Installation and user's guide
H-2000-5233-02-A

RENISHAW
apply innovation™

OMI-2 - optical machine interface

English
Français
Deutsch
Italiano

Renishaw part no: H-2000-5233-02-A

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Contents

CE

EC DECLARATION OF CONFORMITY

Renishaw plc declares that the product:-

Name:	OMI-2
Description:	Optical machine interface

has been manufactured in conformity with the following standard:

BS EN 61326:1998/	Electrical equipment for measurement, control and laboratory use - EMC requirements. Immunity to annex A - industrial locations. Emissions to class A - (non-domestic) limits.

and that it complies with the requirements of directive (as amended):

89/336/EEC	Electromagnetic compatibility

The above information is summarised from the full EC declaration of conformity. A copy is available from Renishaw on request.

FCC DECLARATION (USA)

FCC 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.
2. This device may accept any interference received, including interference that may cause undesired operation.

FCC 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 you will be required to correct the interference at your own expense.

FCC 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.

SAFETY

Information for the user

Beware of unexpected movement. The user should remain outside of the full working envelope of probe head/extension/probe combinations.

Handle and dispose of batteries in according to the manufacturers recommendations. Use only the recommended batteries. Do not allow the battery terminals to contact other metallic objects.

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

Refer to the machine supplier's operating instructions.

Information for the machine supplier

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product documentation, 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 stop the machine's movement.

Installation and user's guide

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.

Care of the OMI-2

Keep system components clean and treat the OMI-2 with care.

Do not apply labels to the front of the OMI-2.

Changes to equipment

Renishaw reserve the right to change specifications without obligation to change equipment previously sold.

Weight

OMI-2 including 8 metres (26 ft) of cable = 1000 g (35 oz).

OMI-2 including 15 metres (49 ft) of cable = 1500 g (53 oz).

Sealing

The unit is fully sealed to IPX8.

CNC machine

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

Environment

Temperature

The OMI-2 is specified for storage over –10 °C to 70° C (14 °F to 158° F) and operation over 0 °C to 60 °C (32 °F to 140 °F) ambient temperature range.

Patent notice

Features of products shown in this guide, and of related products, are the subject of the following patents and/or patent applications:

EP	1130557	US	0134085-A1
EP	1397637	US	6,472,981 B2
EP	1425550	WO	02/103283

CAUTION: Only qualified persons should adjust switches.

OMI-2

OMI-2

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

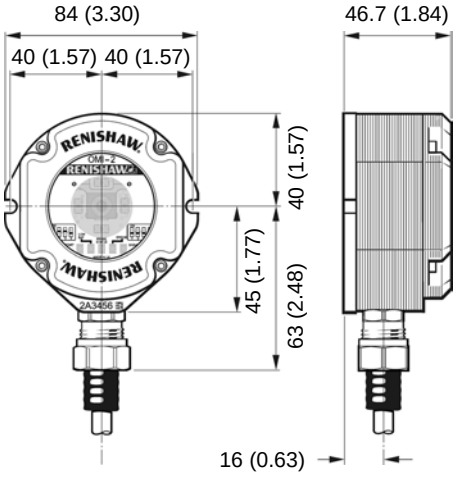
The OMI-2 operates using a 'Modulated' optical transmission mode and is compatible with machine probes that also operate in 'Modulated' mode.

Power supply

The OMI-2 can draw its supply from the CNC machine 12 V to 30 V d.c. Alternatively, power may be supplied from a Renishaw PSU3 power supply unit. The maximum supply current is 40 mA d.c. and the maximum current is 200 mA during a START signal.

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

dimensions mm (in)

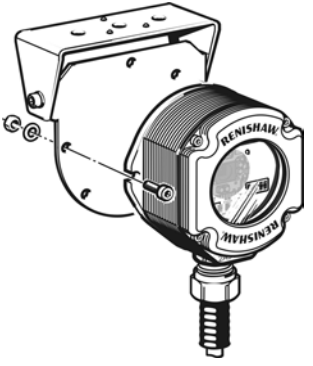


Contact Renishaw for cable rear exit version

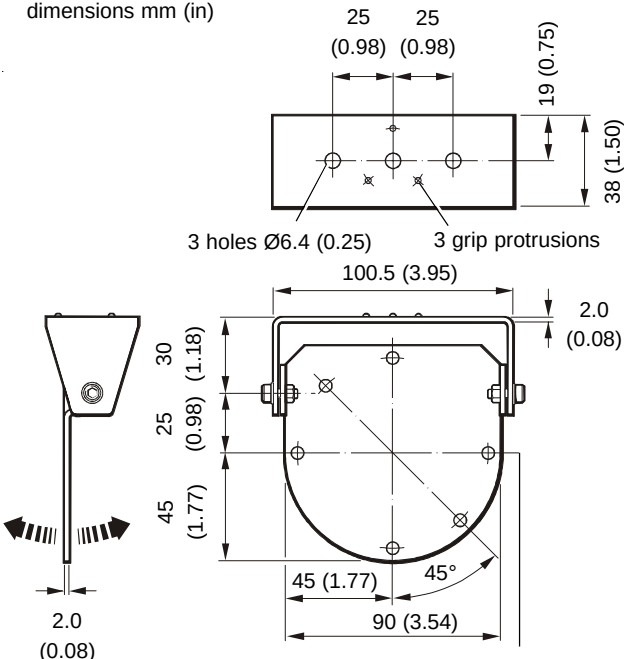
Input voltage ripple

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

Mounting bracket (optional)



dimensions mm (in)



NOTE:
Install OMI-2 with cable exiting from lower side for good coolant run off.

Mounting bracket cannot be used with an OMI-2 in rear exit configuration.

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 CONDITION

KEEP THE WINDOW CLEAN

1. **LED (yellow) – START signal status**
   Lit when a START signal is transmitted to the probe.

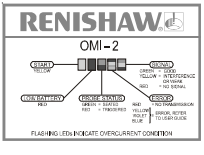
   This LED will either flash once when a machine controlled START signal is commanded, or flash at one second intervals when the system is set to 'Auto–Start' mode and is waiting for a probe transmission signal.

2. **LED (red) – LOW BAT.**
   When the OMP battery voltage falls below a set level, the low battery output device changes state, and causes the LOW BAT LED to be lit.

   Replace the OMP battery as soon as is practicable after the LED is lit.

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.



3. **LED (green, red) – PROBE STATUS**
   This bi–colour 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.

4. **LED (red, blue, yellow, violet) – ERROR**
   Indicates transmission error condition. e.g. optical beam obstructed/probe out of optical range/probe switched off/battery dead.

   Red - Signal from probe has either failed or has stopped.

   Blue - A second modulated signal is being received.

   Yellow - Interference or a weak probe signal is being received.

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

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

5. **LED (red, yellow, green) – Infra red SIGNAL CONDITION received from probe**
   As long as there is power to the system, this LED will always be lit. It is a tri–colour LED and indicates as follows :

   Red - There is no signal from the probe.

   Yellow - Signal received from probe is either too weak or interference is present.

   Green - The condition of signal received from probe is good.

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 section Switches SW1, SW2 and start input.

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 µs max.

Closed to open = 25 µs 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 µs max.

High to low = 10 µs max.

continued on next page

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

Load current = 50 mA max.

Output voltages

Sourcing (Voltage supply - Output voltage)
= 2.6 V max at 10 mA.
= 3.5 V max at 50 mA.

Sinking = 2.0 V max at 10 mA.
= 2.9 V max at 50 mA.

Switching times

Low to high = 10 µs max.
High to low = 10 µs max.

The Low Battery, Probe Status, and Error LEDs will start flashing red when an output overload has occurred. All outputs will be switched off. If this occurs, turn off the power supply and remove the source of the problem. Turning on the power supply will reset the OMI-2.

CAUTION:

Power supply voltage

Do not exceed 30 V between the black wire and the screen wire (green / yellow), or 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

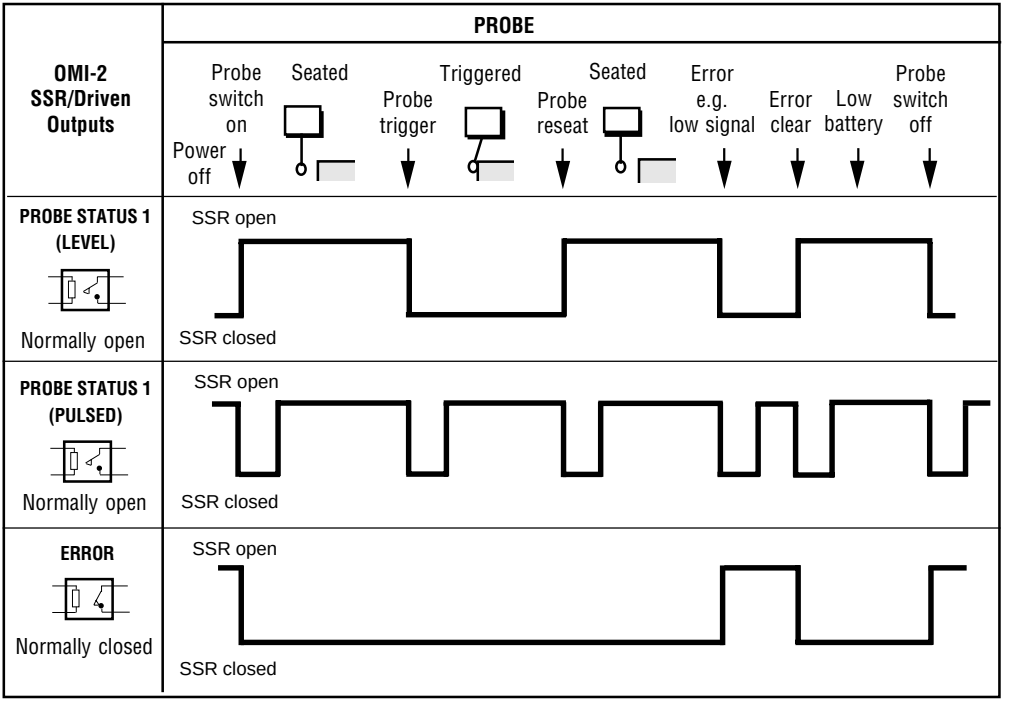
A good connection should be made to machine ground (star point).

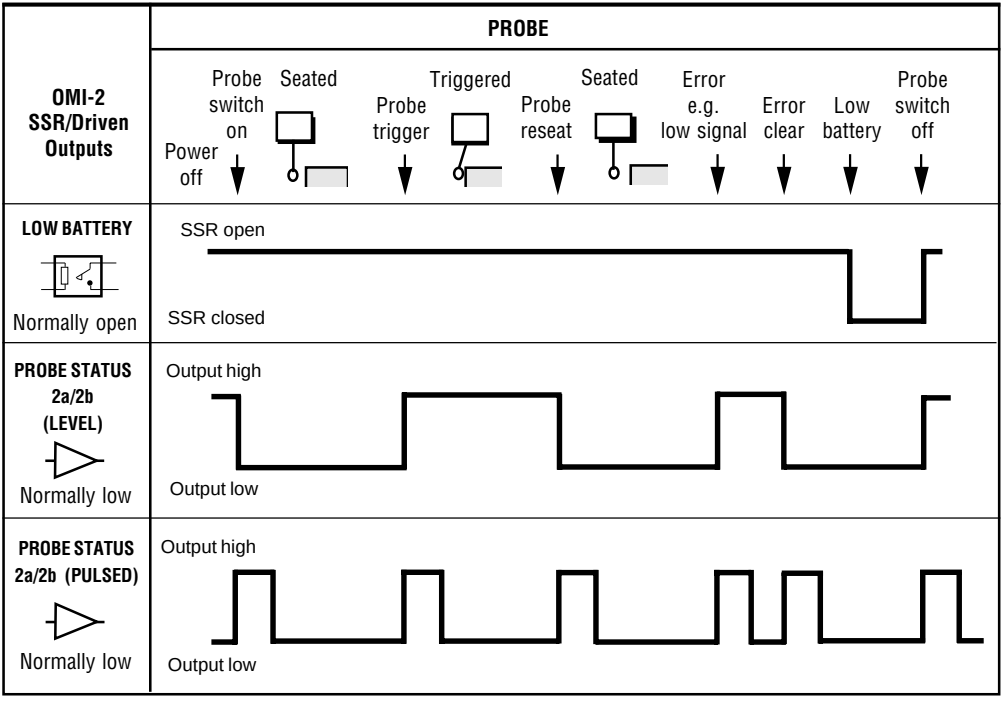
Output

Ensure that outputs from the OMI-2 do not exceed specified current ratings.

OMI-2 output waveforms

Outputs can be inverted by switches - see section 'Switches SW1, SW2 and start input'



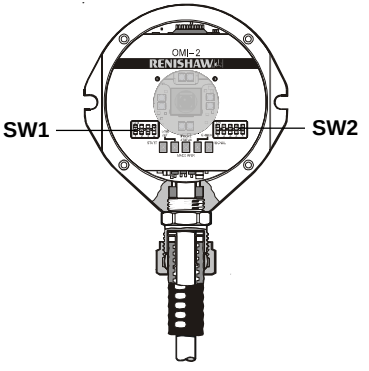


SIGNAL DELAYS

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.

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

Switches SW1, SW2 and start input



To gain access to the switches, remove the OMI-2 window

SWITCH SW1 output configuration

Factory settings shown are for:

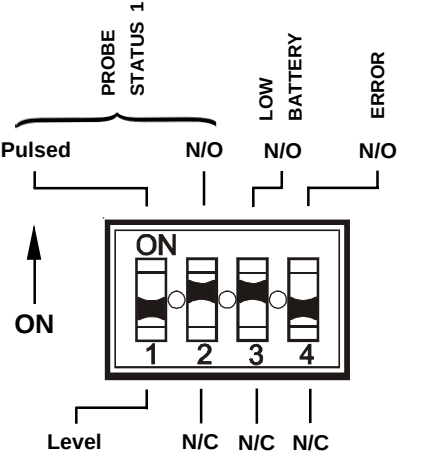
A-5191-0049

A-5191-0050

N/O = Normally Open

N/C = Normally Closed

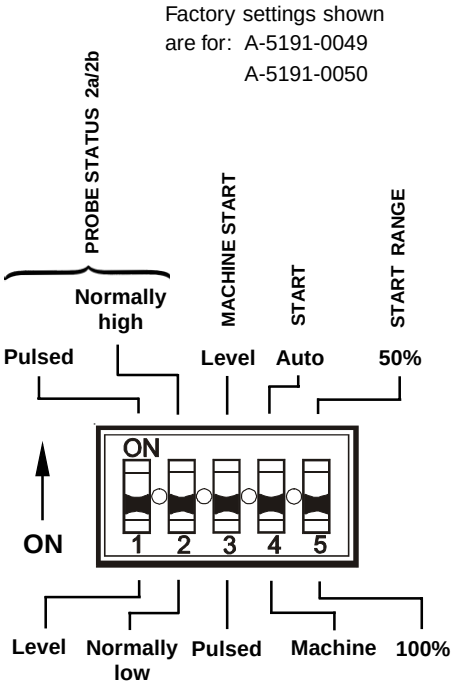
Switch SW1 output configuration



CAUTION:

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

Switch SW2 output configuration



Auto start

'Auto start' selection causes the system to send a START signal at one second intervals, and should only be used when there is no available output from the machine control. In this mode ensure start signals can not be received by probes in the tool changer or on other machines.

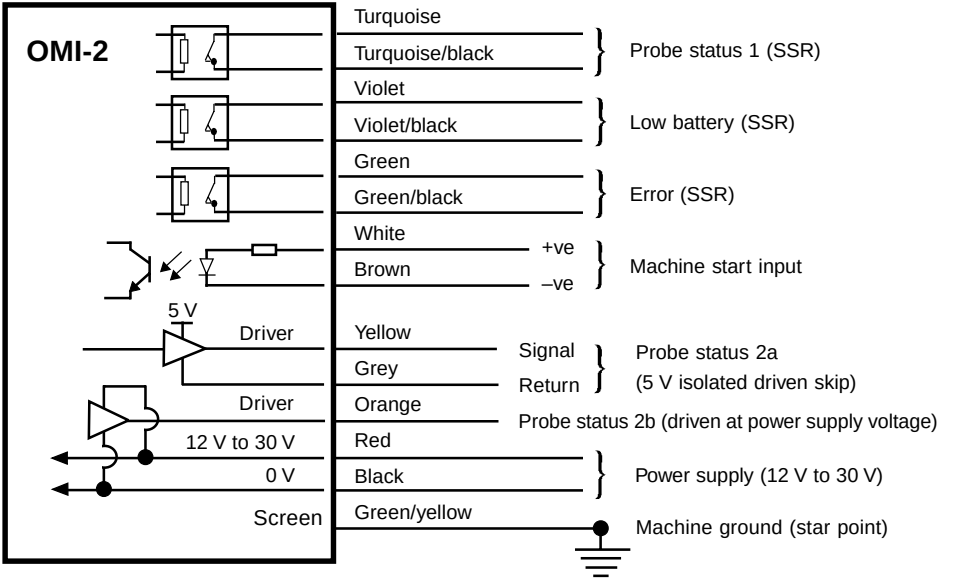
Machine start

'Machine start' is configurable as a level or pulsed signal.

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

Machine start wires (white +ve and brown –ve)

Wiring diagram (with the output groupings shown)



CAUTION:
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.

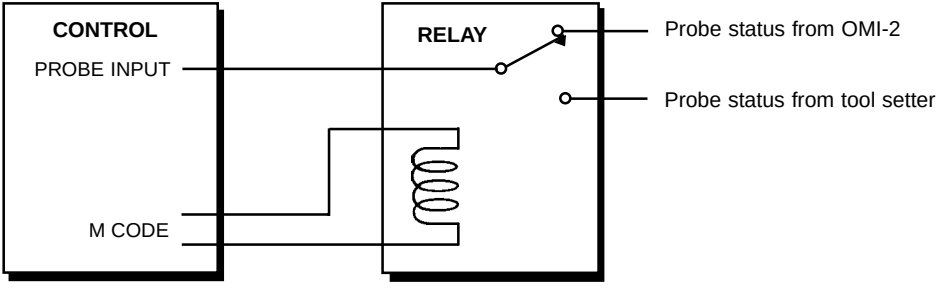
Installation with inspection and tool setting probe

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 utilised 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 section OMI-2 outputs.

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 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 ft) long.

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.

NOTE:
Maximum length of the specified cable must not exceed 25 m (82 ft).

OMI-2 cable sealing

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

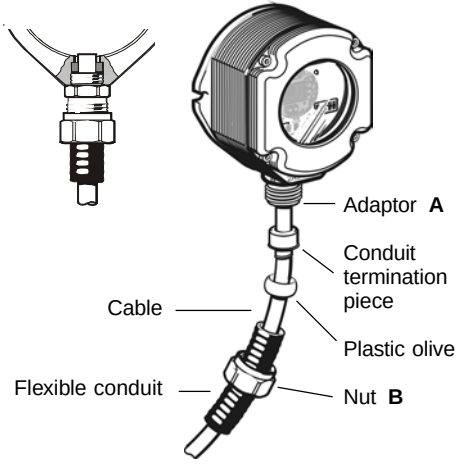
Recommended flexible conduit is Anamet™ Sealtite HFX (5/16 in) polyurethane.
A conduit kit is available - see Parts list.

CAUTION:
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** onto conduit ensure that torque is only applied between **A** and **B**.

Fitting flexible conduit



Conduit bulkhead fittings require a clearance hole for an M16 thread

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

Removing the OMI-2 window

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

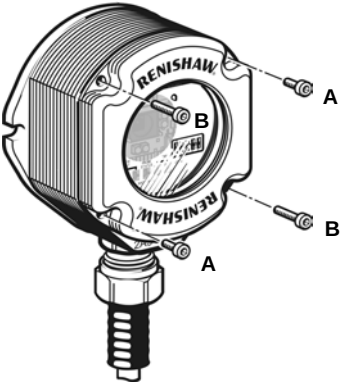
The window may be removed to either change reception/start range settings and output options - see relevant section, or to replace a broken window.

To remove the OMI-2 window

1. Clean OMI-2 to ensure no debris enters unit.

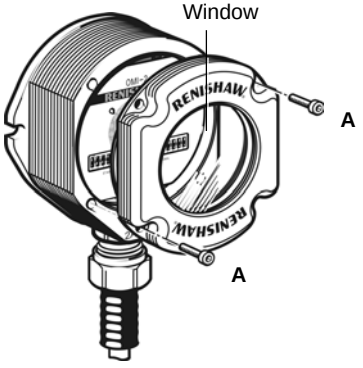
2. Remove the four cover screws, using a 2.5 mm A/F hexagon key.

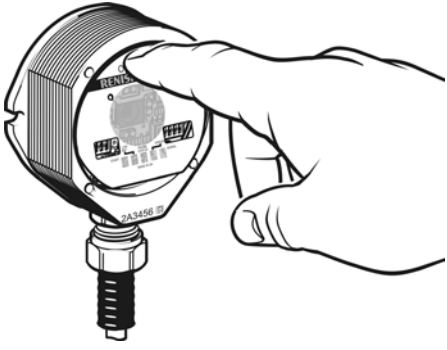
   Two screws are short and two are long. Two of the cover holes are threaded - **A**, and two are plain - **B**.



CAUTION:
DO NOT remove the window by twisting or rotating - use long screws in hole **A** only.

Removing the OMI-2 label





3. The window fits tightly in 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 lift the window evenly.

   When it is clear of the body, remove the window and screws completely.

Press the top of the label to enable removal.

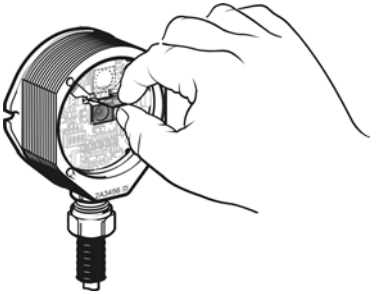
Ensure cleanliness is observed during this procedure.

Re-fitting the OMI-2 label

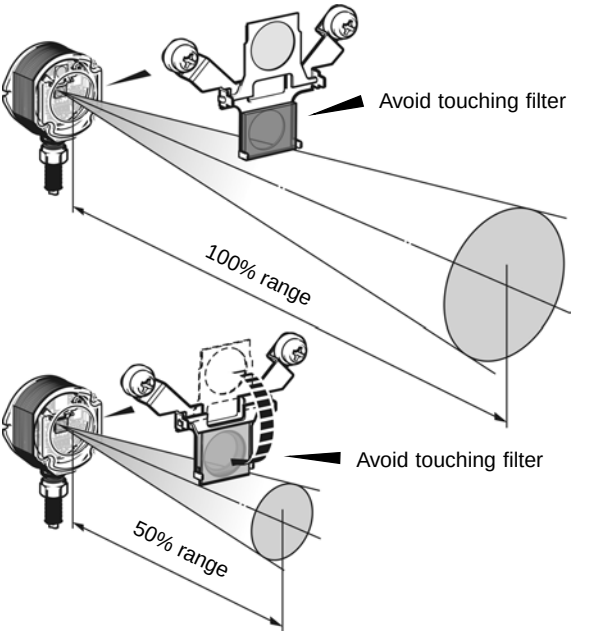
Place the label on the two locating pins, taking care not to touch the opaque centre.

Changing the reception range

(factory set to 100% range)



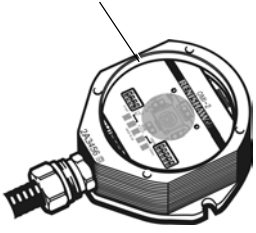
To reduce the reception range to 50%, move the filter to position indicated.



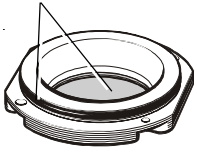
Fitting the OMI-2 window

1. Before fitting window, check for any damage to screws or scratch marks which could prevent sealing.

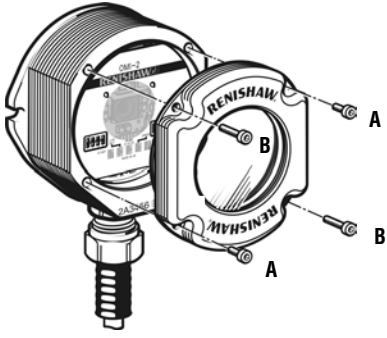
2. Ensure that the 'O' ring seating in the OMI-2 body is clean.



3. Ensure that the window and 'O' ring are clean.



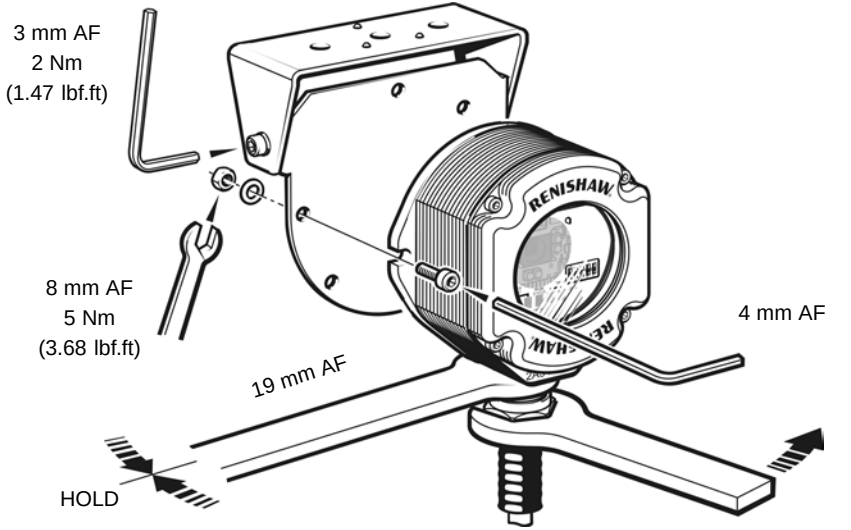
4. Insert the two short screws into window holes **A**, and tighten.
   Screw torque is 0.4 Nm (0.29 lbf.ft).



5. Place window complete with 'O' ring onto OMI-2 body.
   Note : The 'O' ring should be lightly lubricated with grease.

6. Insert the long screws into holes **B**.
   Tighten each screw a few turns at a time, to pull the window down evenly. There may be some resistance due to compression of air trapped inside the body.
   Screw torque is 1.4 - 1.6 Nm (1.03 - 1.18 lbf.ft).

Screw torque values Nm (lbf.ft).



Fault finding - If in doubt, consult your probe supplier.

Symptom	Cause	Action
Probe fails to switch on when in Optical Start mode or switch off when in Optical Stop mode	Installation/CNC program fault	Correct M-code wiring and/or CNC program
	Probe is out of START range	Change CNC program to bring probe within START RANGE of the OMI-2 and that the appropriate START RANGE (SW2) is selected
	Beam obstructed	Clean the OMI-2 window and remove any obstructions
	Incompatible probe/ probe transmission setting	Change probe or probe setting to MODULATED
	Incorrect MACHINE START setting	Reconfigure MACHINE START (SW2) setting
	Dead probe batteries	Replace probe batteries
	Optical interference is blocking Start signal	Remove source of interference or reposition OMI-2 such that interfering light does not shine onto OMI-2 window or probe window
		Check VISUAL DIAGNOSTICS

Symptom	Cause	Action
Probe stops in mid-cycle or An unexpected error occurs during a probing cycle or An unexpected 'trigger' occurs during the probing cycle	Beam obstructed	Remove obstruction
	Optical interference	Remove source of interference or reposition OMI-2 such that interfering light does not shine into OMI-2 window
	Intermittent wiring fault	Correct wiring
	Probe has moved outside 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
	Probe is in Timer Off mode and has not been triggered for the timer period	Increase Timer Off time setting or change probing routine
	Probe has not been triggered for more then 90 min	Re-start probe and ensure that the probe is not idle for 90 min

Symptom	Cause	Action
Probe switches on, but OMI-2 ERROR remains active	Interfering light source shining directly into OMI-2 window	Remove source of interference or reposition OMI-2 such that the interfering light does not shine into OMI-2 window Check VISUAL DIAGNOSTICS
	Probe is out of range	Check SIGNAL CONDITION LED. Change the CNC program to move the probe into the RECEPTION RANGE of the OMI-2 and ensure the appropriate RECEPTION RANGE is selected
	Probe is triggered when OMI-2 is set to Level Machine Start	Reseat 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 Error SSR wiring and CNC program

Symptom	Cause	Action
Probe indicates Low Battery condition, but the machine control does not	Installation/CNC program fault	Correct Low Battery SSR wiring and/or CNC program
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 CNC program to bring the probe within the RECEPTION RANGE
	Installation/CNC program fault	Correct 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 fails to switch on	Probe was already ‘on’ when the START signal was transmitted	Check that the probe was turned off at end of last probing cycle

Parts list - Please quote the Part no. when ordering equipment.

Type	Part no.	Description
OMI-2 kit	A-5191-0049	OMI-2 with 8 m (26 ft) cable, magnetic label, tool kit and User's guide.
OMI-2 kit	A-5191-0050	OMI-2 with 15 m (49ft) cable, magnetic label, tool kit and User's guide.
Mtg Brkt	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 2.5 mm hexagon wrench.
Tool kit	A-5191-0300	Comprising 2.5 mm hexagon wrench, 4 mm hexagon wrench, 14 x ferrules, 2 x M5 screws, 2 x M5 washers and 2 x M5 nuts.

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

Renishaw plc
New Mills, Wotton-under-Edge,
Gloucestershire, GL12 8JR
United Kingdom

T +44 (0)1453 524524
F +44 (0)1453 524901
E uk@renishaw.com
www.renishaw.com

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For worldwide contact details, please visit our main web site at www.renishaw.com/contact

H-2000-5233-02