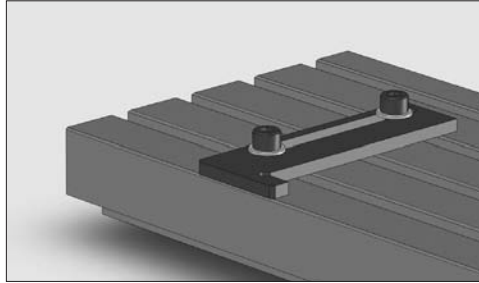
1. Reference the machine axes.
2. Move X axis to X=200.
3. Open machine door.
4. Switch off power to the machine.
5. Ensure that T nuts are still in place in the appropriate table T slots.
6. Place ATC on table and locate using datum pins on ATC base.
 - Push ATC backward and ensure that both front datum pins are in contact with front edge of table.
 - Slide ATC to the right, ensuring that front datum pins remain in contact with table, until the side datum pin contacts the end face of the table.
7. Fit 4 x M6 bolts.
8. Connect ATC cable to 8 pin socket on side wall of cabinet tool store recess.
9. Close door and restart machine.

The machine software will recognise the new soft wired limits and will restrict X axis travel to 250mm.

For further information on toolchanger settings refer to help files on VR Milling CD ROM.



7: Datum Plate



The datum plate is an L shaped bracket, used for helping to 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.

It is fixed against the machine table using two tee nut assemblies which can be moved to the required position for the datum plate.

The tee nuts slide along T shaped channels that run horizontally along the machine bed - these retain the datum plate in position when the allen headed bolts are tightened.

Fitting of Datum Plate.

To fit the datum plate in position on the machine table, place it at the end of the T shaped channels.

Align each Tee-nut with its respective channel and slide it into position.

Slide the datum plate along the machine table to the required position. Note that the datum plate can be adjusted forwards and backwards (ie. parallel to the Y axis), if required.

Once the datum plate has been positioned in approximately the correct place, tighten each of the allen headed bolts, by turning them in a clockwise direction until they just begin to grip the plate to the table surface. It must still be possible to move the datum plate, since it may require final adjustments if it needs to be lined up square with respect to the machine axes.

Removal of Datum Plate.

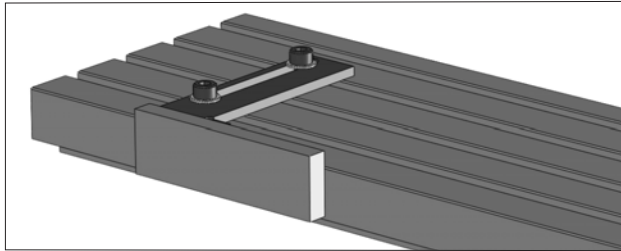
To remove the datum plate, loosen the 2 allen headed bolts, by turning them in an counterclockwise direction.

Slide the datum plate along the machine table, until the Tee-nuts are released from their channels, then withdraw the datum plate from the machine table.

7: 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.



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.

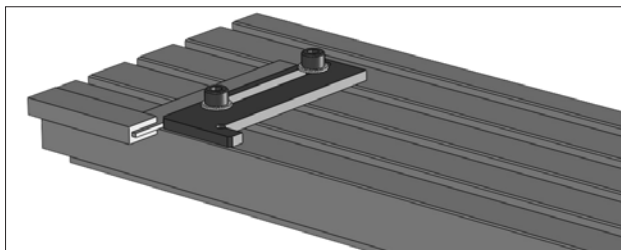
Use the true flat face of a section of material, such as a piece of flat steel bar.

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.

Tighten the allen headed bolts.

Note that although this method is quick, it is also fairly inaccurate.

Datum Plate Setting Method 2.

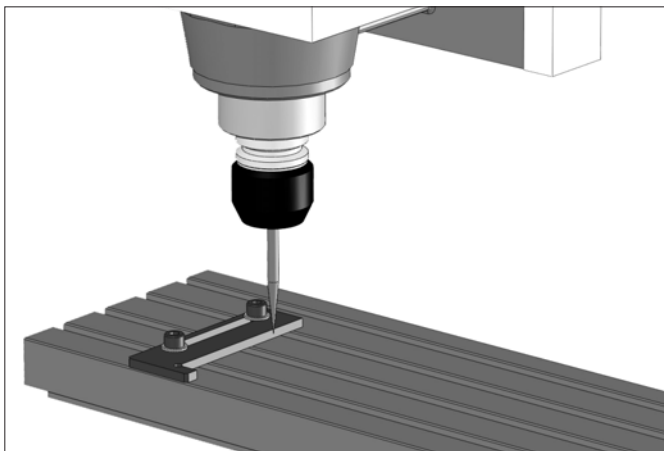


To obtain a better degree of accuracy, use an engineers square lined up against the front edge of the machine table. Adjust the datum plate so it touches the engineers square and tighten the allen headed bolts.

This method has the added advantage of allowing the datum plate to be fixed further into the middle of the machine table.

7: Setting the Datum

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.

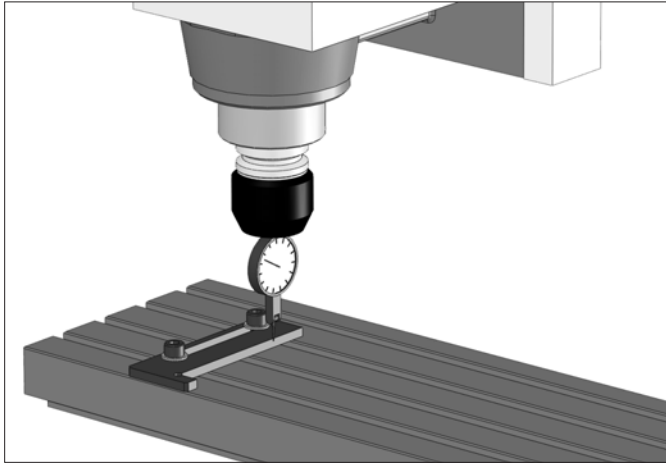
Keep repeating these steps, moving the pointer forwards and backwards along the datum plate edge, until a suitable degree of accuracy has been obtained.

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.

7: Setting the Datum

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.

8: Miteebite Clamps

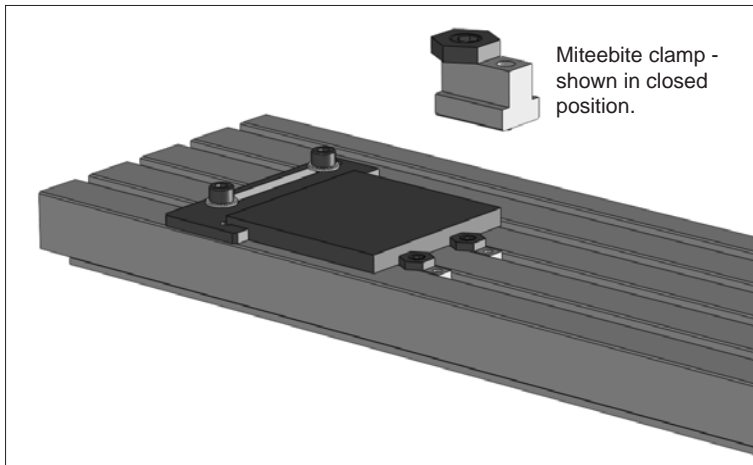
Miteebite clamps are a quick and versatile method of securing most pieces of work to the machine table.

In the example shown below, two miteebite clamps are used with a datum plate to clamp a sheet of MDF.

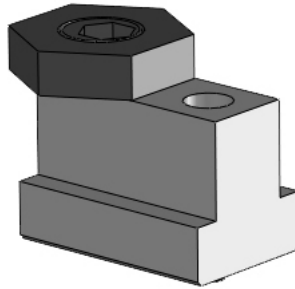
The MDF is used as a sub-table - to permit through machining, and as a safety measure to prevent damage occurring to the machine table itself, should a problem occur when milling.

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 lefthand edges aligned with the front and lefthand edges of the sub-table.



8: How does a Miteebite Clamp work?



The base of the Miteebite clamp consists of a Tee-nut, with 2 threaded holes passing right through its section from top to bottom.

One of these threaded holes contains a grubscrew. When this is tightened, the base of the grubscrew pushes against the bottom face of the T channel in which it has been placed, securing the Tee-nut in position.

The other threaded hole contains a bolt which has its head and allen key hole machined slightly off centre. A hexagon washer spins freely around this bolt head.

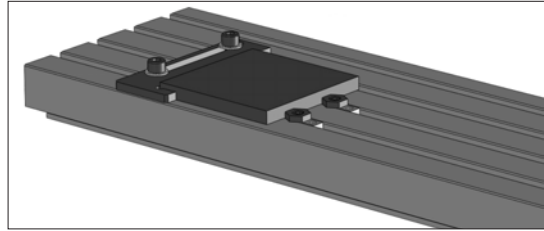
The bolt behaves in a similar way to a cam when rotated. If the allen key hole is facing away from the grubscrew, then the hexagon washer is slack against the work (ie. the Miteebite is open).

If the bolt is then turned through 180 degrees so that the allen key hole is now facing towards the grubscrew, 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.

8: Using Miteebite Clamps



The example used in the description below explains the fitting procedure for a temporary MDF sub-table, onto which a plastic 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.

Next, position the Miteebites into their respective T channels and slide them along until they touch the sub-table. Ensure that one of the six flat sides of the hexagon washers press against the subtable, not one of the hexagon points.

The hexagon washers should be positioned at this stage so they are open (ie. the off-centre allen key holes on the bolts should be facing away from the grub screws).

Now tighten the grub screws in each Miteebite to lock them firmly in position. At this stage, it should still be possible to remove the subtable.

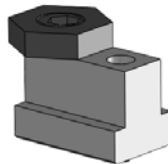
Remember, the grub screws only lock the Miteebites in position on the machine table - it is the hexagon washers which actually lock the sub-table in position.

To lock the temporary MDF bed firmly in place, turn the bolts with the off-centre allen key holes 180 degrees so the hexagon washers are in the closed position (ie. the off-centre allen key holes on the bolts should now be facing towards the grub screws).

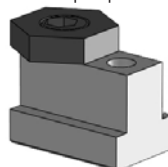
Now that the Miteebites have been set, the sub-table can be continually withdrawn from the machine table, then replaced, always to the same position.

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.

Hexagon washer set in closed position.




Hexagon washer set in open position.



9: Planning Procedure for Maintenance

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



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.

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 5 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.



10: Maintenance Schedule

Every Day

- Remove any swarf.
- Clean tooling system and tool holders.

Every Week

- Clean the machine thoroughly.
- Check all exposed screws and nuts for tightness.
- 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.
Door Part Number VMC/0506
Window Part Number VMC/0502_V2
- Check guard door top retention catch for correct operation.
If it fails to operate correctly, a replacement should be obtained without delay. Part Number SCF50530.

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.

Every Three Months

- Lubricate the machine ballscrews (see note below).
- Clean microswitches.

Every Six Months

- Lubricate the machine slideways.

Every Year

- Check machine alignments and accuracy.
- Check spindle bearing adjustment.
- Check and re-grease axis bearings.
- Check spindle drive belt for wear.



11: Lubrication Chart

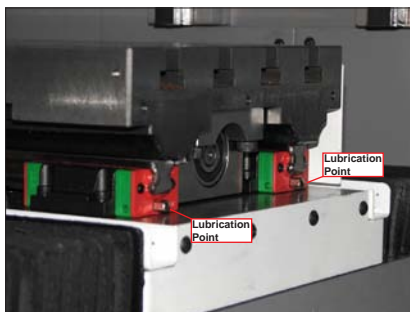
Lubrication point	Lubricating System	Frequency	Recommended Lubricant	Quantity
Machine Slideways	Grease Gun	Every 6 Months	Shell Alvania II or equivalent or Hiwin G05	Apply until grease exudes from seals
Machine Ballscrews	Grease Gun	Every 3 Months	Shell Alvania II or equivalent or Hiwin G05	Apply until grease exudes from seals
Spindle Bearings	Apply by Syringe	On Bearing Renewal	Kluber Isoflex NBU15	4cc/bearing
Axis Bearings	Apply by Syringe	Every 12 Months	Shell Alvania II or equivalent or Hiwin G05	2cc/bearing



12: X Axis Lubrication

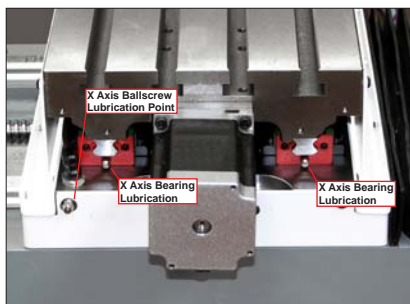


Four lubrication points for the X axis bearings and one point for the X axis ballscrew are located at the sides of the machine saddle. To access these points remove the covers as shown.



For best access to the two right hand X axis bearing lubrication points, jog the X axis fully to the left.

Using a suitable grease gun apply lubricant to the lubrication points.

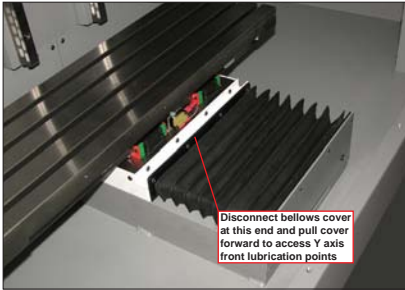


For best access to the two left hand X axis bearing lubrication points and the X axis ballscrew lubrication point, jog the X axis fully to the right.

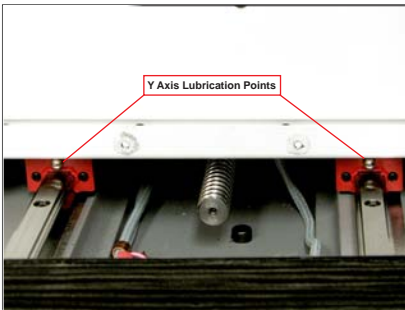
Using a suitable grease gun apply lubricant to the lubrication points.

Finally refit covers and jog axis from side to side 3 or 4 times to distribute lubricant.

13:Y Axis Lubrication

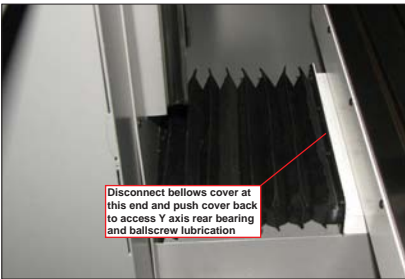


Two lubrication points for the front Y axis bearings are located at the front of the machine saddle. To access these points remove the front bellows cover as shown.



For best access to the two front Y axis bearing lubrication points, jog the Y axis fully back.

Using a suitable grease gun apply lubricant to the lubrication points.



Two lubrication points for the rear Y axis bearings, and the Y axis ballscrew are located at the rear of the machine saddle. To access these points remove the rear bellows cover as shown.



For best access to the two back Y axis bearing and Y axis ballscrew lubrication points, jog the Y axis fully forward.

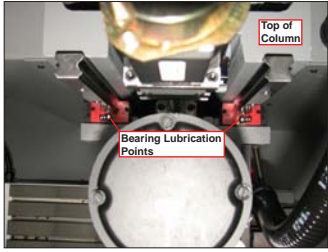
Using a suitable grease gun apply lubricant to the lubrication points.

Finally refit covers and jog axis to and fro 3 or 4 times to distribute lubricant.

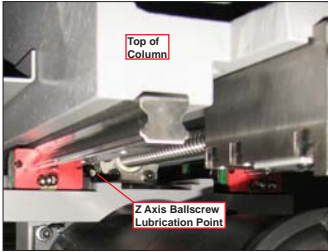
14:Z Axis Lubrication



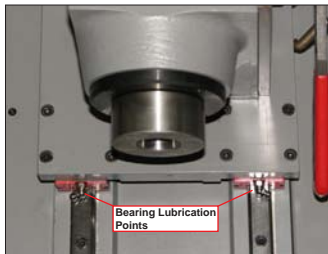
Four lubrication points for the Z axis bearings and one point for the Z axis ballscrew are located around the spindle head. To gain access to these points, remove cabinet top cover, then jog Z axis to top position and remove covers as shown.



Using a suitable grease gun apply lubricant to the top Z axis bearing lubrication points.



Using a suitable grease gun apply lubricant to the Z axis ballscrew lubrication point.



Using a suitable grease gun apply lubricant to the bottom Z axis bearing lubrication points.

Finally refit covers and jog axis up and down 3 or 4 times to distribute lubricant.

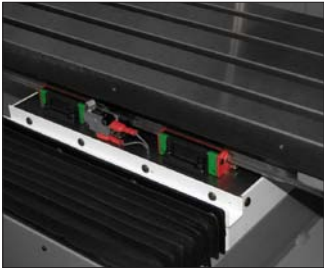


15: Cleaning the Microswitches

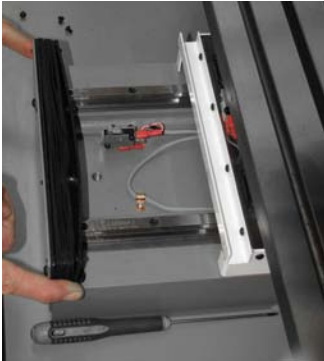
The X,Y and Z axes all have microswitches.

Using a soft bristled brush, carefully clean dust and debris away from the microswitch, to an area where it can be removed using a vacuum cleaner.

All three axis microswitches should be cleaned: they can be found in the locations shown below.



X Axis



Y Axis



Z Axis



16: Maintenance Log

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



16: Maintenance Log

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



17: 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

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 / company 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.

Contact Details:

Denford Limited,

Armytage Road, Brighouse, West Yorkshire, HD6 1QF, UK.

Telephone: 01484 728000

Fax: 01484 728100

E-mail: customerservices@denford.co.uk

Technical Support: Monday to Friday 8.30am - 4.30pm GMT

For international dialling: +44 and remove first 0 in each city code.



19: Specification of the VMC 1300

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 - 375mm (14.75")
Travel X Axis with ATC in Position - 250mm (10")
- Travel Y axis - 150mm (6")
- Travel Z axis - 235mm (9.25")

Dimensions:

- Machine width - 1300mm (47.25")
- Machine height - 1000mm (39.5")
- Machine height with base - 1765mm (69.5")
- Machine depth - 750mm (29.5")

Weights:

- Machine weight - 353kg (777 lbs)
- Machine weight on base - 456kg (1000 lbs)

Electrical Details:

- Mains supply required:
220/240Volts, 50Hz, 8 Amps.
- Spindle motor: 1.1 kw
- Spindle Speeds: 0 - 4000RPM.
- Axis stepper motors

Performance:

- Rapid traverse rate up to 5000 mm/min (197 in./min)
- Max Feed traverse rate up to 5000 mm/min (197 in./min)



20 : Declaration of Conformity for Machines prior to 29.12.09

EC Declaration of Conformity

The responsible person Mr P T Harkness
Business Name Denford Limited
Address Brighthouse
 West Yorkshire
 United Kingdom

Declares that the machinery described:
1. Make Denford Limited
2. Model VMC 1300/ VMC 1300 Pro
3. Serial Number

Conforms to the following The Machinery Directive 98/37/EC
Directives The EMC Directive 89/336/EEC
 The LVD Directive 73/23/EEC

Also the following standards
(where applicable)

And complies with the relevant
health and safety requirements

Signature of responsible person
.....

Position Senior Design Engineer
Signed at Brighthouse
 West Yorkshire
 United Kingdom



20 : Declaration of Conformity for Machines after 29.12.09

EC Declaration of Conformity

The responsible person and person authorised to compile the Technical File
 Business Name

Mr P T Harkness
 Denford Limited

Address

Armytage Road
 Brighouse
 West Yorkshire
 HD6 1QF
 United Kingdom

Declares that the machinery described:

- 1. Make Denford Limited
- 2. Model VMC 1300 Milling Machine
- 3. Serial Number

Fulfils the relevant provisions of the following Directives

Machinery Directive 2006/42/EC
 Low Voltage Directive (LVD) 2006/95/EC
 EMC Directive (2004/108/EC).

Also the following standards (where applicable)

EN 953 1997 + A1 2009: Safety of machinery – Guards. General requirements for the design and construction of fixed and movable guards.
 EN 954-1 1997: Safety of machinery - Control systems - Part 1 General principles for design.
 EN 60204-1 2006: Safety of Machinery - Electrical-equipment of machines Part 1 General requirements.
 EN ISO 12100-1 2003: Safety of machinery. Basic concepts, general principles for design - Part 1 Basic terminology, methodology.
 EN ISO 12100-2 : Safety of machinery. Basic concepts, general principles for design - Part 2: Technical principles.
 EN ISO 13732-1 2006: Ergonomics of the thermal environment. Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces.
 EN ISO 13850 2008: Safety of machinery - Emergency stop -Principles for design.
 BS EN ISO 14121-1 2007: Safety of machinery - Risk assessment Part 1 Principles.
 EN 55011 2007: Limits and methods of radio interference characteristics of industrial, scientific and medical equipment. Conducted Emissions.
 EN 55011 2007: Limits and methods of radio interference characteristics of industrial, scientific and medical equipment. Radiated Emissions.
 EN 61000-4-2: 1995 +A1 +A2 2001: Testing and Measurement Techniques; Electrostatic Discharge immunity test.
 EN 61000-4-3: 2002 +A1 + A2 2005: Electromagnetic Compatibility – Basic Immunity Standard. Radiated radio frequency electromagnetic field immunity test.
 EN 61000-4-4 2004: Testing and measurement techniques. Electrical fast burst/transient immunity test.

Signature of responsible person

Position Senior Design Engineer

Signed at Denford Ltd., Armytage Road, Brighouse

Date



21 : VMC 1300 Series Noise Level Test Results

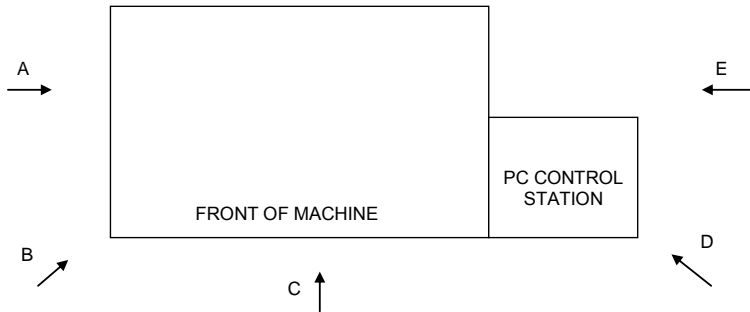
Noise Level test

Test Report No: NL-VMC-02S
Machinery Manufacturer: Denford Limited.
Machinery Type/Model: VMC 1300 CNC Milling Machine

Equipment:
Meter Ref. Standard ST-805
Denford VMC 1300

Test Conditions:

Spindle speed: 0 - 4000 RPM.
Axis speed: 0 - 5000 mm/min
Ambient background noise: 50 dB(A).



A, B, C, D & E are measurement positions 1 metre from the machine and at a height of 1.6 metres above floor level.

Results;

All values are measured in dB(A)

Condition	A	B	C	D	E
Test Program	65	64	67	66	67

Test Program

Spindle speed varying between 0 and 4000 RPM
Machine axes in combination 0 to 3,500mm/min.
ATC Cycle – Spindle Stationary – machine axes in combination 0 to 5000 rpm.

The entire test cycle was run at each of the positions shown and the maximum figures registered at each position were recorded in the above table.



22: Glossary

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.
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 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 CODE	The code obeyed by a computer or microprocessor system with no need for further translation.
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 using the machine offset facility.



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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.
PRJ	Denford CNC Project file, extension ".prj". Project files contain global information about user defined settings in the VR CNC Milling software, such as tooling setup, tooling library, offsets, toolbar and window positions etc.
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).
RPM.....	Revolutions per minute (rev/min) - a measure of spindle speed.
SIMULATION OFFSET.....	The workpiece offset file only used with VR CNC Milling software 2D and 3D graphics.
SLIDES.....	The 3 machine axes - see axis.
SPINDLE	Rotating element of machine head, into which cutting tools are fitted.
SPINDLE SPEED	The rate of rotation (velocity) of the machine head / cutting tool, measured in RPM.
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 milled. The work is sometimes referred to as the billet or stock.



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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.
XNC	Denford Compiled CNC file, extension ".xnc". A compiled file is a FANUC Miller file that is formatted to allow 3D elements such as the 3D Viewer to run as quickly as possible. XNC files can also be used to drive an attached CNC machine when run through the VR CNC Milling software.
Z TOOL OFFSET	See Tool Offset



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Language :

This manual is written using European English.

Questions and Comments :

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