

FG1A

FORM GRINDING MACHINE



OPERATION AND MAINTENANCE MANUAL

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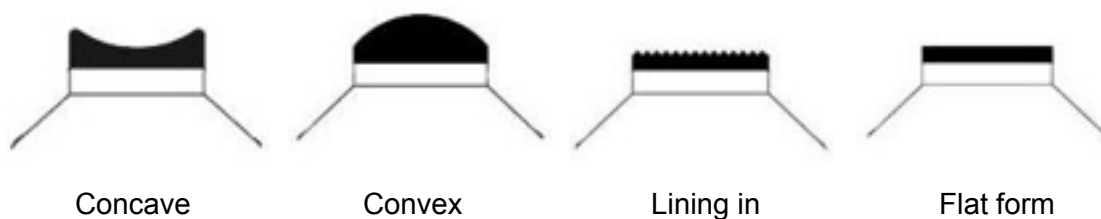
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1. INTRODUCTION

Designed to meet the needs of the toolmaker supplying the jewellery and horological industries, the FG1A Form Grinder has a number of features which make it ideal for natural diamond form (Posalux) tooling.

- Individual front / side clearance setting
- Variable speed main spindle
- Programmable Traverse stroke
- Multi-position adjustable toolholder
- On-machine optics (microscope, projector or video camera)

Typical tool shapes



2. TECHNICAL DETAILS

Specification:

Bench Size	530 x 680 x 864 mm
Spindle Power	0.75 kW
Spindle Speed	0 - 3000 rpm (inverter driven)
Spindle design	4 bearing high precision electrical spindle
Work Head	lateral CNC controlled and Infeed manual controlled
Toolholding	multi-adjustable tool fixture – front clearance $\pm 20^\circ$ side clearance $\pm 20^\circ$, pivot (flank) positioning $\pm 30^\circ$ lateral fine adjust, height adjustment ± 10 mm floating table (free weight pressure) with coarse and fine feeds (0-25mm X 0.001mm)
Electrical Supply	single phase and earth, 220 volts supply
Net Weight	c. 150 kg
Wheel	125mm dia x 40mm bore

3. THE MACHINE

4. ELECTRICAL ENCLOSURE:

The electrical Enclosure will be mounted to the left or right-hand side of the machine base, depending on your request. If the enclosure is mounted to the right, then on the front you will find a fan outlet, plus 2 USB and 1 Ethernet connector. If mounted to the left, then these will be on the back of the enclosure. See (Figure 1 USB and Ethernet Connections). On the Enclosure door you will find the power on button, see (Figure 2 Power on button). And the main isolator, see (Figure 3 Main Isolator)

On the bottom you will find the mains power input hole,
It is suggested you Provide space to open the side door.

The electrical enclosure houses the mains isolator, main contactor, overloads relays, fuses, spindle inverter and the embedded PC. The side door may be opened to give access to all these components.

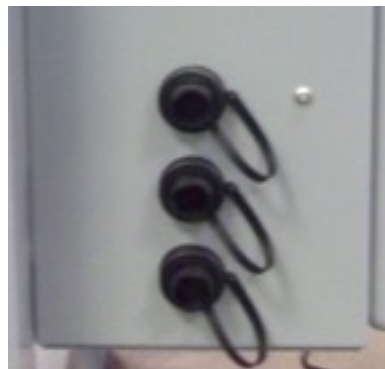


Figure 1 USB and Ethernet Connections



Figure 2 Power on button



Figure 3 Main Isolator

5. CONTROL PANEL / TOUCH SCREEN:

The control panel is mounted to the side of the touch screen Computer monitor; See (Figure 4 Control Panel / Touch Screen)



Figure 4 Control Panel / Touch Screen

The control panel / touch screen is mounted to the front of the electrical enclosure, If the enclosure is mounted to the right or on the back if mounted to the left.

6. CONTROLS

The machine is turned on using the isolator on the side door of the control enclosure. See (Figure 3 Main Isolator) this totally isolates the incoming single phase power supply.

The power on push button (Figure 2 Power on button) should be pushed to POWER UP, switch on the PC. The FG1A software will automatically load, once the PC has fully started

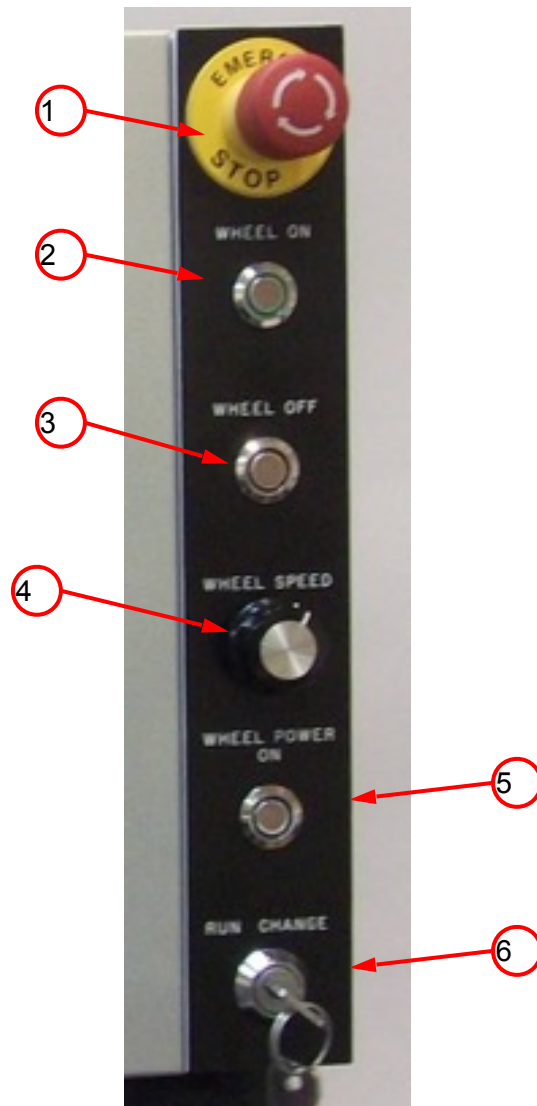


Figure 5 Main Control Panel

Table 1 Main Control Panel Functions

FUNCTION Number	DESCRIPTION
1	Emergency stop button
2	Wheel on button, turns on the wheel spindle
3	Wheel off button, turns off the wheel spindle
4	Wheel speed control, adjusts the wheel speed from 0 – 3000 RPM. The set speed is displayed on the main software screen.
5	Wheel power on button, Turns on the power to the wheel spindle inverter
6	Run / Change button, when turned to the Change position the wheel spindle inverter is disabled. To allow safe changing of the grinding wheel. Turning it back to the run position will re-enable the inverter power.

7. SOFTWARE OPERATION

All software function are controlled via the touch screen

7.1. Initialisation

Once the FG1A software has fully started, you will be in the Main screen. Before you can use any of the functions you will need to initialise the machine. This is done by pushing the “INT” button at the top right of the screen. See (Figure 6 Main screen) once you confirm you wish to initialise the machine, the Traverse slide will move to the right to find the home limit.



Figure 6 Main screen

Once Initialised you will now see the full array of function available. See (Figure 7 Oscillation Function) and (Table 2 Main Screen Functions) See (Table 6 Graticule Functions) for details of the Graticule functions

Table 2 Main Screen Functions

FUNCTION	DESCRIPTION
MOVE	See (Figure 10 Move function)
JOG	See (Figure 9 Jog function)
OSCILLATE	See (Figure 7 Oscillation Function)
VIEW	See (Figure 11 View function)
TOP LIGHT	Turns on or off the Ring light attached to the Camera
PICTURE	Takes you to the Camera adjustment and setup page, See (Figure 19 Camera Adjustments)
EXIT	Exits the software and shuts down the PC

7.2. Oscillation Function

Pushing the Oscillation button, will display the Oscillation function window. See (Figure 7 Oscillation Function)

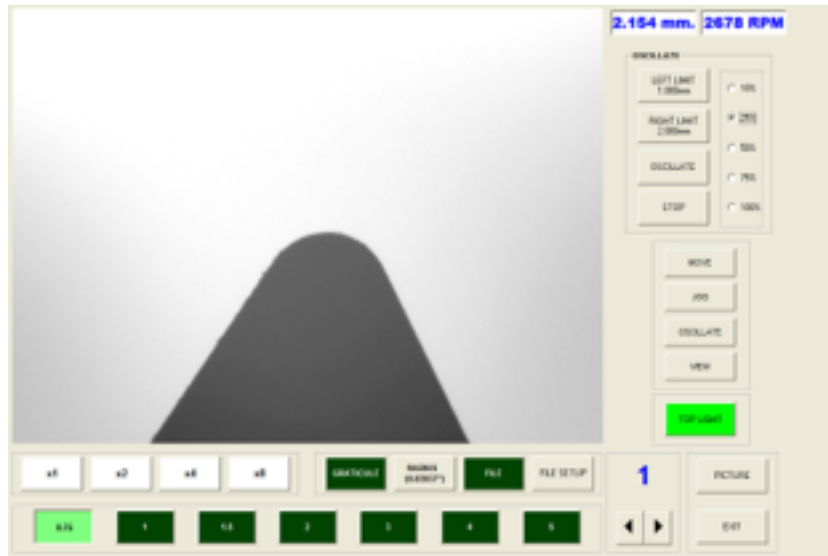


Figure 7 Oscillation Screen

You can now program Left and right Oscillation limits, Oscillation speed and stop and start Oscillation. See (Table 3 Oscillation Functions)

Table 3 Oscillation Functions

FUNCTION	DESCRIPTION
LEFT LIMIT	Allows the programming, of your left limit position. Will call up a keypad, to enter your chosen value, See (Figure 8 Set Limits)
RIGHT LIMIT	Allows the programming, of your right limit position. Will call up a keypad, to enter your chosen value, See (Figure 8 Set Limits)
OSCILLATE	Starts your programmed Oscillation cycle
STOP	Stops your programmed Oscillation cycle
10%, 25%, 50%, 75% and 100%	Allows you to set the Oscillation speed from 10 – 100%



Figure 8 Set Limits

7.3. Jog Function

The Jog Function allows you to program a repeatable “Jog amount”. Ideal for grinding the form on a “Posalux” type lining in tool, See (Figure 9 Posalux type lining tool).

Pushing the Jog button, will display the Jog function window. See (Figure 9 Jog Screen)



Figure 9 Posalux type lining tool

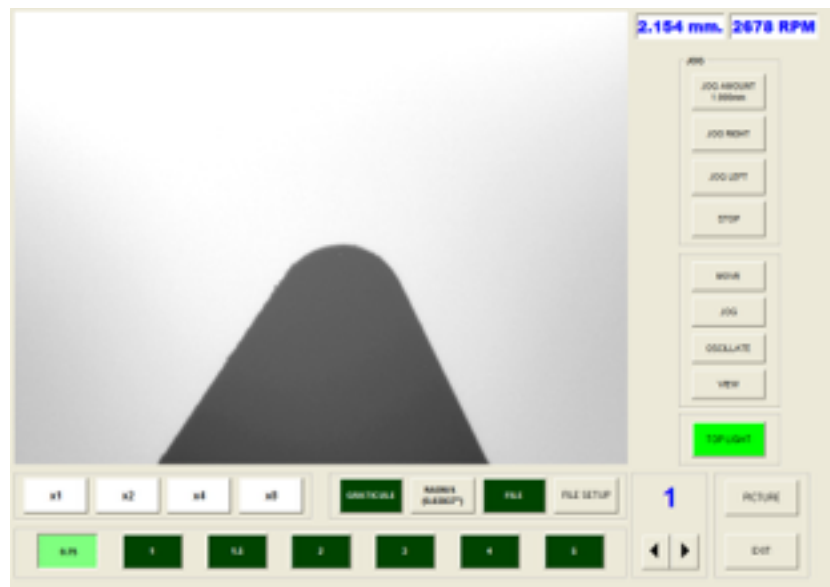


Figure 9 Jog Screen

You can now program your Jog amount, then using the “Jog Right” or “Jog Left” button you can move the Traverse axis by your programmed amount. See (Table 4 Jog Functions)

Table 4 Jog Functions

FUNCTION	DESCRIPTION
JOG AMOUNT	Allows the programming, of a Jog amount. Will call up a keypad, to enter your chosen value.
JOG RIGHT	Jogs the traverse axis to the right by the programmed “JOG AMOUNT”
JOG LEFT	As above, but Jogs to the Left
STOP	Stops your programmed Jog cycle

7.4. Move Function

Pushing the Move button, will display the Move function window. See (Figure 11 Move Screen) pushing and holding the “MOVE RIGHT” will move the Traverse axis to the Right. The longer you hold the button the faster the axis will move. Pushing and holding the “MOVE LEFT” works same as move right but will move the Traverse Axis to the Left.

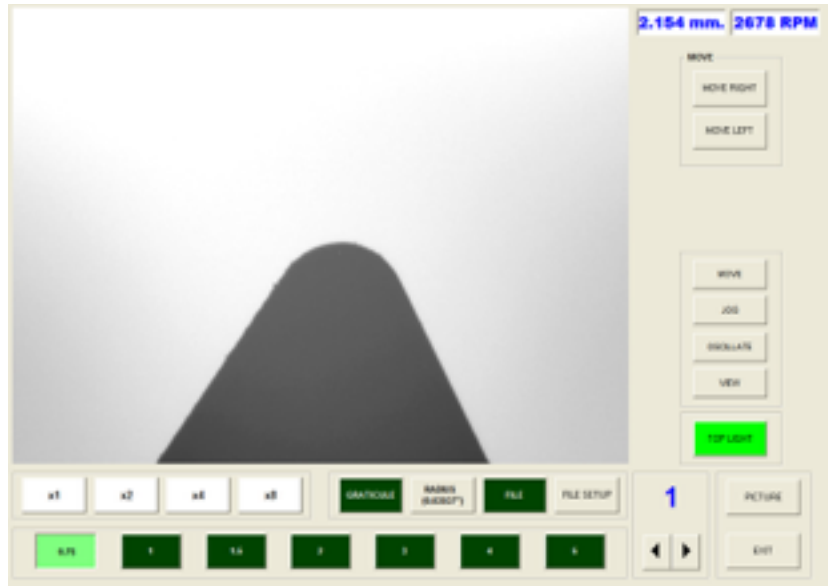


Figure 11 Move Screen

7.5. View Function

Pushing the View button, will move the Traverse Axis fully to the Left. This allows clear viewing of the ground tool, or easy access to change ever the tool or the grinding wheel. See (Figure 12 View Screen)



Figure 12 View Screen

7.6. Traverse Functions

Pushing the Traverse display window, will call up the available Traverse Functions. See (Figure 12 Traverse Screen) the Functions are described in (Table 5 Traverse Functions)



Figure 13 Traverse Screen

Table 5 Traverse Functions

FUNCTION	DESCRIPTION
ABSOLUTE	Changes the display window to show the absolute traverse position. Zero being to the far Right.
INCREMENTAL	Changes the display window to show the Incremental traverse position. The Incremental value can be set to zero at any time, by pushing and holding the "INCREMENTAL" button
GOTO	Allows you to send the Traverse to any position along its travel limit. Will call up keypad as shown is (Figure 13 Goto function)
OK	Closes The option box



Figure 14 Goto function

7.7. Graticule overlay

It is possible to overlay any size of Graticule onto the live camera image. First select the required Radius size, by pushing the Radius button; this will call up a keypad to allow the radius size entry. See (Figure 15 Radius keypad) once this has been entered, you can then enter a Y-offset value, this allows the operator to offset the Graticule by up to 1000mm if required. See (Figure 16 Y-offset keypad) The Graticule can be turn on or off via the Graticule button. See (Figure 16 Graticule Overlay)



Figure 15 Radius keypad



Figure 16 Y-offset keypad

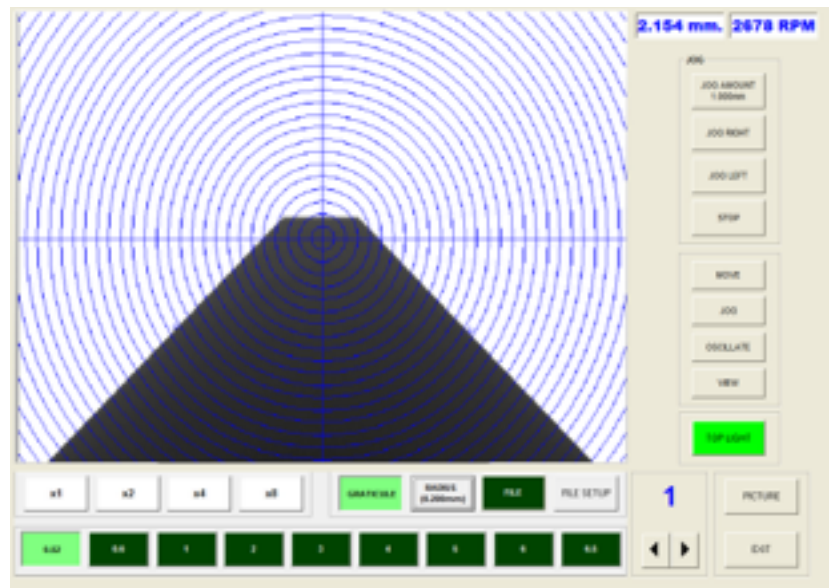


Figure 17 Graticule Overlay

Table 6 Graticule Functions

FUNCTION	DESCRIPTION
Number Window	Allows you to quickly change to saved Graticule
File Setup	This button allows the operator to locate and save DFX image files to any of the 18 presets available. The procedure is detailed in ()
File	This button allows the operator to display and hide pre-loaded 'File' Graticule that has been allocated to the active preset.
Radius	Pressing this button allows the operator to generate a Graticule that will then be displayed and automatically saved to the preset that is active by designating radial and offset values. The procedure is detailed in ()
Graticule	This button allows the operator to display and hide the active Graticule. When the Graticule button shows light green as shown in (Figure 15 Graticule Overlay) the Graticule is shown, when the Graticule button shows dark green the Graticule is hidden.
x1, x2, x4, x8	Allows you to digitally zoom the current camera image
0.52 - 6.5	This row of buttons shows the different settings required in order to use the different optical magnifications available on the camera. The optical magnification of the camera used on the FG1A can be adjusted by turning the numbered sleeve on the camera assembly. When this is changed the Vision system settings must be changed to suit and this is done using these buttons by simply selecting the button that matches the number shown on the camera.

7.8. Camera Adjustment

Some camera adjustments will be required on a regular basis, like brightness and shutter adjustment. These adjustments are needed as and when you adjust the Zoom magnification or depending on tool size etc. to gain access to these adjustments, push the “PICTURE” button located at the bottom right-hand side of the main screen. You will now see the slider bars at the bottom of the screen, to allow adjustment to the camera “Brightness”, “Shutter” and “Gain”.



Figure 18 Camera Adjustments

To the right of the slider bars, you will see the “SETUP” button. Pushing the “SETUP” button will allow access to the setup and calibration functions of the camera.



Figure 19 Camera Calibration

7.9. Calibration Button

All FG1A's come pre-calibrated by our engineers in house and so the use of this function is rarely required. However in some circumstances, such as disassembly and reassembly of the camera, small discrepancies can be caused and re-calibration can be used to ensure accurate grinding at all times.

If after selecting the desired optical magnification level on the camera and the corresponding setting in the Graticule submenu (as explained in 1.7.7 Graticule overlay) it is found that there is a discrepancy between a Graticule and a work piece of known identical size the calibration function can be used to remove this error. If for example a work piece with a 1mm sized tool is set up in the fixture, a 1mm Graticule laid over it on the screen and they fail to meet up exactly then the calibration tool can be used to resolve the issue. This is done by pressing the Calibration button and entering calibration scaling factors between 50 and 1000 until the residual error between the Graticule and the work piece has been eradicated. The range and resolution of the scale are respectively large enough and fine enough that simple trial and error can be used to re-calibrate the camera.

7.10. Importing and Using Pre-Made 'File' Graticules

As well as generating them in the program, graticules can also be imported and used with the Vision software. Only circular graticules can be generated by the FG1A so if a more complex graticule is required it can be designed on AutoCAD etc and imported as a DXF file.

To import and use a 'File' graticule, first click on the File Setup button. The following screen will be displayed.

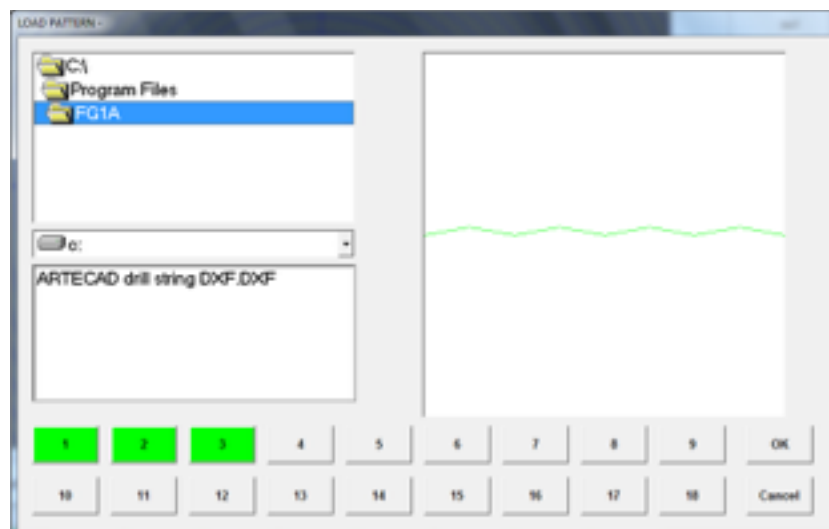


Figure 20 Importing a 'File' Graticule

First, find the file using the drop down menu and the file directory on the left hand side of the screen. Once the file has been located, provided it is a compatible DXF file, a preview of it should appear in the right hand side of the screen as shown in (Figure 20 Importing a 'File' Graticule)

To save this 'File' graticule to a preset simply press and hold the button desired preset button from the row of buttons at the bottom of the screen. The button will initially turn yellow and it must be held until it turns green, signifying a successful upload.

This graticule is now saved under the 1st preset screen and can be toggled off and on by the File button in the Graticule menu expansion. To replace the saved graticule with another one simply repeat the procedure with another graticule. Once you have finished uploading as many graticules as desired, press the OK button to return to the View Screen or Cancel to return without making any changes.

8. METHOD OF OPERATION

2. INSTALLATION

The FG1A will be delivered, fully assembled, once unpacked from it's packing case or pallet (depending on shipping method).

- 1) Remove all Plastic ties, securing the control panel / touch screen and traverse slide
- 2) Fit the 4 levelling feet to the bottom of the bench, adjusting the height to your chosen height.
- 3) Level table top using spirit level.
- 4) Connect the table weight / weights to the cable under the bench, see (Figure 21 Table Weights)



Figure 21 Table Weights

- 5) Fix wheel to spindle and fit wheel guard.
- 6) Wire single phase electricity supply to machine, see (Figure 22 mains isolator) the entry point for the wire is on the underside of the electrical enclosure.

Check your voltage supply and frequency suits the machine.

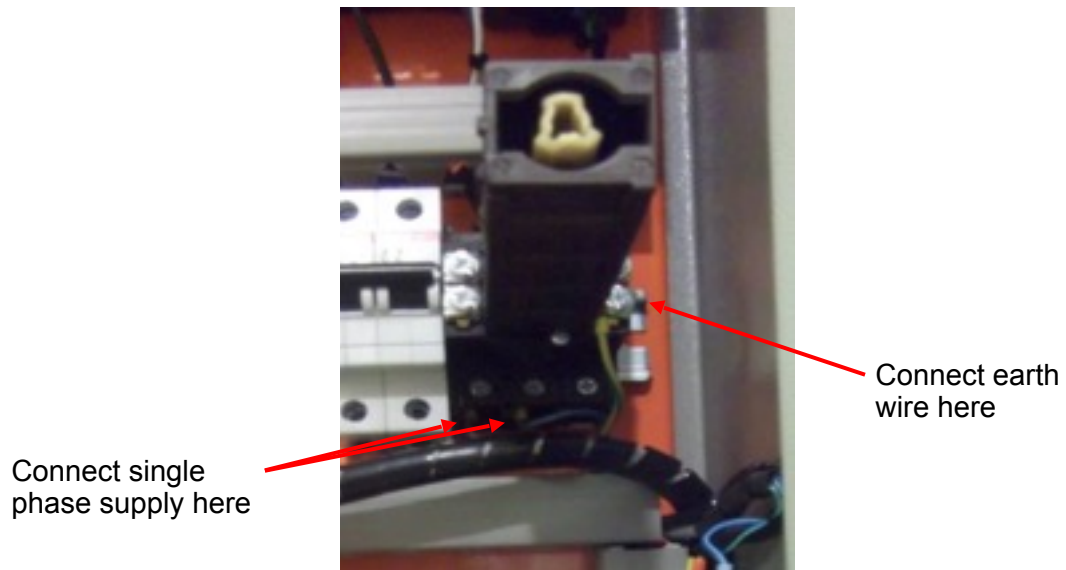


Figure 22 mains isolator