

OMI-2 optical machine interface



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Before you begin

1.1

Before you begin

Disclaimer

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Trade marks

RENISHAW and the probe symbol used in the RENISHAW logo are registered trade marks of Renishaw plc in the United Kingdom and other countries. **apply innovation** and names and designations of other Renishaw products and technologies are trade marks of Renishaw plc or its subsidiaries.

All other brand names and product names used in this document are trade names, trade marks, or registered trade marks of their respective owners.

Warranty

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

Unless otherwise specifically agreed in writing between you and Renishaw, if you purchased the equipment from a Renishaw company, the warranty provisions contained in Renishaw's CONDITIONS OF SALE apply. You should consult these conditions in order to find out the details of your warranty, but in summary the main exclusions from the warranty are if the equipment has been:

- neglected, mishandled or inappropriately used; or
- modified or altered in any way except with the prior written agreement of Renishaw.

If you purchased the equipment from any other supplier, you should contact them to find out what repairs are covered by their warranty.

Changes to equipment

Renishaw reserves the right to change equipment specifications without notice.

CNC machines

CNC machine tools must always be operated by fully trained personnel in accordance with the manufacturer's instructions.

Care of the interface

Keep system components clean.

Patents

Features of OMI-2 (and features of similar products) are the subject of one or more of the following patents and/or patent applications:

EP 0974208

JP 4294101

EP 1503524

US 6,839,563

EC declaration of conformity



Renishaw plc declares that the OMI-2 complies with the applicable standards and regulations.

Contact Renishaw plc or visit www.renishaw.com/omi-2 for the full EC declaration of conformity.

WEEE directive



The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, please contact your local waste disposal service or Renishaw distributor.

FCC Information to user (USA only)

47 CFR Section 15.19

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

47 CFR Section 15.21

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

47 CFR Section 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Safety

Information to the user

In all applications involving the use of machine tools or CMMs, eye protection is recommended.

The OMI-2 has a glass window. Handle with care if broken to avoid injury.

Information to the machine supplier/installer

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved during operation, including those mentioned in Renishaw product literature, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine.

Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant EC and FCC regulatory requirements. It is the responsibility of the equipment installer to ensure that the following guidelines are adhered to, in order for the product to function in accordance with these regulations:

- any interface **MUST** be installed in a position away from any potential sources of electrical noise, i.e. power transformers, servo drives etc;
- all 0 V/ground connections should be connected to the machine "star point" (the "star point" is a single point return for all equipment ground and screen cables). This is very important, and failure to adhere to this can cause a potential difference between grounds;
- all screens must be connected as outlined in the user instructions;
- cables must not be routed alongside high-current sources, i.e. motor power supply cables etc, or be near high-speed data lines;
- cable lengths should always be kept to a minimum.

- the dc supply to this equipment must be derived from a source which is approved to IEC/BS/EN 60950-1.

Equipment operation

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Optical safety

This product contains LEDs that emit both visible and invisible light.

OMI-2 is ranked Risk Group: Exempt (safe by design).

The product was evaluated and classified using the following standard:

BS EN 62471:2008	The photobiological safety of lamps and lamp systems.
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Renishaw recommends that you do not stare at or look directly into any LED device, irrespective of its risk classification.

OMI-2 basics

2.1

Introduction

The OMI-2 is a combined optical receiver and machine interface which is designed to be mounted within the machine's working envelope.

The OMI-2 operates using a 'Modulated' optical transmission mode and is compatible with machine probes that also operate in 'Modulated' mode.

Power supply

The OMI-2 can draw its supply from the CNC machine's nominal 12 Vdc to 30 Vdc supply.

The maximum supply current is 100 mA when the OMI-2 is transmitting and 40 mA when the OMI-2 is receiving.

The values quoted are based on a 24 Vdc and assume all outputs are open circuit.

CAUTION: This equipment will only perform to specification if the power supply 0 V is connected to the machine ground (star point).

Input voltage ripple

The input voltage ripple must not cause the voltage to fall below 12 V or rise above 30 V.

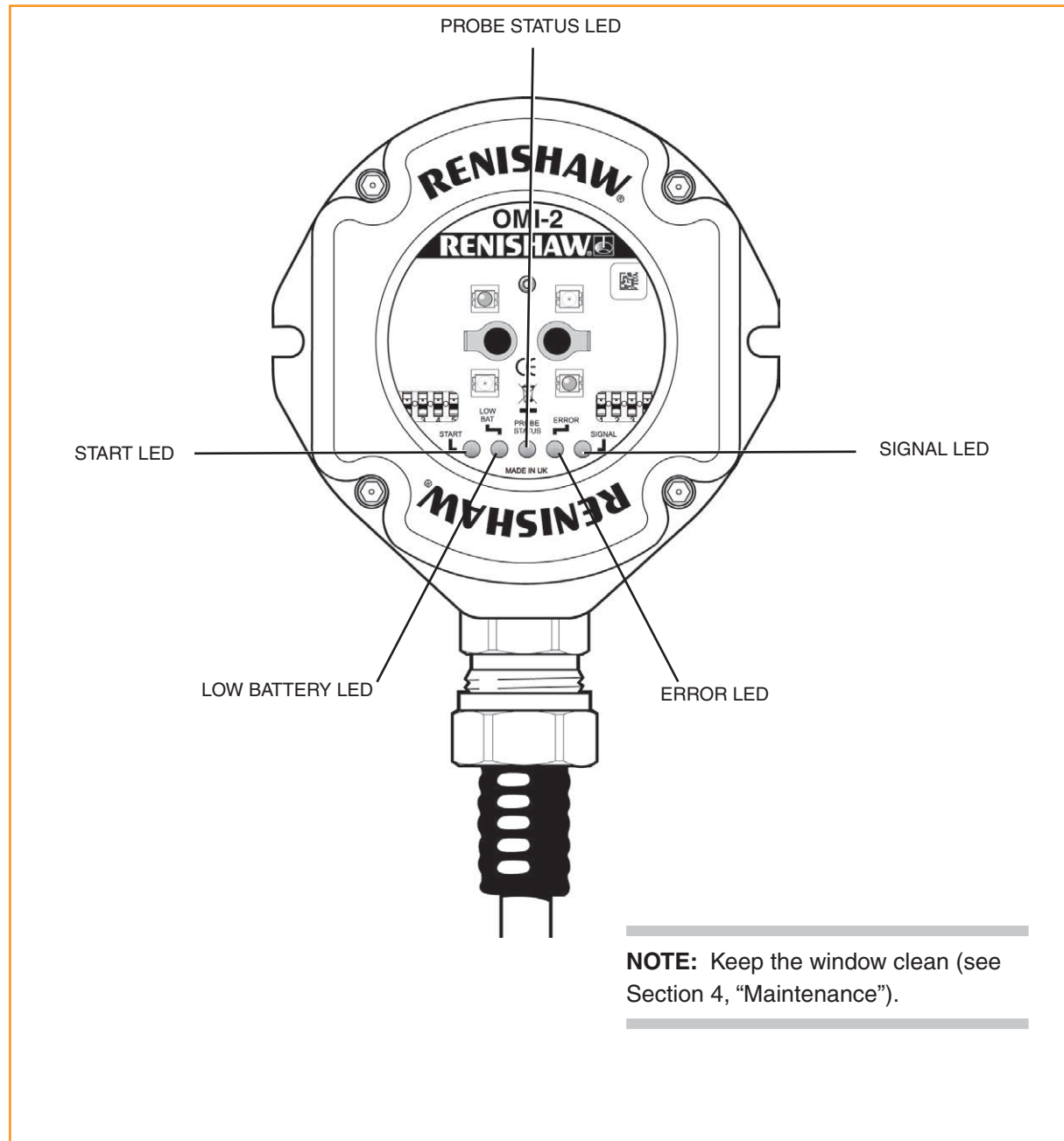
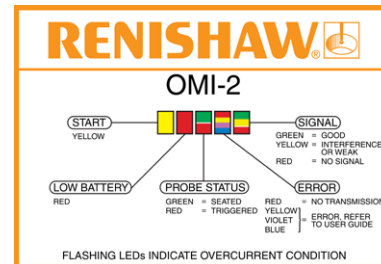
OMI-2 visual diagnostics

A visual indication of system status is provided by LEDs. Indication is provided for:

- START;
- LOW BATTERY;
- PROBE STATUS;
- ERROR;
- SIGNAL.

Magnetic label

A summary of OMI-2 LED activity is provided on a magnetic label. The label may be placed on any machine flat metal surface.



START SIGNAL LED (yellow)

Lit when a START signal is transmitted to the probe.

This LED will either flash once when a machine control START signal is commanded, or flash at one second intervals when the system is set to 'Auto-Start' mode and is waiting for a probe transmission signal.

LOW BATTERY LED (red)

The LED is lit when the activated probe battery voltage falls below a set level.

Replace the probe battery as soon as is practicable after this LED is lit.

PROBE STATUS LED (green, red)

This bicolour LED is lit when the OMI-2 is powered.

Green – Probe is seated.

Red – Probe is triggered or an error has occurred.

The change of colour of this LED will coincide with the probe status output devices changing state.

ERROR LED (red, blue, yellow, violet)

Indicates a transmission error condition, e.g. optical beam obstructed, probe out of optical range, probe switched off or battery dead.

Red – No transmission:
The signal from the probe has either failed or has stopped.

Blue – Multiple probe detected:
A second modulated signal is being received.

Yellow – Interference:
Interference or a weak probe signal is being received.

Violet – Gauging:
Interference or a weak probe signal has caused the trigger instant to be delayed.

NOTE: If the ERROR LED is activated because the blue or yellow condition causes the loss of a good probe signal, or the violet condition occurs, then the indication will persist until the 'Machine Start' is activated or one hour has elapsed.

SIGNAL CONDITION LED (red, yellow, green)

This tricolour LED is lit when the OMI-2 is powered and indicates as follows:

Red – No communication:
There is no signal from the probe.

Yellow – Interference:
Either the signal received from the probe is too weak, or interference is present.

Green – Good communication:
The condition of signal received from the probe is good.

OMI-2 inputs

Machine Start inputs:

Machine Start is configurable as a level or pulsed signal.

Level	10 V to 30 V (2.4 mA at 24 V) When the input is active, the probe is switched on.
Pulsed	12 V to 30 V (10 mA at 24 V) The probe toggles from being switched on/off. The minimum pulse width is 10 ms.

Machine start wires

White = positive

Brown = negative

OMI-2 outputs

There are five outputs:

- Probe status 1 (SSR)
- Probe status 2a (5 V isolated driven skip)
- Probe status 2b (driven at power supply voltage)
- Error (SSR)
- Low battery (SSR)

All outputs can be inverted by using switches SW1 and SW2, (see “Switches SW1 and SW2” on page 2.6).

Probe status 1, Error, Low battery (SSR):

- ‘On’ resistance = 50 ohms max.
- Load voltage = 40 V max.
- Load current = 100 mA max.

Switching times

- Open to closed = 100 μ s max.
- Closed to open = 25 μ s max.

Probe status 2a, (5 V isolated driven skip):

- Load current = 50 mA max.

Output voltages

- Sourcing = 4.5 V min at 10 mA.
= 2.4 V min at 50 mA.
- Sinking = 0.4 V max at 10 mA.
= 1.3 V max at 50 mA.

Switching times

- Low to high = 20 μ s max.
- High to low = 10 μ s max.

Probe status 2b, (driven at power supply voltage):

- Load current = 50 mA max.

Output voltages

- Sourcing (voltage supply – output voltage)
= 2.6 V min at 10 mA.
= 3.5 V min at 50 mA.
- Sinking = 2.0 V max at 10 mA.
= 2.9 V max at 50 mA.

Switching times

- Low to high = 10 μ s max.
- High to low = 10 μ s max.

CAUTIONS:

Power supply voltage

Do not exceed 30 V between: the black wire and the screen wire (green/yellow); the red wire and screen wire (green/yellow); or the red and black wires (power supply); as this could result in permanent damage to the OMI-2 and/or the customer power supply.

The use of in-line fuses at the machine cabinet end is recommended to provide protection for the OMI-2 and cable.

Screen connection

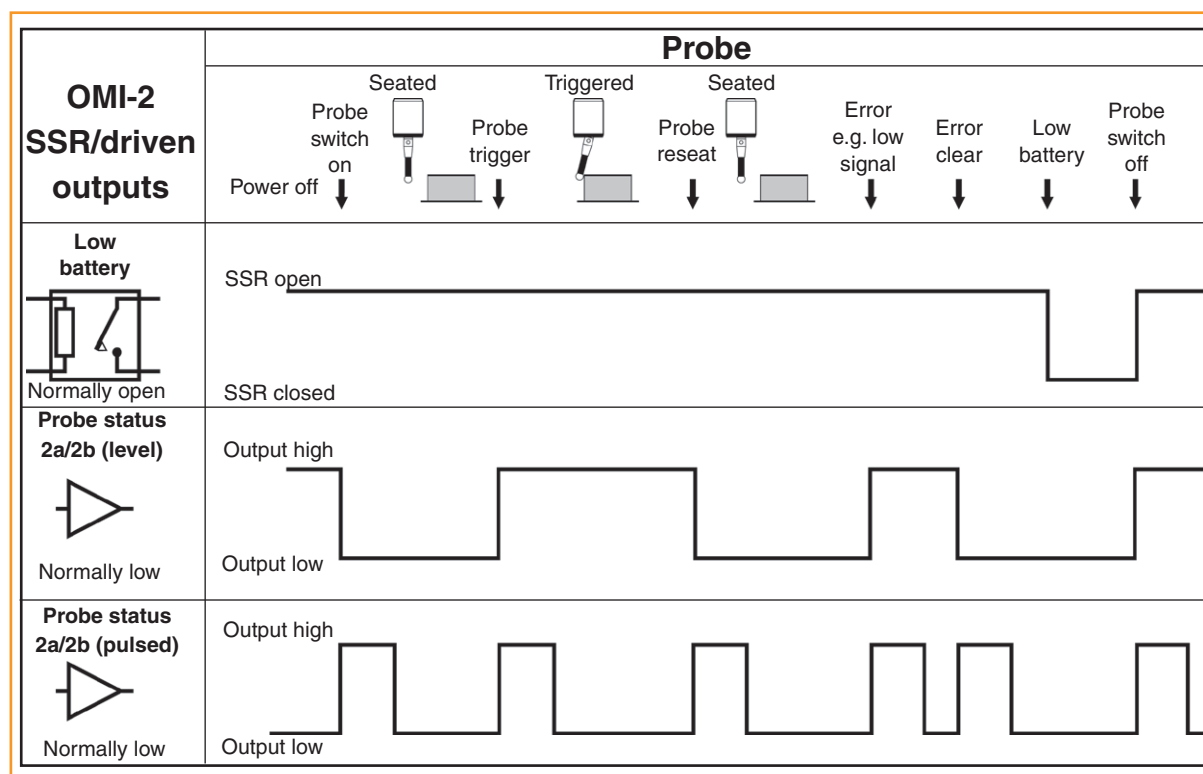
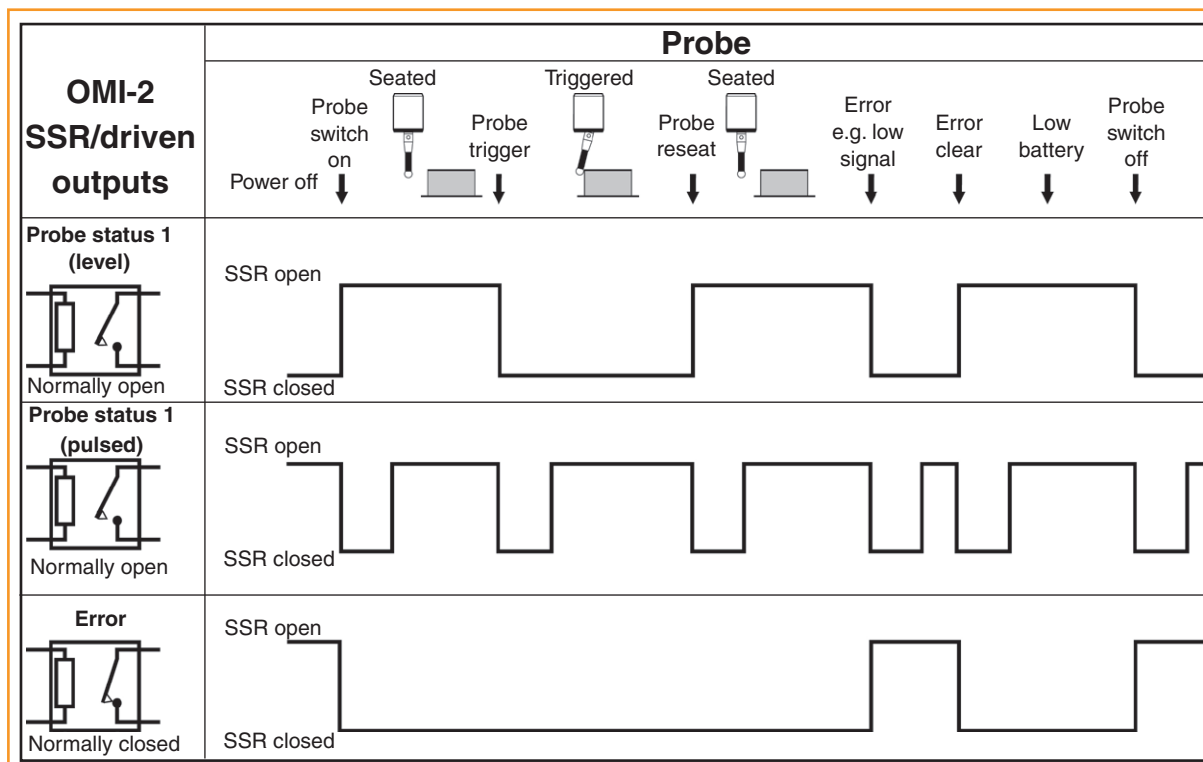
A good connection must be made to the machine ground (star point).

Output

Ensure the output from the OMI-2 does not exceed the specified current ratings.

OMI-2 output waveforms

NOTE: Outputs can be inverted by switches (see “Switches SW1 and SW2” on page 2.6).

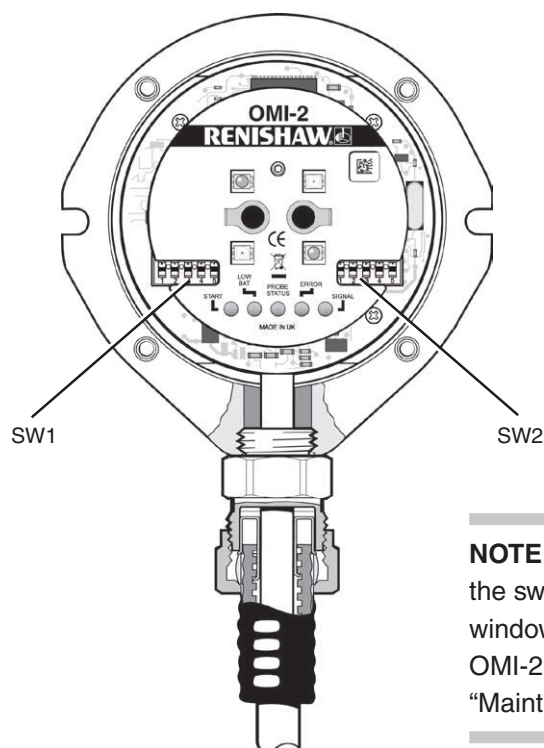


Signal delays

- 1. Transmission delay** Probe trigger to output change of state = 1.3 ms max.
- 2. Start delay** Time from initiation of start signal to valid signal transmission = 410 ms max. for kinematic probes and 1 second max. for strain gauge probes.

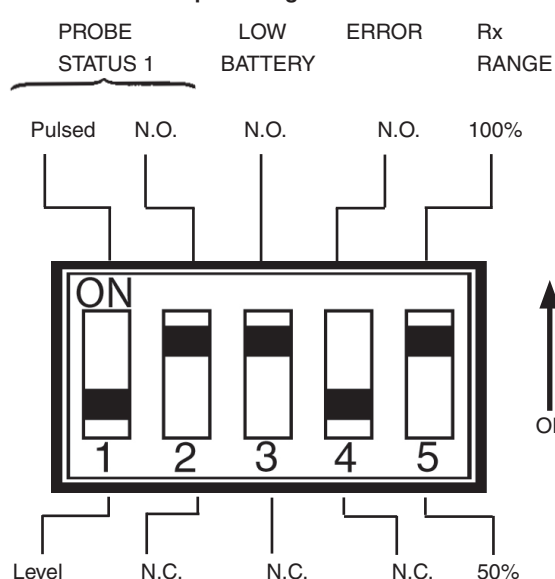
Note: Pulsed outputs are 40 ms ±1 ms duration.

Switches SW1 and SW2



NOTE: To gain access to the switches, remove the window (see “Removing the OMI-2 window” in Section 4, “Maintenance”).

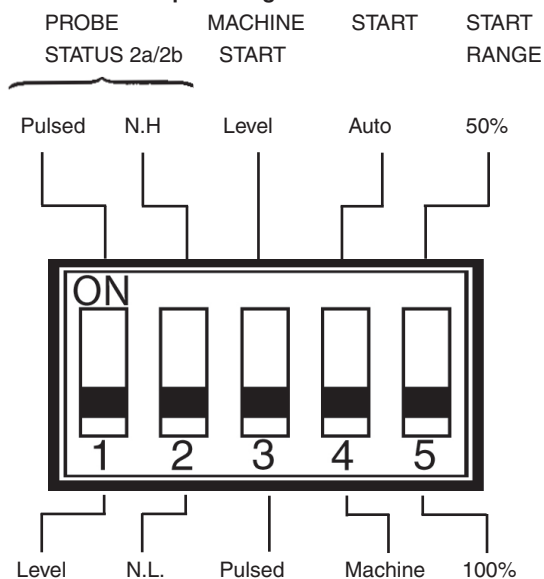
Switch SW1 output configuration



Factory settings shown are for:

- A-5191-0049
- A-5191-0050

Switch SW2 output configuration



Abbreviations are as follows:

- **N.O.** = Normally Open
- **N.C.** = Normally Closed
- **N.H.** = Normally High
- **N.L.** = Normally Low

CAUTION: Exercise caution when using error or probe SSR in N.O. mode as a wiring fault could cause a loss of error condition and therefore could result in a non-fail safe condition.

Switch on / switch off

Switch on / switch off method

The OMI-2 operates using either optical on / optical off as the switch on / switch off method or Auto start.

Optical on / optical off is available with all Renishaw's OMP range of spindle probes and the optical tool setter (OTS). Time out, spin on / spin off and shank on / shank off options are also compatible with the OMI-2.

Auto start

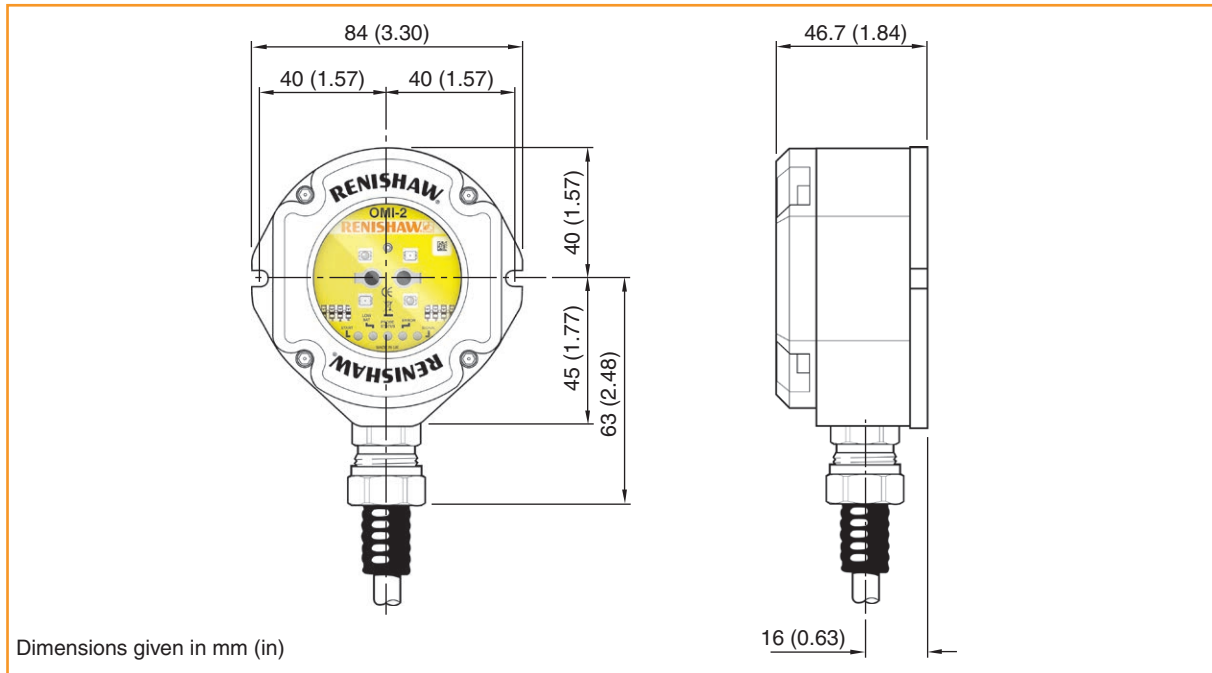
'Auto start' selection causes the system to send a start signal at 1 second intervals, and should only be used when there is no available output from the machine control. In this mode, ensure start signals cannot be received by probes in the tool changer, on the machine table (e.g. OTS) or on other machines. Auto start is not recommended for use with the OTS.

Start-up times

In normal operation the start-up time for a modulated probe (as reported by the OMI-2 error signal) is 410 ms max. for kinematic probes and 1 second max. for strain gauge probes.

When turning the probe off and back on, allow 1 second between machine start inputs.

OMI-2 dimensions



OMI-2 specification

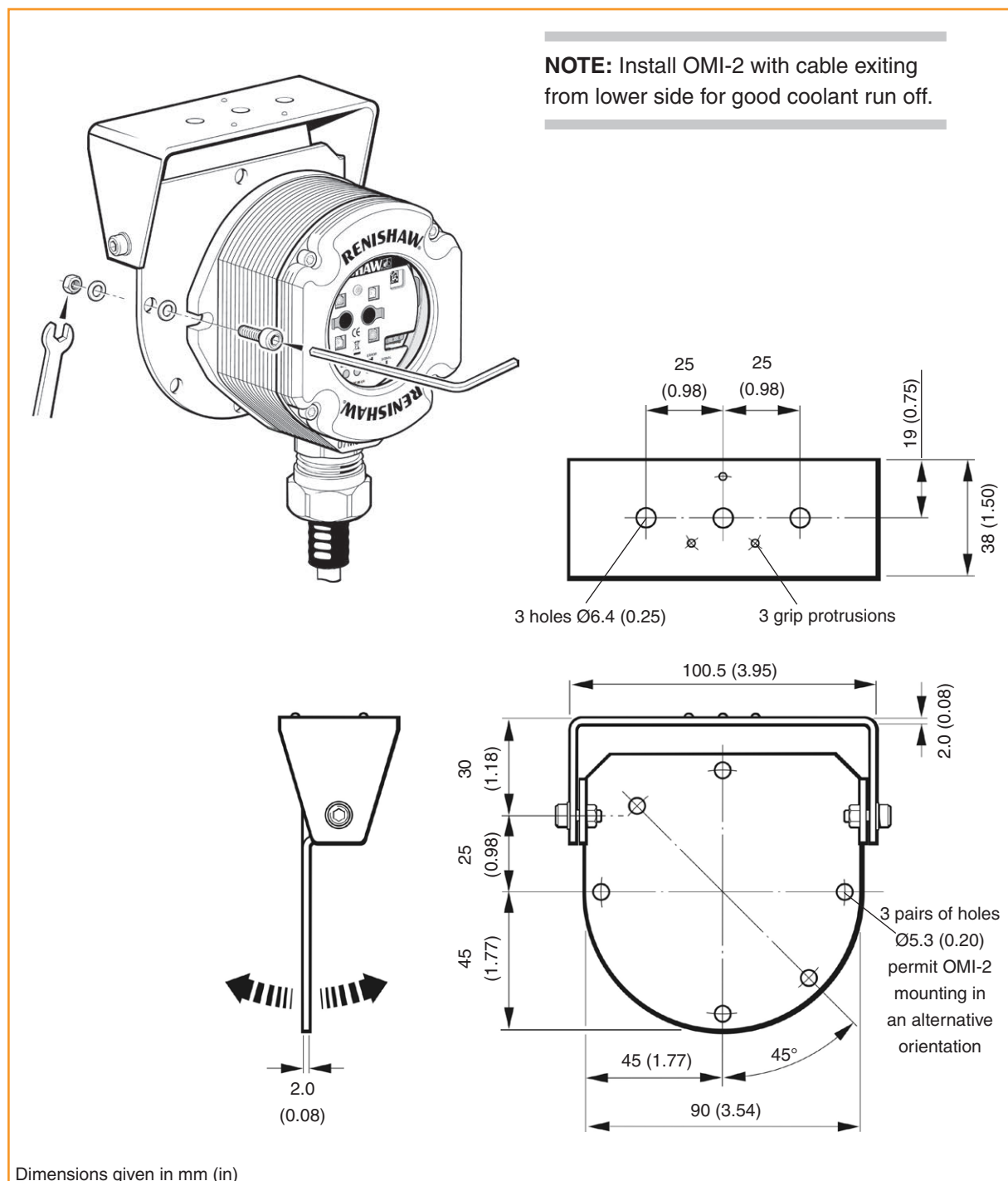
Principal application		The OMI-2 processes signals from RENGAGE™ or standard probes, and converts them into machine outputs, which are then transmitted to the CNC control.
Transmission type		Infrared optical transmission (modulated)
Probes per system		One
Compatible probes		OMP40-2, OMP40M, OLP40, OMP60, OMP60M, OMP400, OMP600 and OTS
Operating range		Up to 6 m (19.7 ft)
Weight		OMI-2 including 8 m (26.2 ft) of cable = 926 g (32.66 oz) OMI-2 including 15 m (49.2 ft) of cable = 1457 g (51.39 oz)
Supply voltage		12 Vdc to 30 Vdc (see “Wiring diagram” in Section 3, “System installation”)
Supply current		Transmitting: 100 mA max. Receiving: 40 mA max. Note: @24 Vdc, all outputs open circuit.
Configurable M-code input		Pulsed or level
Output signal		Probe Status 1, Low Battery, Error Voltage-free solid-state relay (SSR) outputs, configurable normally open or normally closed. Probe Status 2a 5 V isolated driven output, invertible. Probe Status 2b Power supply voltage driven output, invertible.
Input / output protection		Supply protected by resettable fuse. Outputs protected by over current protection circuit.
Cable (to machine control)	Specification	Ø7.5 mm (0.29 in), 13-core screened cable, each core 18 × 0.1 mm
	Length	8 m (26.2 ft), 15 m (49.2 ft)
Diagnostic LEDs		Start, low battery, probe status, error and signal condition.
Mounting		Flush mounting or directional mounting with optional mounting bracket (available separately).
Environment	IP rating	IPX8 (EN/IEC 60529)
	IK rating	IK03 (EN/IEC 62262) [for glass window]
	Storage temperature	-25 °C to +70 °C (-13 °F to +158 °F)
	Operating temperature	+5 °C to +55 °C (+41 °F to +131 °F)

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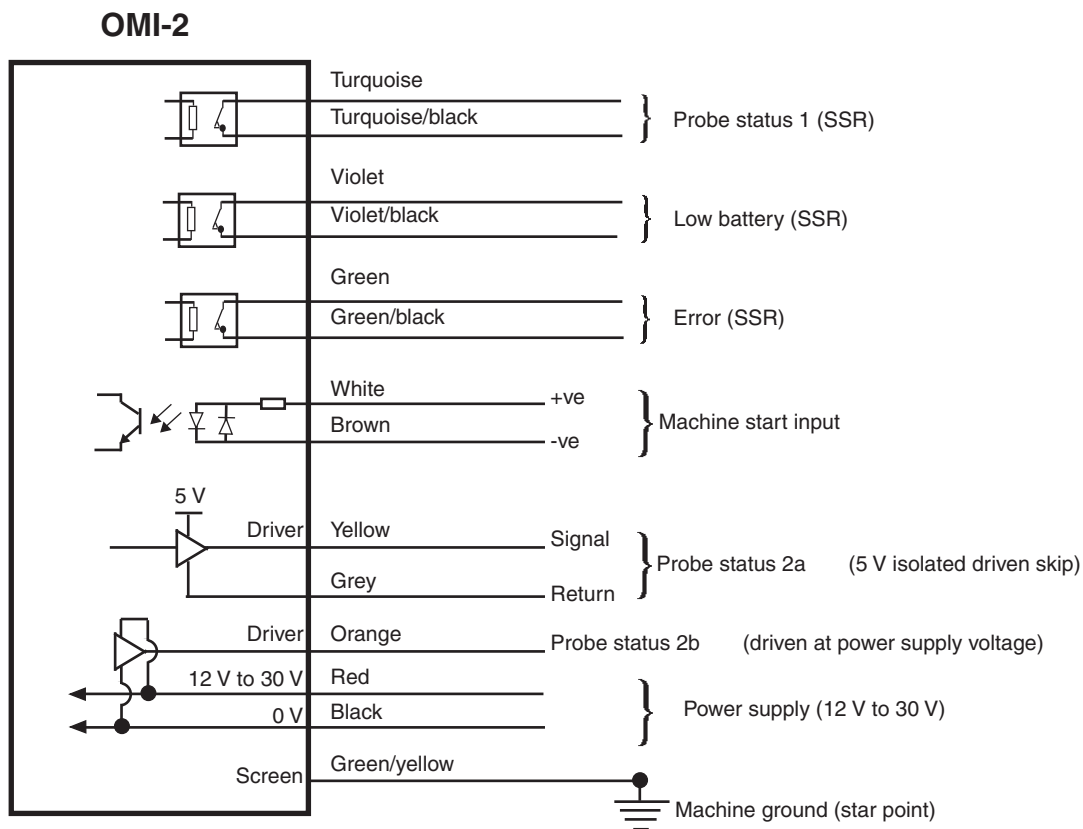
System installation

3.1

Mounting bracket (optional)



Wiring diagram (with output groupings shown)



CAUTIONS:

The power supply 0 V should be terminated at the machine ground (star point). If a negative supply is used then the negative output must be fused.

The dc supply to this equipment must be derived from a source which is approved to IEC/BS/EN 60950-1.

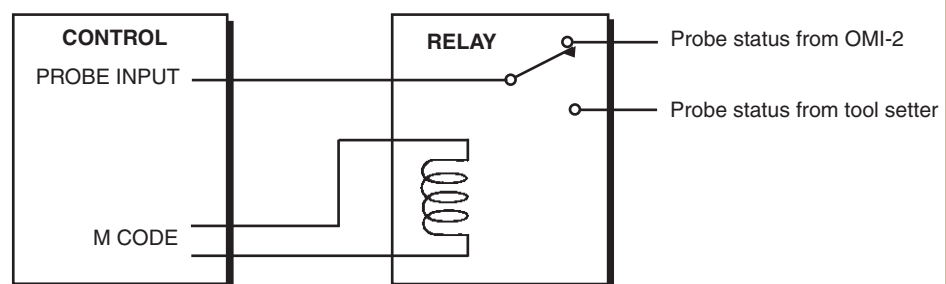
Installation with inspection and tool setting probe

On machines where the OMI-2 is to be integrated with a tool setting probe input, and only one probe input is provided on the control, an M code can be used to drive an external relay that will select which probe is monitored.

Remote external audible output

Any one of the probe status outputs can be used to drive an external audible indicator when set to pulsed (see “OMI-2 outputs” on page 2.4).

NOTE: Audible indicator operation is not possible if both skip drives are being monitored by the control.



OMI-2 cable

Cable termination

A ferrule should be crimped onto each cable wire for a more positive connection at the terminal box.

Standard cable variants

The OMI-2 standard polyurethane cables are 8 m (26 ft) and 15 m (49.2 ft) long.

Please contact Renishaw for other cable lengths.

Cable specification

Ø7.5 mm (0.29 in), 13 core screened cable, each core 18 x 0.1 mm.

Cable sealing

Coolant and dirt are prevented from entering the OMI-2 by the cable sealing gland. The OMI-2 cable can be protected against physical damage by fitting a flexible conduit if required.

A recommended flexible conduit is Anamet™ Sealtite HFX (5/16 in) polyurethane.

A conduit kit is available (see Section 6, “Parts list”).

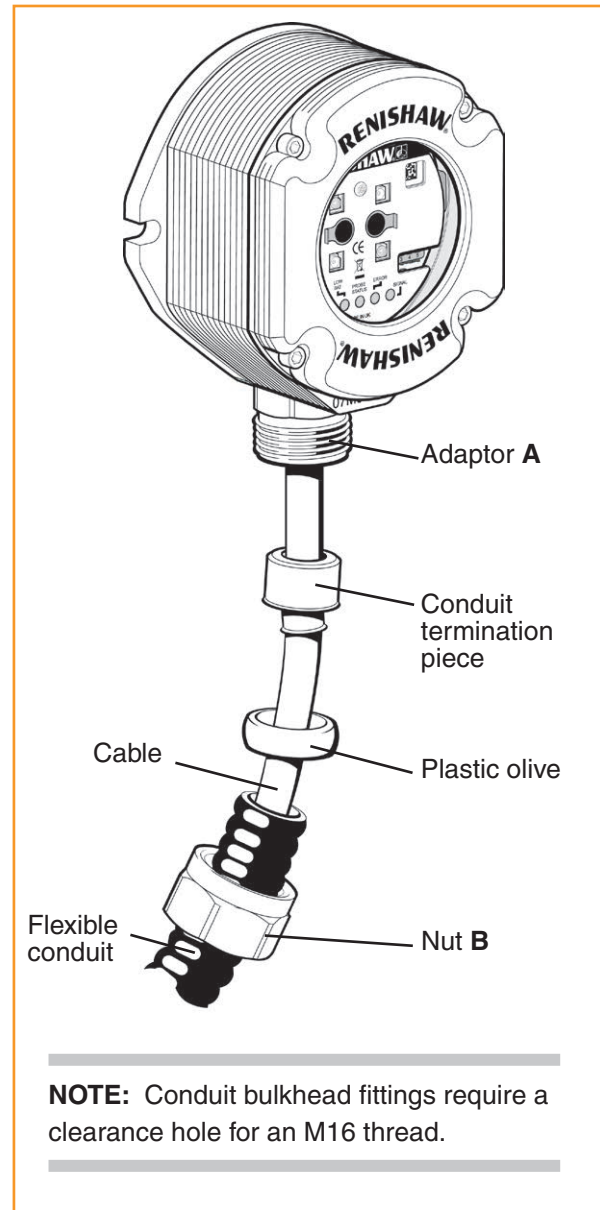
CAUTIONS:

Failure to adequately protect the cable can result in system failure due to either cable damage or coolant ingress through cores into the OMI-2.

Failure due to inadequate cable protection will invalidate the warranty.

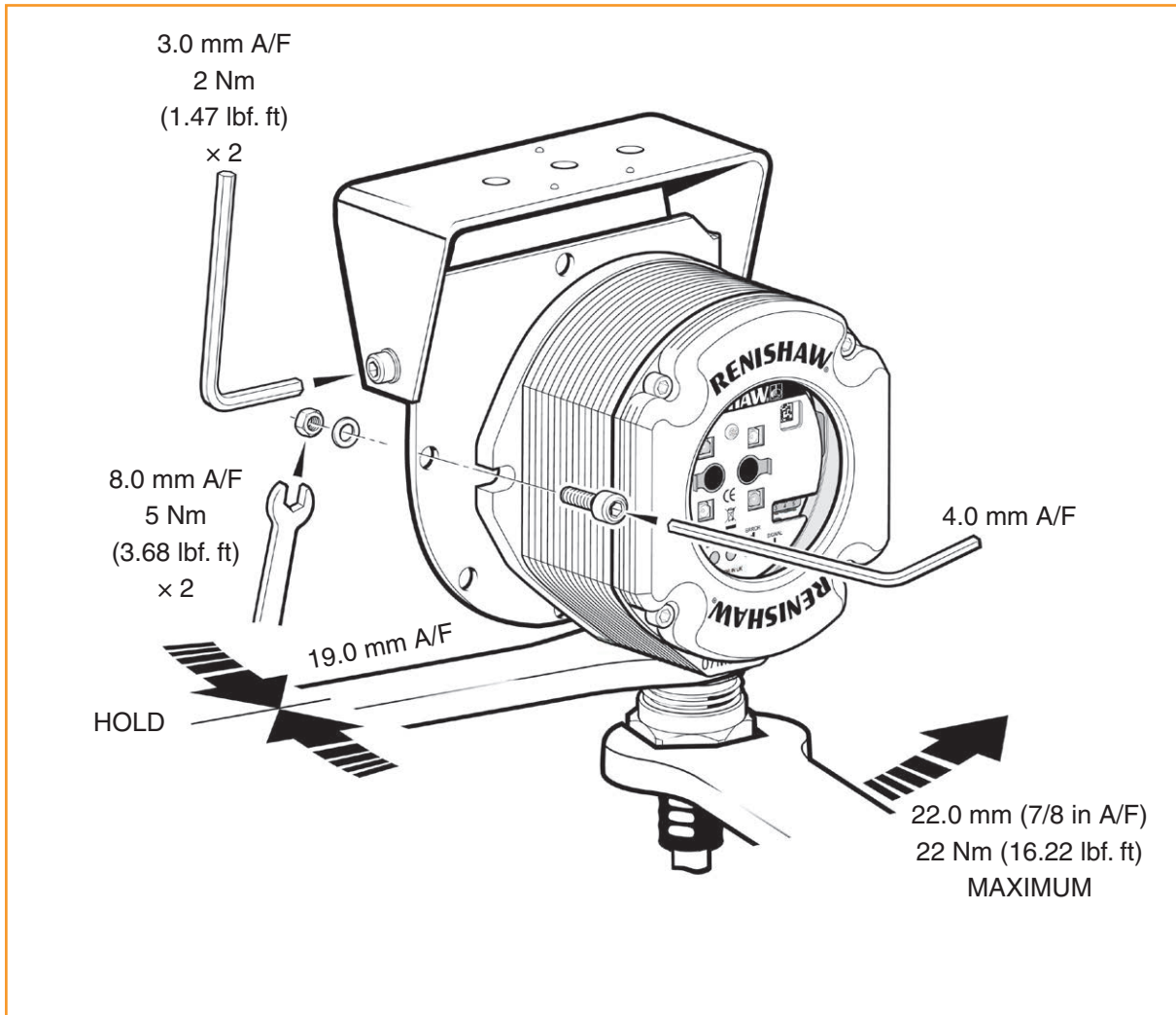
When tightening or loosening nut **B** on the conduit, ensure that torque is only applied between **A** and **B**.

Fitting flexible conduit



1. Slide nut **B** and the plastic olive onto the conduit.
2. Screw the conduit termination piece into the end of the conduit.
3. Fit the conduit to adaptor **A** and tighten nut **B**.

Screw torque values Nm (lbf.ft)



Maintenance

4.1

Maintenance

You may undertake the maintenance routines described in these instructions.

Further dismantling and repair of Renishaw equipment is a highly specialised operation, which must be carried out at authorised Renishaw Service Centres.

Equipment requiring repair, overhaul or attention under warranty should be returned to your supplier.

Cleaning the interface

Wipe the window of the interface with a clean cloth to remove machining residue. This should be done on a regular basis to maintain optimum transmission.



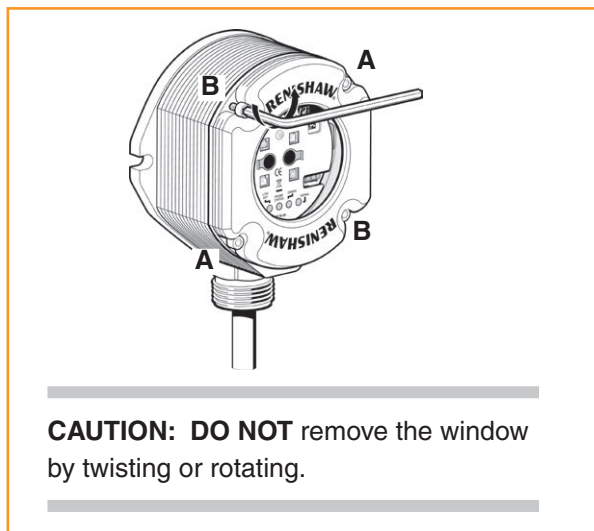
CAUTION: The OMI-2 has a glass window, handle with care if broken to avoid injury.

Removing the OMI-2 window

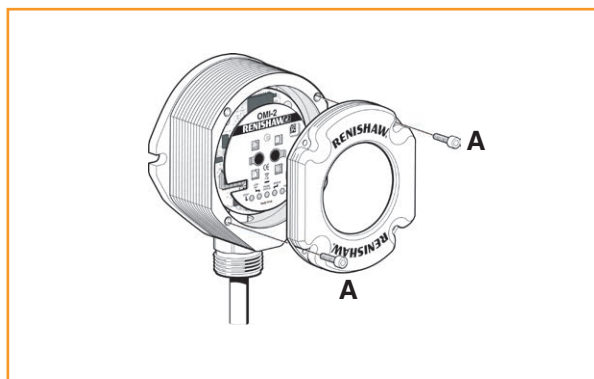
It is not necessary to remove the OMI-2 from the machine when adjusting the switch or installing replacement parts.

The window may be removed and replaced as described below to change the switch settings.

To remove the OMI-2 window



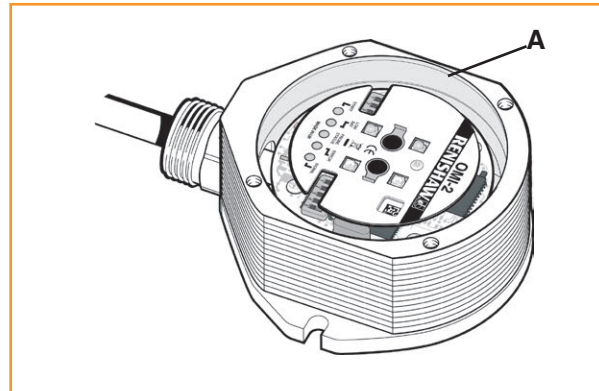
1. Clean the OMI-2 to ensure no debris enters the unit.
2. Remove the four cover screws, using a 2.5 mm A/F hexagon key. Two screws are short and two are long. Two of the cover holes are threaded **A**, and two are plain **B**.
3. The window fits tightly on the OMI-2 body, and is removed using the two long screws, which are inserted into the threaded holes **A**.



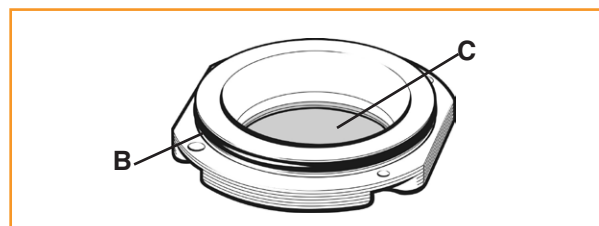
Tighten each screw a few turns at a time to pull the window up evenly. When it is clear of the body, remove the window and screws completely.

Fitting the OMI-2 window

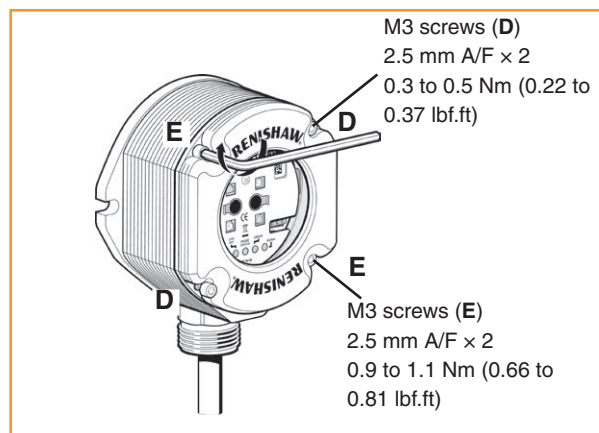
1. Before fitting the window, check for any damage to screws or scratch marks which could prevent sealing.
2. Ensure the O-ring seating **A** in the OMI-2 body is clean.



3. Ensure that the O-ring **B** and window **C** are clean.



4. Insert the two short screws into window holes **D**, and tighten.



5. Place the window complete with the O-ring onto the OMI-2 body.

NOTE: The O-ring should be lightly lubricated with grease.

6. Insert the long screws into holes **E**. and tighten each screw a few turns at a time, to pull the window down evenly. There may be some resistance due to some compression of air trapped inside the body.

Fault-finding

5.1

Symptom	Cause	Action
The probe fails to switch on when in Optical Start mode or fails to switch off when in Optical Stop mode.	Installation / CNC program fault.	Correct the M-code wiring and/or the CNC program.
	The probe is out of the start range.	Change the CNC program to bring the probe within the start range of the OMI-2 and ensure that the appropriate start range is selected.
	The transmission beam is obstructed.	Clean the OMI-2 window and remove any obstructions.
	Incompatible probe / probe transmission setting.	Change the probe or probe setting to modulated PROBE1.
	Incorrect Machine Start setting.	Reconfigure the Machine Start setting SW2.
	Dead probe batteries.	Replace the probe batteries.
	Optical interference is blocking the start signal.	<p>Check the OMI-2 visual diagnostics. For instructions describing how to check the visual diagnostics (see “OMI-2 visual diagnostics” on page 2.2).</p> <p>Remove the source of interference or reposition the OMI-2 such that interfering light does not shine onto the OMI-2 window or probe window.</p>

Symptom	Cause	Action
The probe stops in mid-cycle. or An unexpected error occurs during a probing cycle. or An unexpected trigger occurs during the probing cycle.	The transmission beam is obstructed.	Remove the obstruction.
	Optical interference.	Remove the source of interference or reposition the OMI-2 such that interfering light does not shine into the OMI-2 window.
	Intermittent wiring fault.	Correct wiring.
	The probe has moved outside the reception range.	Change the CNC program to bring the probe within the reception range of the OMI-2 and ensure that the appropriate reception range is selected.
	The probe is in Timer Off mode and has not been triggered for the timer period.	Increase the Timer Off time setting or change the probing routine.
	The probe has not been triggered for more than 90 minutes.	Restart the probe and ensure that the probe is not idle for 90 minutes.
The probe switches on, but the OMI-2 error LED remains lit.	Interfering light source is shining directly into the OMI-2 window.	<p>Check the OMI-2 visual diagnostics. For instructions describing how to check the visual diagnostics (see “OMI-2 visual diagnostics” on page 2.2).</p> <p>Remove the source of interference or reposition the OMI-2 such that the interfering light does not shine into the OMI-2 window.</p>
	The probe is out of range.	<p>Check the signal condition LED.</p> <p>Change the CNC program to move the probe into the reception range of the OMI-2 and ensure the appropriate reception range is selected.</p>
	The probe is triggered when OMI-2 is set to Level Machine Start.	Reseat the probe.
	A signal is being received from a probe on an adjacent machine tool.	Change the adjacent probe to low power mode or change the OMI-2 reception range to 50%, if this range is acceptable.
	Installation / CNC program fault.	Check wiring and CNC program.

Symptom	Cause	Action
The probe indicates low battery condition, but the machine control does not.	Installation / CNC program fault.	Correct low battery SSR wiring and/or CNC program.
The machine control does not respond to the probe being triggered or seated.	Probe is not switched on.	Attempt to switch it on.
	Probe is out of range.	Change the CNC program to bring the probe within the reception range.
	Installation / CNC program fault.	Correct the probe status output(s) wiring and CNC program.
	A signal is being received from a probe on an adjacent machine tool.	Change the adjacent probe to low power mode or change the OMI-2 reception range to 50%, if this range is acceptable.
Probe triggers but the OMI-2 does not respond.	The OMP400 or OMP600 has the 3 second switch-on mode selected.	Reconfigure the OMP400 or OMP600 to the standard switch-on delay.
	The probe is out of range.	Review the performance envelopes.
	The transmission beam obstructed.	Check that the probe and OMI-2 windows are clean, and remove any obstruction.
	The probe is set to legacy transmission.	Reconfigure to modulated transmission.
Low battery, probe status and error LEDs are flashing red.	An output overload has occurred.	<p>Remove power to the system and remove the source of the problem. Turning on the system will reset the OMI-2.</p> <p>If the system displays any other symptom, check the installation before contacting your local Renishaw office.</p>

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Parts list

6.1

Item	Part number	Description
OMI-2 kit	A-5191-0049	OMI-2 with 8 m (26 ft) cable, magnetic label, tool kit and quick-start guide.
OMI-2 kit	A-5191-0050	OMI-2 with 15 m (49 ft) cable, magnetic label, tool kit and quick-start guide.
Mounting bracket	A-2033-0830	Mounting bracket.
Conduit kit	A-4113-0306	Conduit kit with 1 m (3.28 ft) of polyurethane conduit and bulkhead connector (M16 thread).
Window replacement kit	A-5191-0019	Comprising: window assembly with O-ring, 3 x stainless steel M3 x 14 mm long screws, 3 x stainless steel M3 x 5 mm long screws and 1 x 2.5 mm hexagon wrench.
Tool kit	A-5191-0300	Comprising: 1 x 2.5 mm hexagon wrench, 1 x 4 mm hexagon wrench, 14 x ferrules, 2 x M5 screws, 2 x M5 washers and 2 x M5 nuts.
Publications. These can be downloaded from our website at www.renishaw.com		
OMI-2	A-5191-8500	Quick-start guide: for rapid set-up of the OMI-2 optical machine interface (includes CD with installation guides).
OMP40-2	A-4071-8500	Quick-start guide: for rapid set-up of the OMP40-2 optical machine probe (includes CD with installation guides).
OLP40	A-5625-8500	Quick-start guide: for rapid set-up of the OLP40 optical lathe probe (includes CD with installation guides).
OMP400	A-5069-8500	Quick-start guide: for rapid set-up of the OMP400 optical machine probe (includes CD with installation guides).
OMP60	A-4038-8501	Quick-start guide: for rapid set-up of the OMP60 optical machine probe (includes CD with installation guides).
OMP600	A-5180-8500	Quick-start guide: for rapid set-up of the OMP600 optical machine probe (includes CD with installation guides).
OTS	A-5401-8500	Quick-start guide: for rapid set-up of the OTS optical tool setting probe (includes CD with installation guides).

NOTE: The serial number of each OMI-2 unit is found at the bottom of the housing.

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