Denford G35Ø

DENFORD
COMPUTERISED MACHINES AND SYSTEMS

Operating Guide for the G35Ø Series CNC Milling Machine

- Installation
- Specific Features
- Routine Maintenance

This manual applies only to the machine having the serial number shown below.

Please note that this number will be required should Denford Limited be contacted regarding this machine.

Machine Serial Number : _____

Year of Manufacture : _____

CE

Manufactured by
Denford Limited,
Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.
Telephone: +44 (Ø)1484 712264.
Fax: +44 (Ø)1484 722160.
Email: service@denford.co.uk

Notes.

CONTENTS.

INTRODUCTION.

This guide describes the correct procedures for transporting and installing your Denford G35Ø milling machine.

These procedures should be followed precisely to ensure your G35Ø milling machine is not damaged in any way during the installation period.

During the installation period, the protective coats and coverings applied prior to despatch should not be removed.

All installation work should be carried out by Denford or Denford approved personnel.

General operating functions are explained in the separate FANUC control manuals delivered with your machine.

A Routine Maintenance section is also included. Please note, the Electrical Diagrams for your machine are held in a folder fixed inside the electrical control box.

IF YOU HAVE ANY DOUBTS AND/OR QUESTIONS REGARDING THE SPECIFICATION, SERVICING OR FEATURES OF YOUR MACHINE, PLEASE CONTACT CUSTOMER SERVICES AT DENFORD.

WARNING.

The Warranty on this machine will be invalidated if any modifications, additional ancillary equipment is fitted, or any adjustments made to the controlling devices without prior notification from Denford Limited.

Do not carry out any portable appliance testing (PAT) on any of the supplied equipment.

EC Declaration of Conformity.

The responsible person :	_____
Business Name :	Denford Limited.
Address :	Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.
Declares that the machinery described :	
Manufacturer :	Denford Limited.
Model Name :	G35Ø
Serial Number :	_____
conforms to the following directives :	EC Machinery directive 89/392/EEC as amended by directive 91/368 EEC and directive 93/44/EEC, CE marking directive 93/68/EEC and low voltage directive 73/23/EEC
and the following standards :	BS EN 6Ø2Ø4 - 1 : 1993
	_____

and complies with the relevant health and safety requirements.

Signature :	_____
Position within company :	_____
Signed at :	Denford Limited, Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.

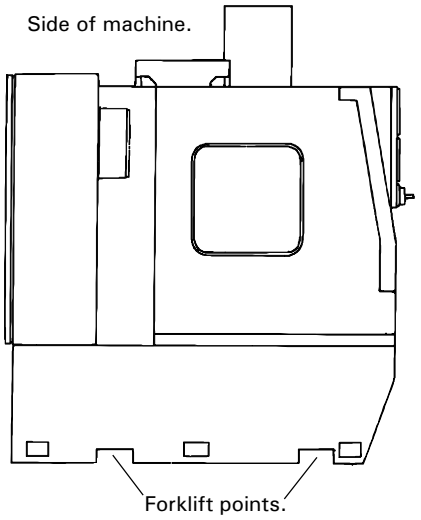
Unpacking & Lifting the Machine.

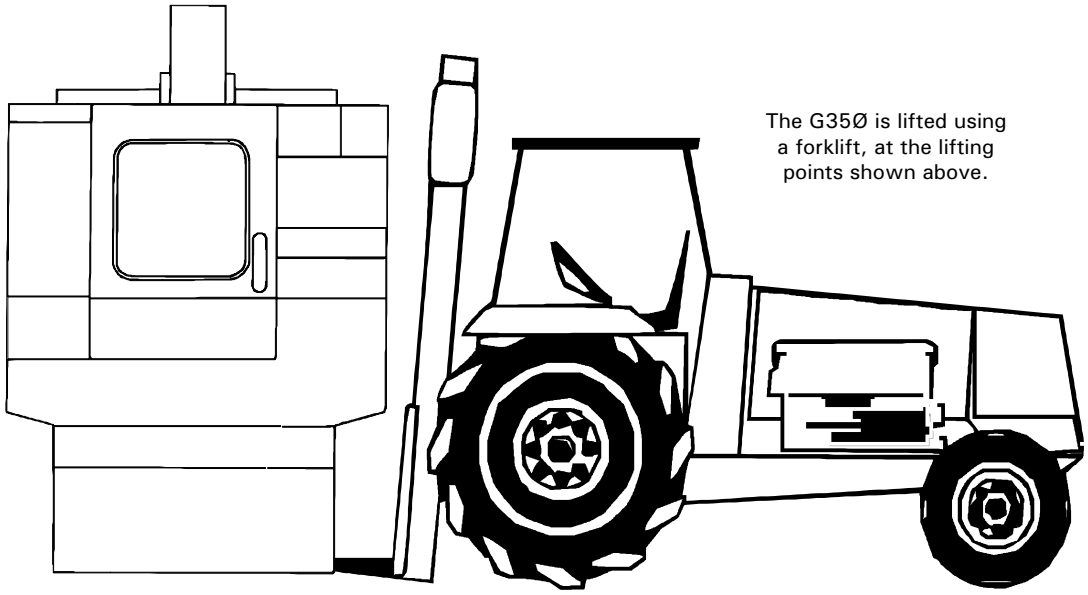
Cut any transit packaging away from the G35Ø milling machine.

The G35Ø is lifted using a forklift, under the two lifting points (channels) accessible at the side of the cabinet base.

Ensure that the machine is secure before lifting. Always use correct lifting precautions in accordance with Health and Safety Regulations in your establishment.

G35Ø Weight (net) = 127Ø Kilos (2794 lbs)



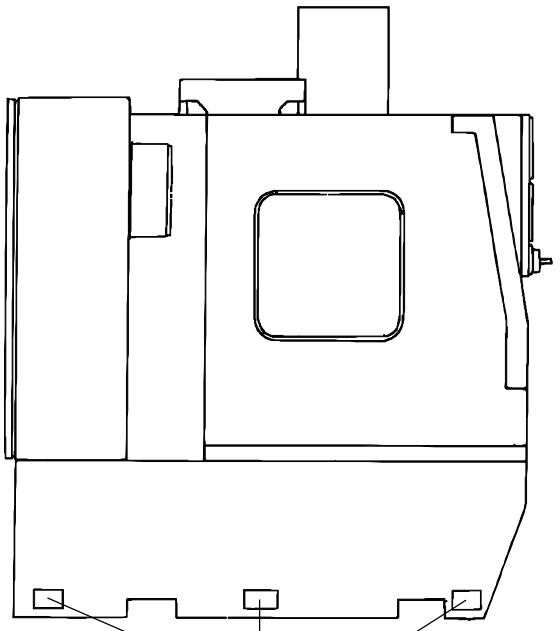


The G35Ø is lifted using a forklift, at the lifting points shown above.

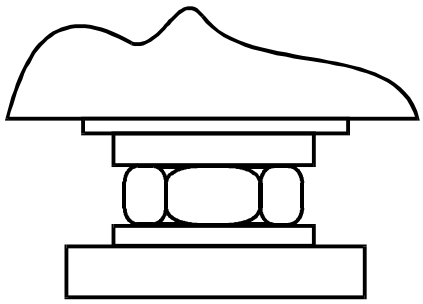
Levelling & Positioning the Machine.

Remember when positioning the machine in the room, space will be required for access to the electrical control box, mounted at the back of the machine. Sufficient room should also be provided for effective maintenance to be carried out.

The G35Ø is levelled to the machine base prior to dispatch, but should the machine require re-levelling on site, this can be done using the six contact points in the base of the machine (3 per side of the machine).

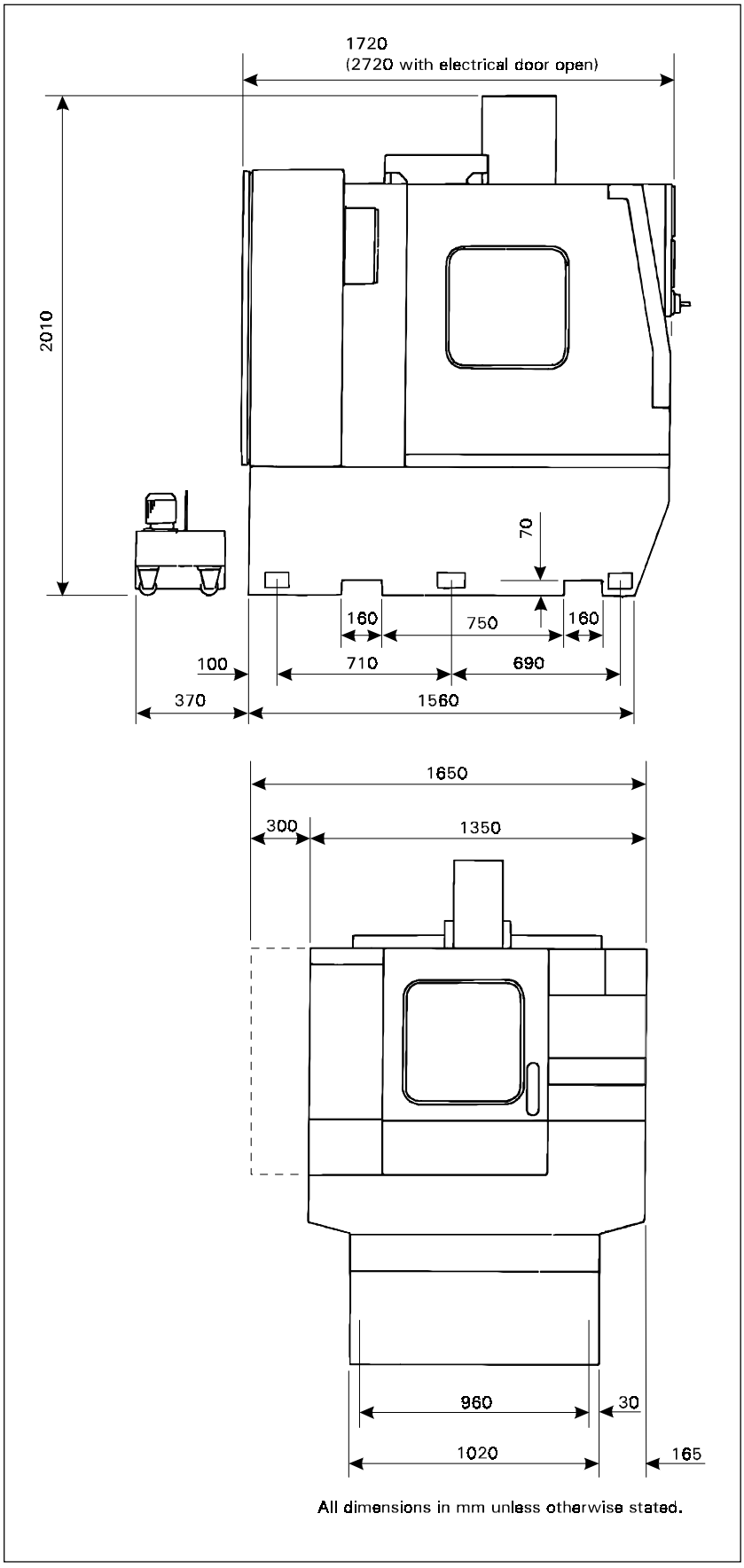


Levelling contact points
(3 per machine side).



To increase the machine height, turn the adjusting nut anticlockwise (when the adjusting nut is viewed from above).

Machine Extent Drawings.



Electrical Diagrams, Control Box Connection and Seal.

The Electrical Diagrams for your machine are held in a folder fixed inside the electrical control box.

Warning! Do not connect cables between any electrical hardware with the mains power switched on, since this could damage the hardware.

The electrical control box is inspected then sealed with a yellow seal; if this seal is broken on delivery, inform the suppliers immediately. The seal should only be broken for the initial mains power connection.

Connecting the Mains Supply.

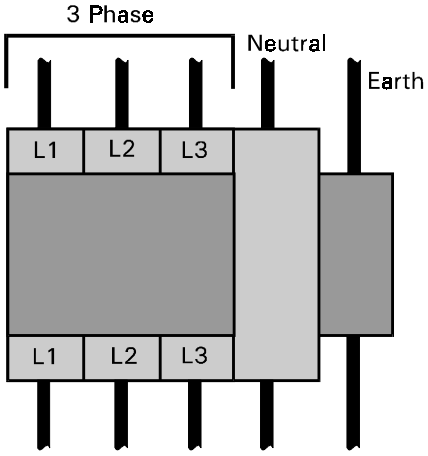
Note! For the smooth running of the system, it is essential that the power supply is constant and stable.

The electrical power supply is fed to the electrical control box, fitted to the back of the machine cabinet, which in turn is connected to the milling machine.

Connection procedure:

1) Unlock and open the the electrical control box (breaking the delivery seal).
2) Put crimp connectors on the mains, neutral and earth wires.
3) Connect the mains wires into the top of the contact block, as shown in the diagram below.

Tool required:
Phillips head screwdriver and crimping pliers.



Cable required:- 4 Core (3 Phase, Neutral) Earth - 2.5mm per phase - 415 Volts - 5Ø/6Ø Hz - 2Ø amp/phase.

ALL ELECTRICAL WORK SHOULD BE CARRIED OUT BY A SUITABLY QUALIFIED ELECTRICAL ENGINEER.

Removal of Protective Coatings.

Once the machine has been sited and connected electrically, the protective coatings must be removed to prepare the machine for running.

The protective coatings applied to the slideways and bright surfaces can be removed using a kerosene based solvent. The coatings must be removed from the slideways before any attempt to move them is made. Once these protective coatings have been removed, all untreated surfaces should be coated with a light covering of machine oil (eg BP: CS 68).

The protective plastic sheeting on the guard windows should be removed and the perspex cleaned with an anti-static cleaner.

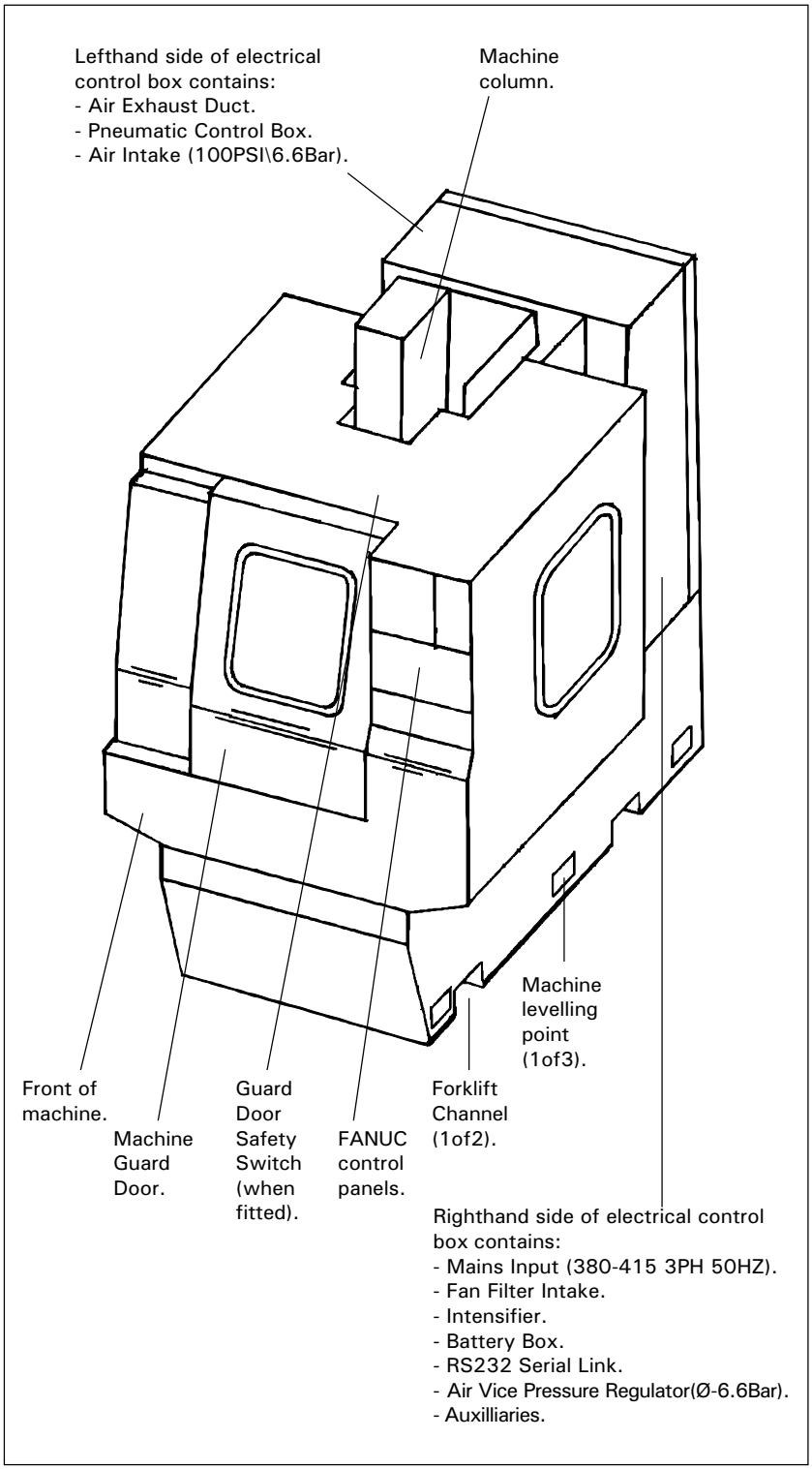
Air Pipe Connection.

The ATC (Automatic Tool Changer) and the Hydro/ Pneumatic Vice require an air compressor fitted with a SCHRADER quick release connector.

The connection fitted onto the machine air filter regulator and lubricator is SCHRADER part number SC 8Ø51-11 1/8 BSP MALE (or Denford part number BI Ø1451S).

The female connector required on the 1/4" pipe leading to the air compressor is SCHRADER part number 9793C-12 1/4" BSP FEMALE (or Denford part number BI Ø1128S).

G35Ø - General Layout.



Hydro/ Pneumatic Vice Operation.

Hydro/Pneumatic Vice (when fitted).

The pressure of the vice jaws can be adjusted using the rotary control on the regulator feeding air into the main cylinder. To adjust the pressure, pull up the rotary control to unlock it from its current position. Turn the control clockwise to increase pressure, or anticlockwise to decrease pressure. Push the rotary control down to relock it in its new position. The pressure cannot be adjusted higher than the operating pressure of the main air filter regulator.

General Safety Precautions.

General Safety Precautions :

- Wear clothing suitable for operating the machine and follow the safe working procedures in place at your establishment.
- 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.
- If power fails turn off the yellow isolator (found on the electrical control box) immediately.
- Ensure the power is switched off before starting any maintenance work on the machine or opening/ working on the electrical control box.
- Check the state of the slideway lubrication daily, to prevent the axes from becoming jammed. The machine is fitted with an auto-lubrication system, ensure the resovoir is topped up regularly.

Safety Features.

Key operated Emergency Stop button.

The red emergency stop button is fitted on one of the FANUC control panels When depressed it has the effect of stopping all axis and spindle movement. To reset, push the button in and turn clockwise (a key may be required).

Axis Limit Switches.

Limit switches are fitted to all three axes to prevent overtravel. The X and Y limit switches are fixed, but the Z limit switch is adjustable using the sliding bar.

An axis limit switch override button is fitted on one of the FANUC control panels. It should be used when the table or head has overtravelled and activated the limit switch. To reset, depress the button and simultaneously press the appropriate axis key to move away from the limit switch, then home each axis individually.

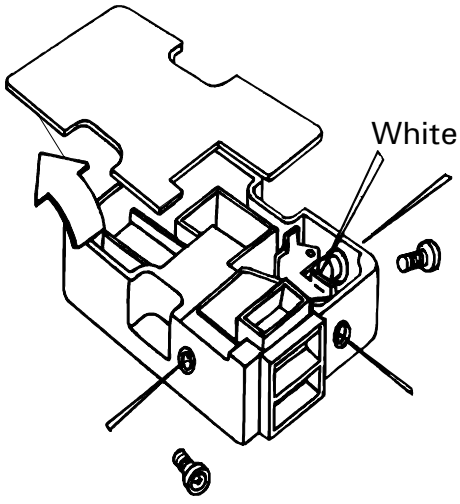
Guard Door Safety Switch.

To enter the working area when the 24 volt cicuit has failed and the door is clamped electrically. As indicated in the diagram below:

1) The cover of the microswitch can be removed using the special tool (supplied in the toolkit) to remove the special tamper proof screws (6); the internal workings of the switch are now exposed. Alternatively, by removing any of the three screws indicated, the white trip lever may be moved using a 2mm dia. rod through the screw hole.

2) Using a screwdriver , or similar tool, move the white trip lever to the right to operate the switch, keeping this depressed the door can now be opened.

Applies to machines supplied within the EEC only.



Switching the Machine On/Off.

Switching the machine 'on'.

Power up the machine by turning the yellow rotary isolator switch on the electrical control box door to the 'on' position.

Press the green 'control on' button (on the righthand side of the lower FANUC control panel) to power up the FANUC controller.

Switching the machine 'off'.

Press the red 'control off' button (on the righthand side of the lower FANUC control panel) to power down the FANUC controller.

Power down the machine by turning the yellow rotary isolator switch on the electrical control box door to the 'off' position.

The machine must not be turned off if a milling program is running, or the machine is cutting work....

Run In Procedures.

Before working on the G35Ø for the first time, it is important that the spindle is "run in" for a set period:

Speed.	Time.
5ØØ rpm	15 min
1ØØØ rpm	1Ø min
2ØØØ rpm	1Ø min

A total running in time of 35 minutes.

Use the following procedure to "run in " the spindle:

1) Select MDI Mode on the FANUC data input control panel.
2) Press the [PRGRM] button.
3) Press the [PAGE *DOWN ARROW*] button until the MDI screen is displayed.
4) Key in M Ø3 followed by the [INPUT] button.
5) Key in S 5ØØ followed by the [INPUT] button.
6) Key in G 97 followed by the [INPUT] button.
7) Press the [CYCLE START] button.

Note - Ensure that SPDL 1ØØ% is activated on the FANUC control panel.

To change the speed:

1) Key in S 1ØØØ followed by the [INPUT] button (the value after the S code should be changed to the numbers stated in the "run in" table above).
2) Press the [CYCLE START] button.

To stop the spindle:

1) Key in M Ø5 followed by the [INPUT] button.
2) Press the [CYCLE START] button.

Planning Procedure for Maintenance Work.

When carrying out maintenance work, pay special attention to the following items to ensure safe and correct procedures.

1) Before starting any maintenance work, define the task and obtain the information relevant to carry out the maintenance to a successful conclusion.
2) Prior to commencing any maintenance task, define the work period to do the necessary work, obtain the correct tools, order the spare parts needed to complete the task.
3) During the maintenance work period put up a notice in a place easily seen, to the effect that the machine is under maintenance and should not be used until the notice is removed.
4) Safety should be a priority when carrying out any maintenance, covers and safety guards that are removed during the maintenance period should be replaced after the work is completed and all interlocks and micro-switches reset.
5) All maintenance work should be carried out by suitably qualified personnel.
6) When replacing electrical components ensure that they are the ones specified. When carrying out maintenance work with the power turned off, put up a notice "DO NOT TURN ON POWER" on the isolator switch.
7) All maintenance work done on the machine whether progressive or preventative should be logged so that a complete service record can be kept for future referral.
8) When the maintenance is completed, check that the replaced and serviced parts are working correctly, and that the machine runs efficiently.

Maintenance Schedule.

Daily	-	Clean and remove swarf. - Check/top-up slide lubrication oil level in reservoir.
Weekly	-	Clean machine thoroughly. - Check/top-up Cutting Coolant level.
Biannually	-	Check adjustment of head, cross slide and table strips.
Annually	-	Grease Axis Bearings. - Check machine alignments and accuracy. - Check spindle bearing adjustment. - Check spindle drive belt. - Check axis drive belt for wear. - Change air filters. - * Change FANUC controller memory batteries.

** When changing the batteries in the memory of the FANUC controller, ensure that the FANUC controller is switched ON before and during the battery changing operation.*

If in doubt about any of the above procedures, contact Denford Limited for assistance.

Lubrication Chart.

Lubrication Point	Lubricating System	Frequency	Recommended Oil/Grease	Quantity
Slide ways and Ballscrews	Auto Pump Unit	Alarm Message on Control VDU	BP : CS 68 Shell : Vitrea 68 Castrol : Perfecto NN	Ø.5 litre
Milling Head	Grease Seal	On Maintenance of Milling Head	Kluber Isoflex NBU 15	4 cc/Bearing
Axis Bearings	Grease Seal	Once a year	BP : LS 3 Shell : Alvania No. 3	2 cc/Bearing
Coolant	Electric Pump	As required	Cincinnati Millacron Simcool C 6Ø (Dilute2.5%)	5Ø litres

Coolant Filling and Draining.

Capacity: 5Ø litres (11 gals).

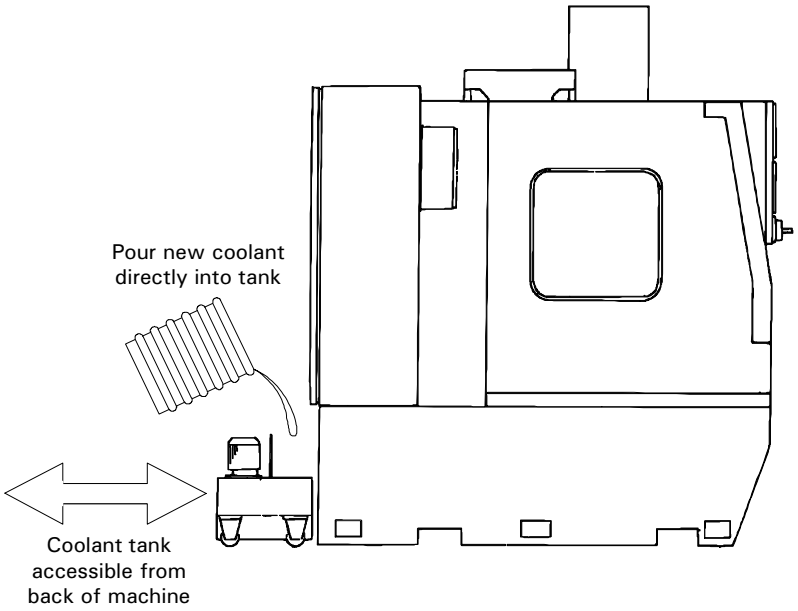
Recommended Type: Cincinnati Millacron Simcool C6Ø - dilution 2.5%.

To empty the coolant tank of swarf, pull out the tank from the rear of the machine ensuring that the pump cable and the coolant pipe are not too extended.

Remove the main pipe from the coolant pump and attach a transfer pipe, leading an empty container.

Switch on the pump to drain any swarf into the empty container.

Fill the coolant tank by pouring the fresh liquid directly into the tank.



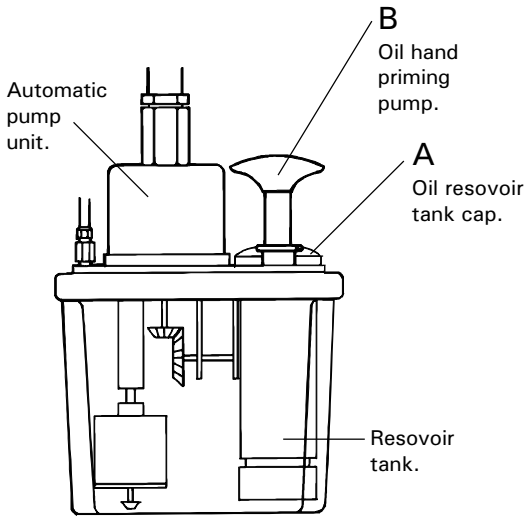
Slide Lubrication System.

The G35Ø is fitted with an automatic lubrication system, comprising of an oil reservoir tank and an automatic pump unit. Oil is automatically pumped to the required areas of the machine. The reservoir on the system should be filled to the correct level before any work commences and a check should be made to ascertain if the oil is being pumped to the slides and the ballscrews.

The lubrication system works from a signal on the main spindle so the pump is only active when the spindle is running.

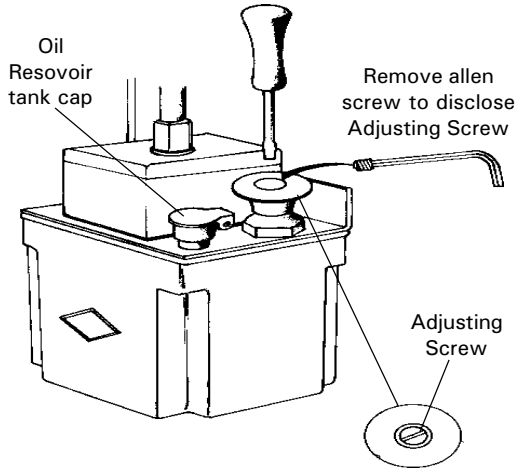
The oil level can be topped-up by adding the required grade of lubrication oil into the reservoir through cap A. Use SAE 10 for the lubrication system. All bearings are of the "sealed for life" type and no maintenance should be required.

The hand priming pump, B, should only be used if there is no oil in the reservoir, ie, the pump has run dry or the oil is being renewed (shown below).

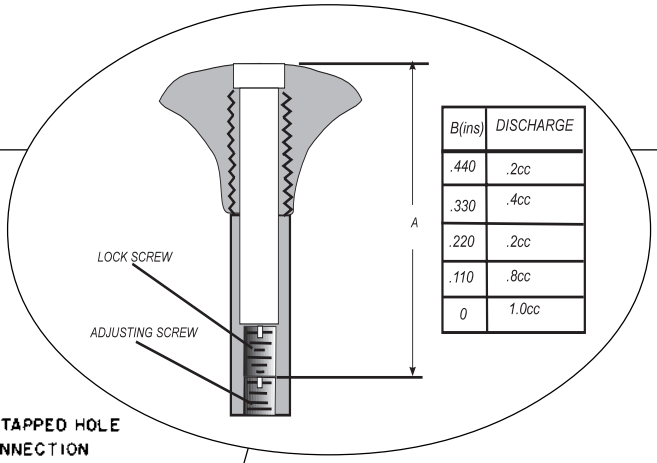


FRONT ELEVATION OF SLIDE LUBRICATION SYSTEM.

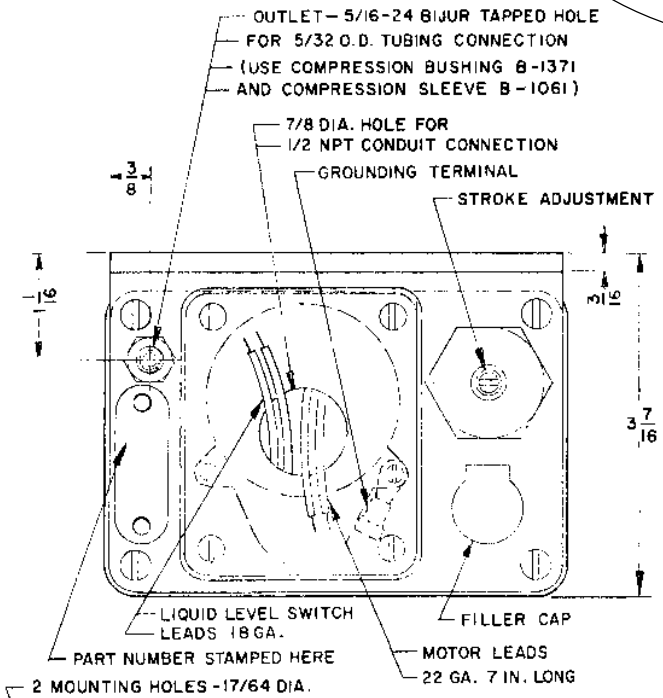
The lubrication flow is set for correct flow at the manufacturers, to lessen the flow - remove the allen screw and turn the cross-head screw clockwise. Replace the allen screw after adjustment (shown below).

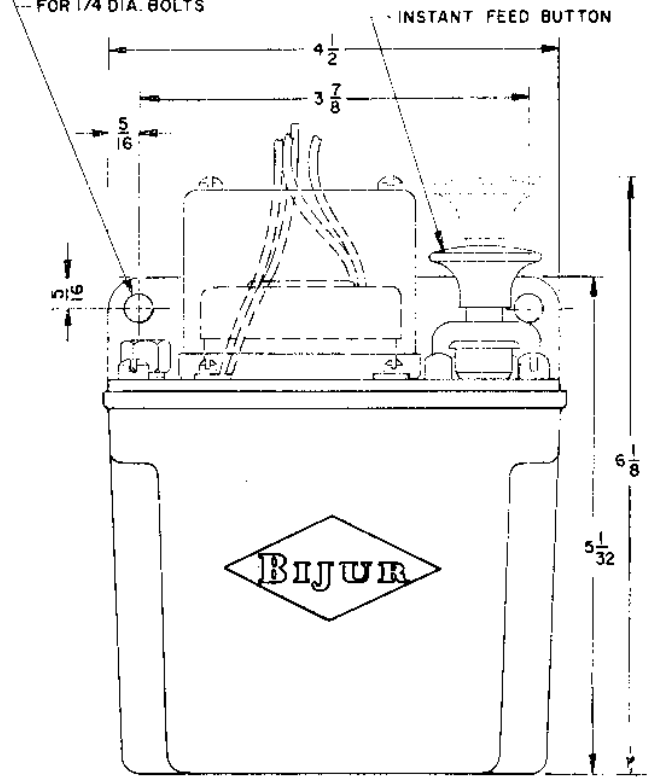


Slide Lubrication System.



B(ins)	DISCHARGE
.440	.2cc
.330	.4cc
.220	.2cc
.110	.8cc
0	1.0cc





Operation.

Lubricator type TM1 is a motor driven piston pump of the spring discharge type. The motor incorporates a gear reduction which determines the operating cycle of the pump piston. The cycle times available are shown in the table above.

Discharge Volume per Stroke

Adjustable - Ø.2 cu cm. minimum

1.Ø cu. cm. maximum

The flow is set at the factory for medium flow - to lessen the flow, remove the lock screw (1/8"allen key), then measure A , turn the adjusting screw clockwise increasing A by B dimension.

Capacity.

The reservoir capacity is 1 pint (475 cu. cm.)

ATC Maintenance.

ATC Slides lubrication.

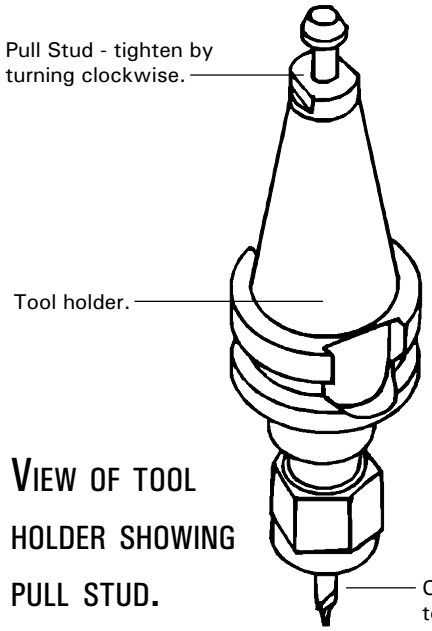
The slides on the Automatic Tool Changer are not supplied with lubricating oil automatically.

As part of the weekly maintenance schedule, the condition of the slides should be checked. The slides and the indexing cam mechanism of the ATC will require lubrication regularly. This is effected with an oilcan beneath the ATC guard. DO NOT lubricate the slides whilst the machine is running.

ATC Maintenance of pull studs.

The cutting tools, used with an ATC, are fitted in separate tool holders. Each tool holder shank has a pull stud which is used to clamp the tool holder firmly in the machine head.

These pull studs should be checked weekly and retightened if they are loose.



View of tool holder showing pull stud.

Air Filters.

The air filters on both sides of the machine should be changed either annually, or when they are "black" in colour.

When reordering quote reference:

Air Inlet Filter - 16Ømm Ref: RS 5Ø7-86Ø.

Air Filter Regulator and Lubricator.

The ATC and hydro/pneumatic vice are supplied with compressed air, passing through an air filter regulator and lubricator, situated on the back panel of the machine.

Air supply isolator.

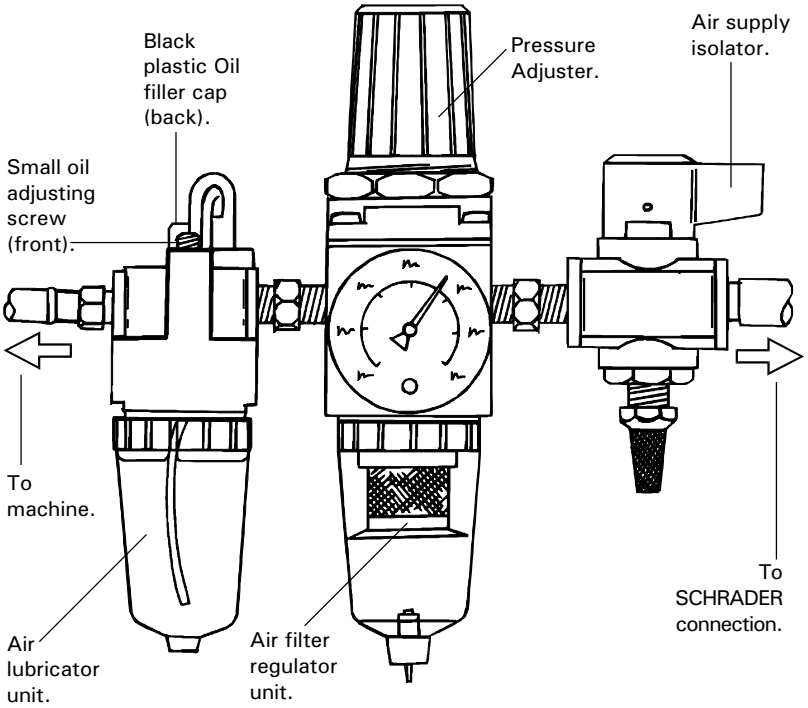
Turn anticlockwise to allow air to flow (as shown in the diagram below).
Turn clockwise to cut air supply and drain air pressure from the system.

Air filter regulator.

Normal operating pressure (as supplied, preset on the machine) is 1ØØ PSI (6.6 Bar).
Maximum pressure for the air regulator is 15Ø PSI (9.9 Bar).
Always check the main supply pressure before adjusting pressure at the regulator. To adjust the pressure, pull up the rotary control to unlock it from its current position. Turn the control clockwise to increase pressure, or anticlockwise to decrease pressure. Push the rotary control down to relock it in its new position.
Regularly drain any water collected in the filter bottle using the cap in the base of the bottle. The interval at which this operation is required will depend on the type and condition of the air compressor being used.

Air lubricator.

The air lubricator uses oil - ISOVG32.
Turn the front small adjusting screw clockwise to decrease the oil flow, or anticlockwise to increase the oil flow.
Oil can be added to the resovoir bottle by removing the black cap positioned behind the glass bell housing.



G35Ø
SPECIFICATION.

MECHANICAL.

Working Table Surface Area ..... 4ØØx28Ømm (15.5"x11")
X Table Traverse ..... 35Ømm (13.7")
Y Table Traverse ..... 25Ømm (9.8")
Z Table Traverse ..... 4ØØmm (15.7")
Spindle to Table ..... 47Ømm (18.4")
Spindle to Column ..... 25Ømm (9.8")
Spindle Taper ..... ISO3Ø or BT3Ø
3 Tee Slots ..... 16mm width x 9Ømm centres
Z Axis Ballscrew ..... 25mm dia. x 5mm Pitch
X Axis Ballscrew ..... 25mm dia. x 5mm Pitch
Y Axis Ballscrew ..... 25mm dia. x 5mm Pitch
Feedrates ..... Ø-1Ø m/min
Machine Depth ..... 172Ømm (68")
Machine Width ..... 135Ømm (53")
Machine Height ..... 2Ø1Ømm (79")
Machine Weight (net) ..... 127Ø Kilos (2794 lbs)
Machine Resolution ..... Ø.Ø1mm (Ø.ØØØ4")
System Resolution Ø.ØØ5mm
Spindle Speed Range ..... Programmable 5Ø-5ØØØ rpm

ELECTRICAL.

Mains Supply
415 Volts - 5Ø/6Ø Hz - 3 phase - 2Ø amp/phase

Spindle Motor:
3 HP

Axes Motor:
AC Servo

Denford Contacts, Products and Services.

If you require specific help regarding the specification, operation or maintenance of this machine, contact Denford on the phone/fax number below. Please have the machine serial number and year of manufacture (printed on the front of this guide) to hand, when you call.

Telephone: +44 (Ø)1484 712264.
Fax: (Ø1484) 72216Ø.
Denford Limited,
Birds Royd, Brighouse, West Yorkshire, HD6 1NB, England.
Email: education@denford.co.uk

Stuck for projects and ideas?

Denford produces a range of project based courseware material, especially designed for use with our range of CNC Milling Machines and software products. Denford Courseware is developed to encourage the use of CNC machines and software within Keystages 3 and 4 of the Design and Technology National Curriculum.

Products available include:

- Milling Courseware Introductory (a brief introduction to the milling machine and Denfords "MillCAM Designer" software).
- Keystage 3 Projects for Milling.
- Milling Courseware Intermediate (exploring how the machine works, basic G-code program writing and the use of CNC machines in Industry).
- Keystage 4 Projects for Milling.

Need further training?

The Denford PTDC (Professional Training and Development Centre) is a purpose built centre specialising in project guidance, CNC machine training and software development skills for Denford customers. Training packages can be tailored to suit your needs, with the help of our experienced Education Support team. The centre can cater for training sessions from the very basics of CNC machine operation, upto the complexities of G-code programming, then further into 'new' Technology areas such as video conferencing.

Denford Limited is committed to the development of its training guides and manuals. If you have found certain sections in this setup guide useful, or feel that particular sections could be further developed, or new sections added in future, we would welcome your suggestions and comments.