

MI 8-4 interface unit



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Installation and Users Guide - English

WARRANTY

Equipment requiring attention under warranty must be returned to your supplier.

No claims will be considered where Renishaw equipment has been misused, or repairs or adjustments have been attempted by unauthorised persons.

CHANGES TO EQUIPMENT

Renishaw reserves the right to change specifications without notice.

CNC MACHINE

CNC machine tools must always be operated by competent persons in accordance with manufacturers instructions.

MI 8-4 MAINTENANCE

No maintenance is required.

ENVIRONMENT

Temperature

The MI 8-4 is specified for storage over -10° to 70° C (14 to 158° F) and operation over 0° to 50° C (32° to 122° F) ambient temperature range.

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SAFETY

MI 8-4

The unit must be supplied from a 24 V d.c. SELV supply complying with the essential requirements of BSEN61010 or similar specification. It is essential for continued safety that the on board fuse (FS1) is replaced by the correct type and rating. Approved parts are Renishaw, list no. P-FS20-1A25 or Littlefuse, list no. 251 250.

The power supply connected to the power supply terminals of this unit (B1/B2) must have it's 0 V connected to the machine star point.

Do not exceed 30 V between any terminal and the machine star point terminal (B3).

The isolated totem-pole output power supply (A10/A12) should be supplied from the controllers I/O supply and should be current limited or fused at no more than 8 A.

Ensure the machine tool is in a safe state and power is removed from the MI 8-4 when changing fuses, making wiring connections, or changing SW1.

LP2 hard wired inspection system

The probe should **not** be rotated (spun) by the machine spindle with the cable connected. If this is allowed, then serious injury could occur to persons nearby due to flying cable or entanglement.

MI 8-4 ASSEMBLY**MI 8-4 INSTALLATION**

Ideally install the interface in the CNC machine control cabinet.

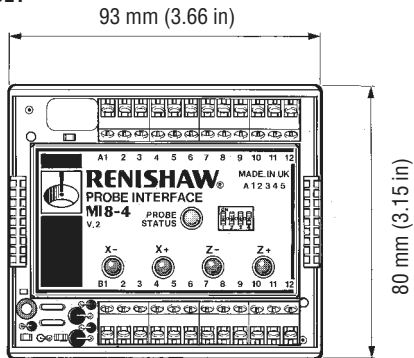
Take care to avoid potential sources of interference, such as three phase transformers and motor controllers.

MI 8-4 MOUNTING

The MI 8-4 is DIN rail mounted and is compatible with all DIN EN carrier rails.

The alternative dual lock fixing allows the MI 8-4 to be attached to any flat surface.

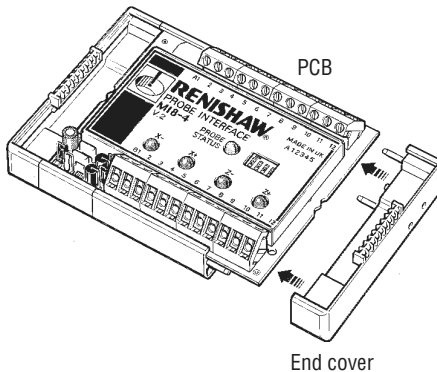
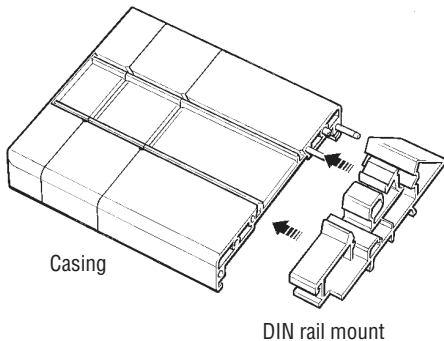
Both forms of mounting are supplied. Select the appropriate parts and assemble as shown.

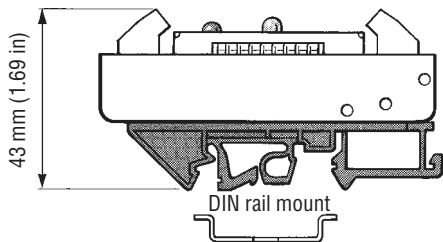
**DIN RAIL MOUNT**

1. Fit the DIN rail mount onto back of casing.

2. Slide the PCB into the casing,

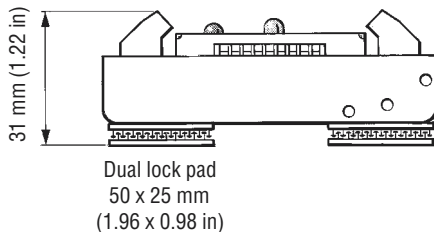
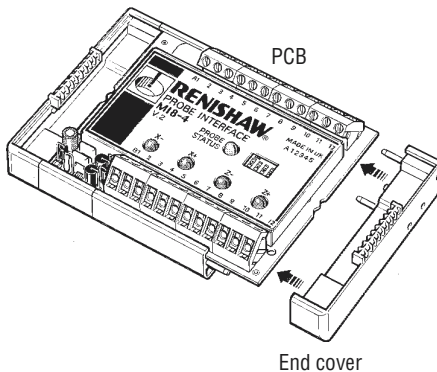
3. Fit the end cover. Press in to make a snap fit.



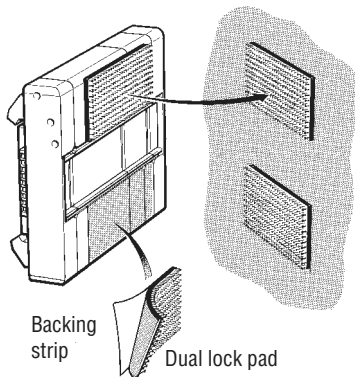


DUAL LOCK PAD

1. Slide the PCB into the casing,
2. Fit the end cover.
Press in to make a snap fit.



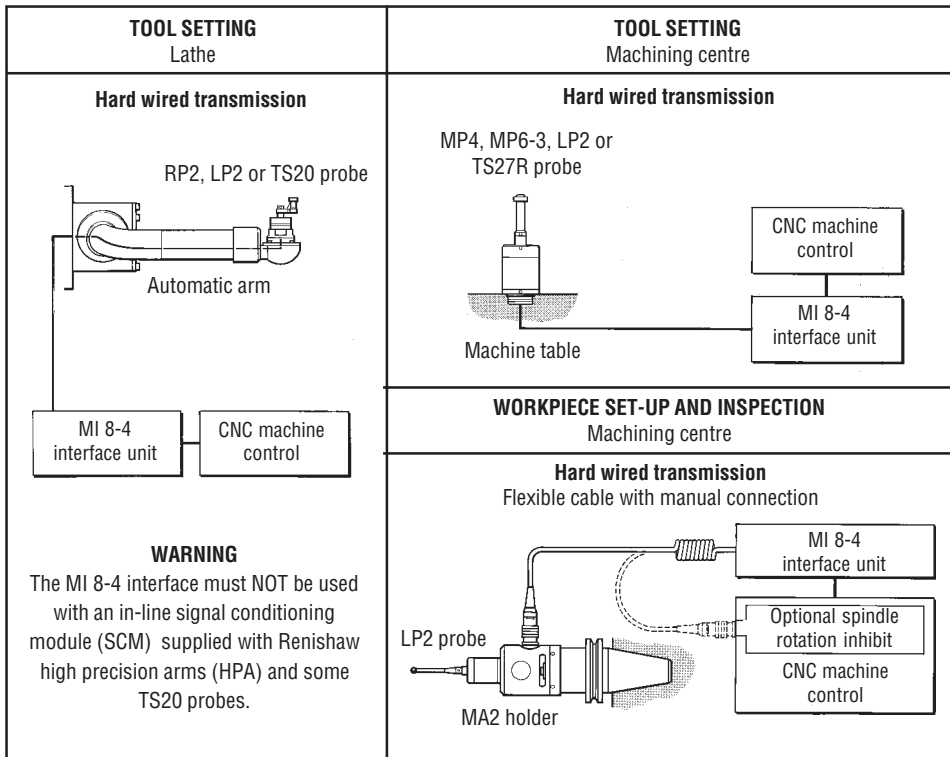
3. Remove backing strip from dual lock pad.
4. Stick two pads on back of casing and two equally spaced pads onto flat surface.



5. Press the dual lock pads together to mount MI 8-4.
6. Pull apart to remove MI 8-4 from mounting surface.

MI 8-4 INTERFACE

CNC machine tools using a Renishaw probe system for tool setting or workpiece set-up and inspection require an interface unit, to convert probe signals into an acceptable form for the CNC machine control. The MI 8-4 interface unit is part of probe systems using hard wired signal transmission.



The MI 8-4 interface processes signals from Renishaw hard wired probes and converts them into compatible outputs, for transmission to the CNC machine control. The control stores work offsets and responds to probe inputs.

It is designed to allow the Renishaw probe to connect directly into the standard Fanuc 'automatic length measurement' input (XAE, ZAE).

The machine tool builder must provide FOUR outputs from the control to indicate which machine axis is moving, in order to obtain a probe trigger.

(SELX- SELX+ SELZ- SELZ+).

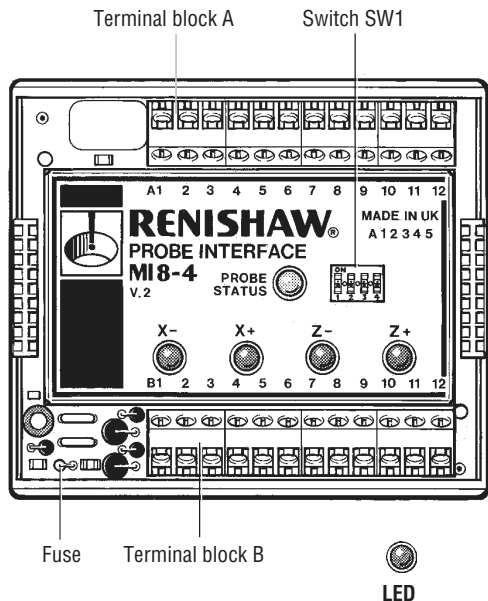
This signal will instruct the MI 8-4 to send the probe trigger signal out through one of four possible output channels (X- X+ Z- or Z+).

An example of a typical Fanuc OTC control probe interface PMC ladder logic is shown on pages 1-8 and 1-9.

Probe status LED

The bi-colour probe status LED is off when the MI 8-4's power is off. It is green when the probe stylus is seated (at rest), or the interface is inhibited. It is red when the probe is triggered.

When the stylus deflects on contact with a tool or workpiece the MI 8-4 output changes state, and the LED changes from green to red.



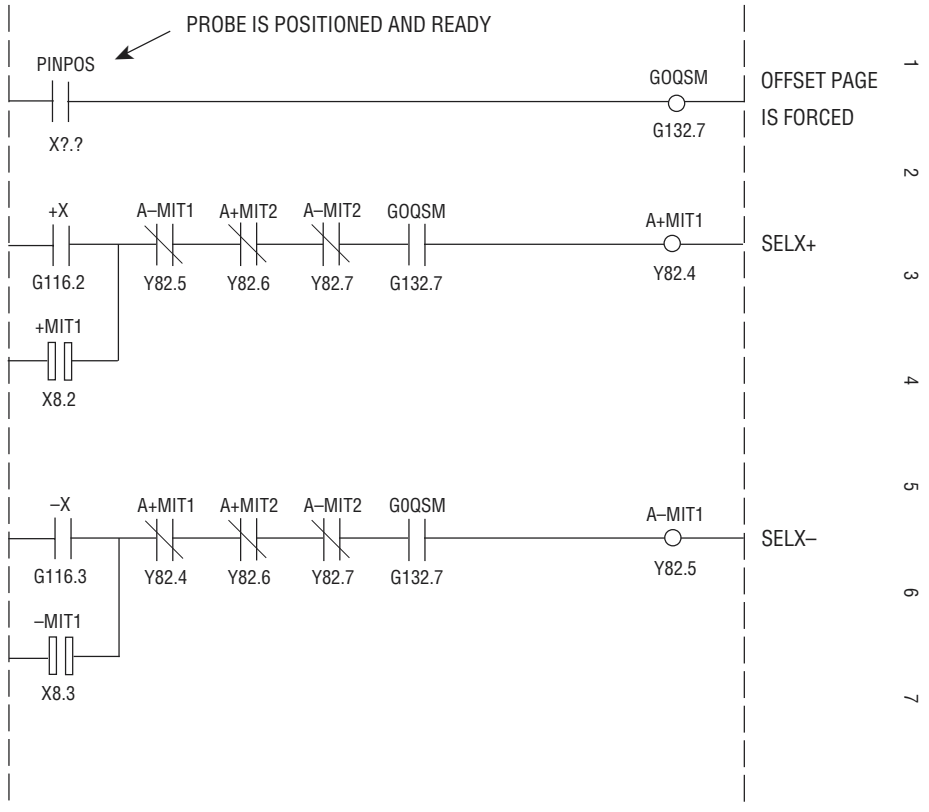
As the probe moves clear of the contact surface, the LED changes back to green, indicating that the probe stylus has resealed, and the probe is available for the next contact in the probing routine.

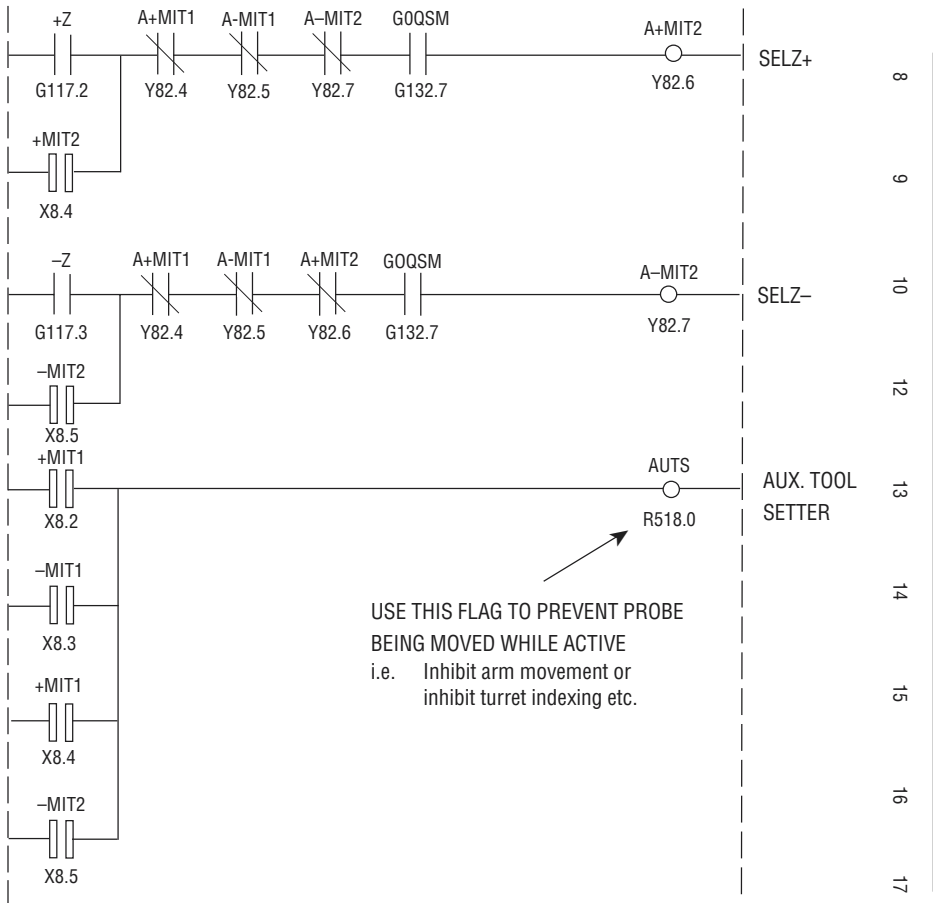
Machine movement indicating LEDs

Four green diagnostic LEDs are also provided to indicate which machine axis is moving. e.g. During an X- move the X- LED will illuminate.

FANUC OTC CONTROL

Example of a typical PMC ladder logic diagram





USE THIS FLAG TO PREVENT PROBE
BEING MOVED WHILE ACTIVE
i.e. Inhibit arm movement or
inhibit turret indexing etc.

8
9
10
12
13
14
15
16
17

MI 8-4 SPECIFICATION

Power supply

The MI 8-4 can draw its power from the CNC machine 24 V nominal d.c. supply. Alternatively it can be powered from a Renishaw PSU3 power supply unit.

The MI 8-4 input voltage range is 15 to 30 V d.c. (Supply voltage with ripple -16.5 to 28.5 V with 3 V peak to peak ripple at 100 Hz).

Maximum load with outputs disconnected is 80 mA. Each XAE/ZAE output connection will add to the supply current.

Probe input

Normally closed, open for trigger.

Inhibit input

When inhibit is active the outputs are in the seated state irrespective of the actual probe state.

Two probe operation - toolsetting and inspection

The MI 8-4 has a facility for connecting an output from a different Renishaw probe system (i.e. inspection) and then selecting which probe input (toolsetter or inspection) is routed out through the outputs. The selection of probe is controlled by a machine control input to the MI 8-4 (M code).

When the inspection select input is active the inspection system input is routed through to the outputs. When inactive the probe input (toolsetter) is routed through the outputs.

The inspection system input can be driven by a normally closed relay (open for trigger) or a totem-pole output (high for triggered).

Inhibit, inspection select and machine axis moving inputs

These inputs are open collector transistor (OCT), totem-pole, and relay compatible.

They can be configured as active low or active high. Also, they can be terminated by pull-up or pull-down resistors.

With the input resistors common (A9) connected to 0 V all inputs have 2 k4 pull-down resistors. With it connected to 15 to 30 V d.c. all inputs have 2 k4 pull up resistors.

Switch **SW1-3** controls the polarity of the input signals.

SW1-3 OFF = Inputs active high

SW1-3 ON = Inputs active low

V in low = 4.0 V max

V in high = 11.0 V min

If the inputs are not to be used then SW3-1 should be in the default state of OFF and the input resistors common (A9) should be connected to 0 V. This makes all inputs inactive.

Probe status XAE/ZAe outputs

Switch **SW1-1** controls the polarity of all the output signals.

SW1-1 OFF Output triggered = High

SW1-1 ON Output triggered = Low

Probe status output

This is an isolated totem-pole output which requires a three wire connection: signal, power and ground. It works over a 4.75 to 30 V supply range and will source and sink up to 20 mA.

Output voltage high

(V supply minus 3.5 V max) at 20 mA

(V supply minus 2.8 V max) at 10 mA

Output voltage low

0.6 V max at 20 mA

0.4 V max at 10 mA

Supply current

10 mA max at 30 V

The three wires are protected against short circuit by current limiting circuitry.

TTL compatibility

The probe status output is TTL compatible with a 5V \pm 5% supply voltage. If this supply voltage is not available then another voltage in the 4.75 to 30 V range can be used with **SW1-4** ON.

V out high = 2.5 V min at 2.5 mA.

V out low = 0.4 V max at 10 mA.

With **SW1-4** ON, the probe status output will be TTL compatible irrespective of the supply voltage.

Supply current with **SW1-4** ON,

22 mA max at 30 V

15 mA max at 10 V

Fanuc 'automatic length measurement'

The four 'machine axis moving' inputs (B4, B6, B8, B10) to the MI 8-4 are open collector transistor (OCT), totem-pole and relay compatible.

The four outputs (B5, B7, B9, B11) are totem-pole outputs supplied by the 15 to 30 V power supply (B1, B2) to the MI 8-4.

Output voltage high

(V supply minus 4.0 V max) at 20 mA.

(V supply minus 3.4 V max) at 10 mA.

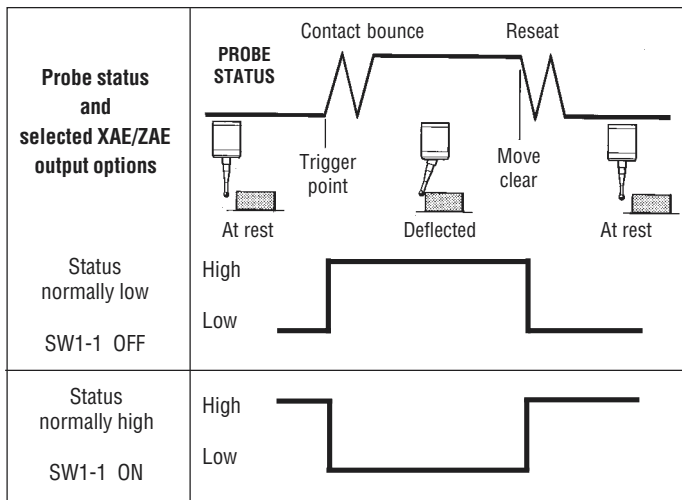
Output voltage low

1.5 V max at 20 mA.

1.0 V max at 10 mA.

The outputs are protected against short circuit by current limiting circuitry.

MI 8-4 OUTPUT WAVEFORMS



The output signals from the interface must be compatible with the machine control.

Note:

Change of state debounce time is 20 ms \pm 5 ms.
Debounce time is the time delay after the MI 8-4 has responded to a probe trigger, before it can be used again.

DIAGRAM OF OUTPUTS FOR XAE, ZAE

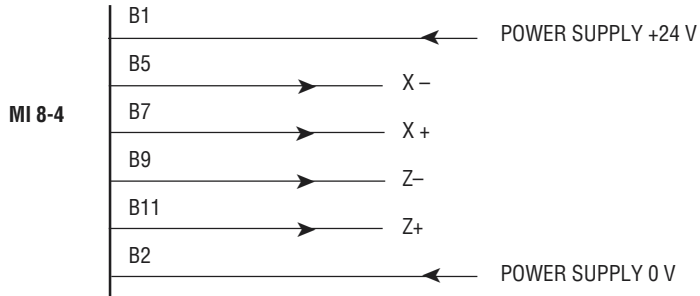
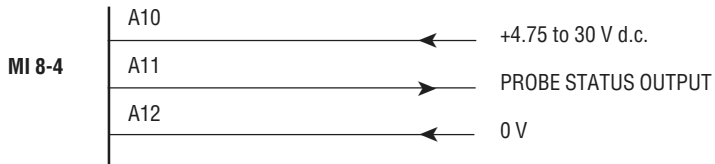


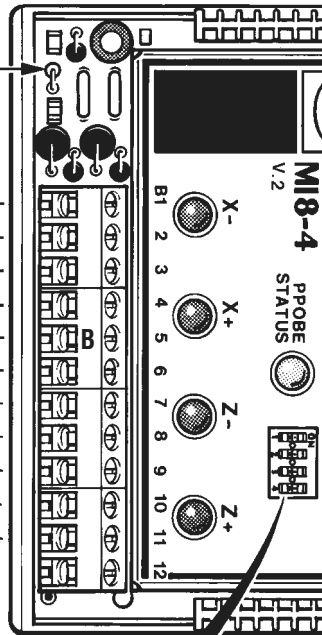
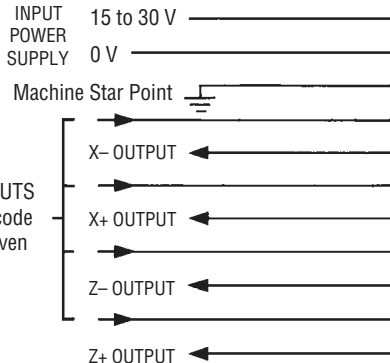
DIAGRAM OF PROBE STATUS OUTPUT



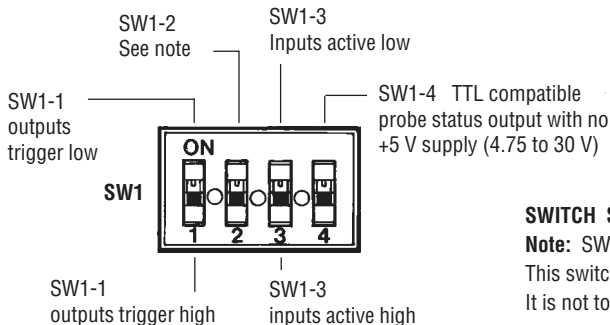
MI 8-4 TERMINAL CONNECTIONS AND SWITCH SW1

PIN	DESCRIPTION
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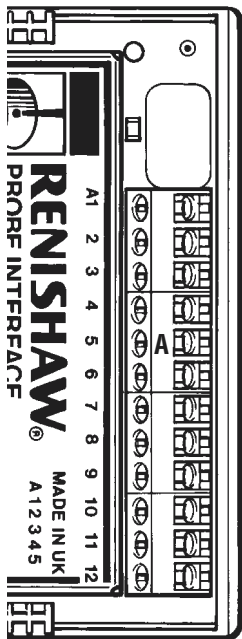
B1	POWER SUPPLY 24 V
B2	POWER SUPPLY 0 V
B3	MACHINE STAR POINT
B4	SELX- INPUT
B5	X- OUTPUT
B6	SELX+ INPUT
B7	X+ OUTPUT
B8	SELZ- INPUT
B9	Z- OUTPUT
B10	SELZ+ INPUT
B11	Z+ OUTPUT
B12	SCREEN



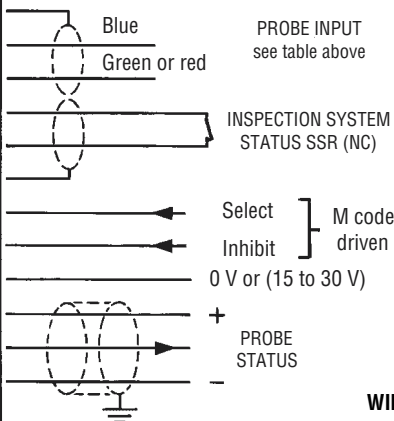
FS1
SUPPLY PROTECTION
250 mA (FF) fuse FS1
mounted in sockets

**SWITCH SW1**

Note: SW1-2 should be in the off position. This switch activates an in-line filter circuit. It is not to be adjusted by the end user.



Terminal no.	Core colour	Probe			
		LP2 MP6-3	RP2	MP4	TS20 TS27R
2	Blue	●		●	
3	Green	●			
3	Red				●



PIN	DESCRIPTION
-----	-------------

A1	SCREEN
A2	PROBE INPUT +
A3	PROBE INPUT -
A4	INSPECTION SYSTEM INPUT +
A5	INSPECTION SYSTEM INPUT -
A6	SCREEN
A7	INSPECTION SELECT
A8	INHIBIT
A9	INPUT RESISTORS COMMON
A10	OUTPUT SUPPLY +
A11	PROBE STATUS OUTPUT
A12	OUTPUT SUPPLY -

WIRING - PROBE to MI 8-4

Use two core screened cable.

Each core $\varnothing 2.5$ mm sq. ($\varnothing 0.10$ in sq.) maximum.

Maximum permitted length 30 m (98 ft).

WIRING - MI 8-4 to CNC CONTROL

Use single wires.

Each wire $\varnothing 2.5$ mm sq. ($\varnothing 0.10$ in sq.) maximum.
Maximum permitted length 3 m (9.8 ft).

Screened cable is recommended for probe status when driving a TTL input. Also for all MI 8-4 to CNC control connections where cable lengths of 3 to 10 m (9.8 to 32.8 ft) are used and interference may be encountered.

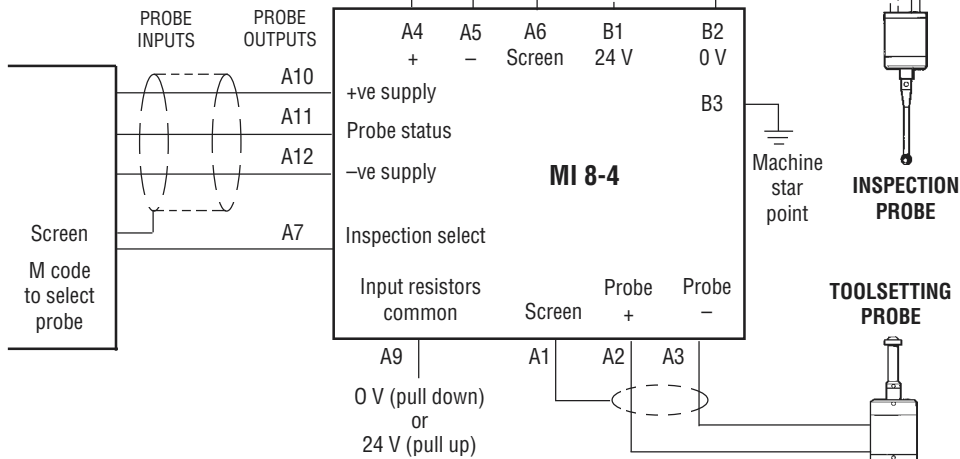
WIRING FOR TWO PROBES

Probe select functions for an inspection probe and a toolsetting probe

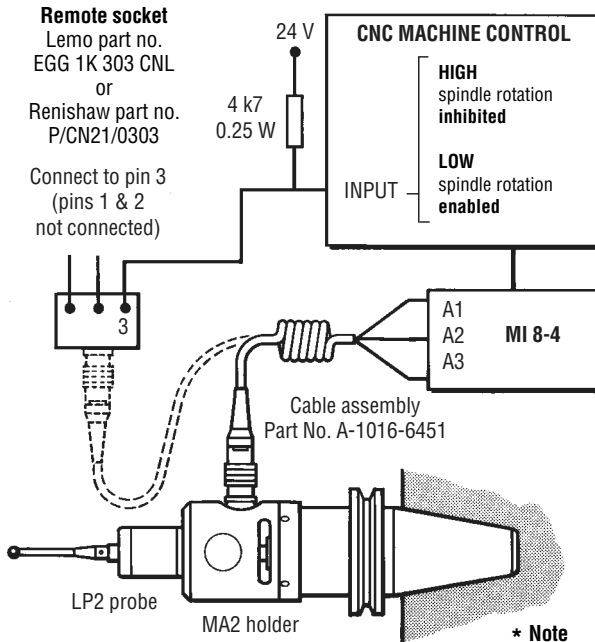
For installations where an inspection probe and a toolsetting probe are fitted to the same machine, the MI 8-4 features a circuit that allows the machine control to select which probe is to be used.

An M code will select which probe signal is sent to the machine control probe inputs.

MACHINE TOOL



LP2 HARD WIRED INSPECTION SYSTEM



TO ENSURE OPERATOR SAFETY
It is recommended that a fail safe
SPINDLE ROTATION INHIBIT
is built into the machine
installation.

The example shows the probe
cable plugged into a remote
socket before spindle rotation is
enabled. This prevents spindle
rotation when the probe is used.

WIRING TABLE

Wire colour	Plug pin no	MI 8-4 terminal block
* Screen	3	A1
Blue	1	A2
Green	2	A3

*** Note**

Screen must be connected to machine star point.

PARTS LIST - Please quote the Part No. when ordering equipment

Type	Part No.	Description
MI 8-4	A-2157-0001	MI 8-4 interface unit.
Fuse	P-FS20-1A25	250 mA (FF) fuse FS1

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