

LTO2S and LTO2S-R probe systems for lathes



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Patents

Features of the Renishaw equipment described in this guide, and features of similar equipment, are the subject of the following patents and/or patent applications:

EP 0283486	JP 2,653,806	US 4899094
EP 0337669	JP 2,945,709	US 5,040,931
EP 0390342	JP 2,994,401	US 5,150,529
EP 0695926		US 5,669,151
		WO 88/02139

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EC DECLARATION OF CONFORMITY

Renishaw plc declares that the products:

Name	Description
LTO2S series	Optical signal transmission systems.

have been manufactured in conformity with the following standards:

BS EN 61326: 1998/ A1:1998/A2:2001	Electrical equipment for measurement, control and laboratory use - EMC requirements. Immunity to annex A - industrial locations. Emissions to class A (non-domestic) limits.
BS EN 60825-1:1993/ A1:1997/A2:2001	Safety of laser products. Part 1: Equipment classification, requirements and user's guide.

and that they comply with the requirements of the following directives (as amended):

89/336/EEC 73/23/EEC	Electromagnetic compatibility Low voltage
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The above information is summarised from the EC Declarations of Conformity, 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 must 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.

FCC Section 15.27

The user is also cautioned that any peripheral device installed with this equipment such as a computer, must be connected with a high-quality shielded cable to insure compliance with FCC limits.



Safety

Only qualified persons should change the switch settings or replace fuses.

Where appropriate, remove the mains supply from units before removing covers.

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.

CNC machine

CNC machine tools must always be operated by competent persons in accordance with the manufacturer's instructions.

Caring for the probe / LTO2S-OMP

Keep system components clean and treat the probe system as a precision tool.

Probe IP rating

IPX8

Related publications

When you install the LTO2S or LTO2S-R probe system, you will also need to refer to one or more of the publications listed below for details of how to install the ancillary equipment.

- *Optical module machine (OMM) installation and user's guide* – Renishaw part No. H-2000-5044.
- *MI 12 interface unit installation and user's guide* – Renishaw part No. H-2000-5073.
- *Optical machine interface (OMI) installation and user's guide* – Renishaw part No. H-2000-5062.
- *PSU3 power supply unit installation and user's guide* – Renishaw part No. H-2000-5057.

This guide describes the following Renishaw inspection probe systems for lathes:

- LTO2S
- LTO2S-R (visible-red model) – see page 12.

System components

Each system comprises the following main components:

- An LTO2S optical module probe (OMP).
- A 3D touch-trigger inspection probe ($\pm X$, $\pm Y$ and $+Z$ directions). This is either a Renishaw LP2 or LP2H probe. The LP2 is more sensitive than the LP2H, which has a greater resistance to vibration and can support heavier styli. The probe is mounted in the OMP.
- An optical transmitter and receiver unit (OMM) and an MI 12 machine interface unit.

The interface unit may be either a free-standing MI 12 interface unit or an MI 12 interface board.

- Alternatively, an optical receiver and machine interface unit (OMI) may be used instead of the OMM and MI 12 interface. This unit combines the functions of both the OMM and MI 12 in one unit.
- A PSU3 power supply unit. This is an optional unit. It provides a 24 V supply to the interface unit when a suitable power supply is not available from the CNC machine controller.
- Renishaw software for probe routines.
- LPE extension bars. One of these can be fitted between the OMP and the LP2 probe to provide greater access to workpiece features.
- MA4 90° adaptor. This allows the LP2 probe to be mounted at 90° to the machine turret and set through 360°.

Operation

The LTO2S OMP is mounted in a tool position on the lathe turret and receives and transmits optical signals. Power for operation is provided by an internal battery. A 3D touch-trigger inspection probe, either an LP2 or LP2H, is attached to the OMP.

A workpiece setup and inspection cycle may be included at any stage of the machining process. When a cycle is initiated, signals pass from the CNC control to the OMP, via MI 12 and OMM units. Signals also return along the same route.

The MI 12 interface unit converts the probe signals into the correct format for the CNC machine control.

Instead of the OMM and MI 12 combination, an OMI may have been installed. This process signals in the same way as the OMM and MI 12.

Using two OMMs

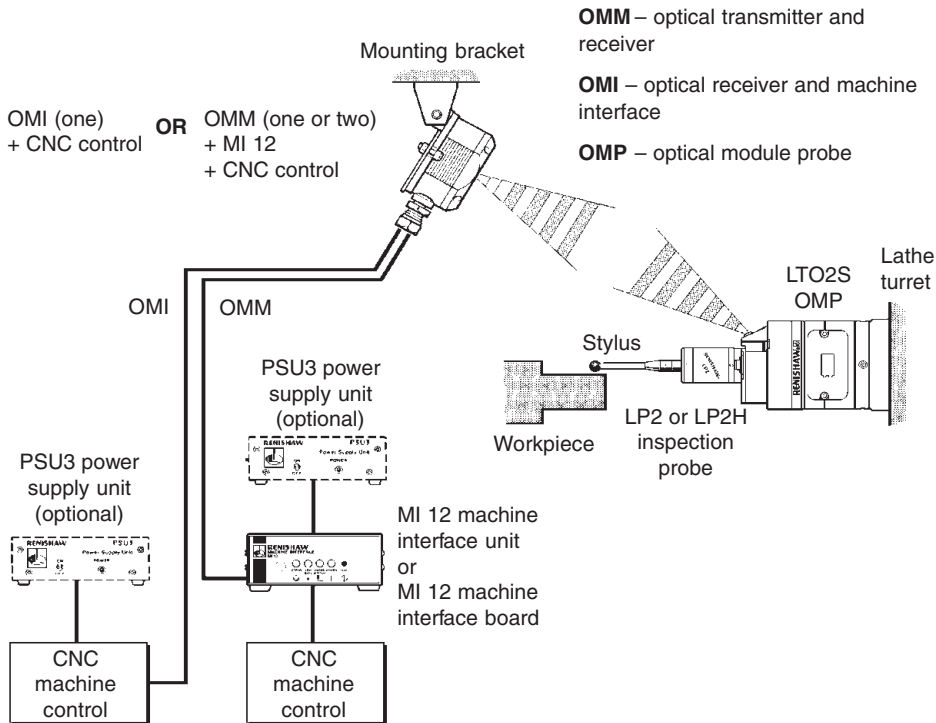
If it is not possible for one OMM to cover the full range of movement of the LTO2S OMP, a second OMM may be added. The reception cones of the OMMs must be arranged to overlap so that they act as one receiver over the area they cover.

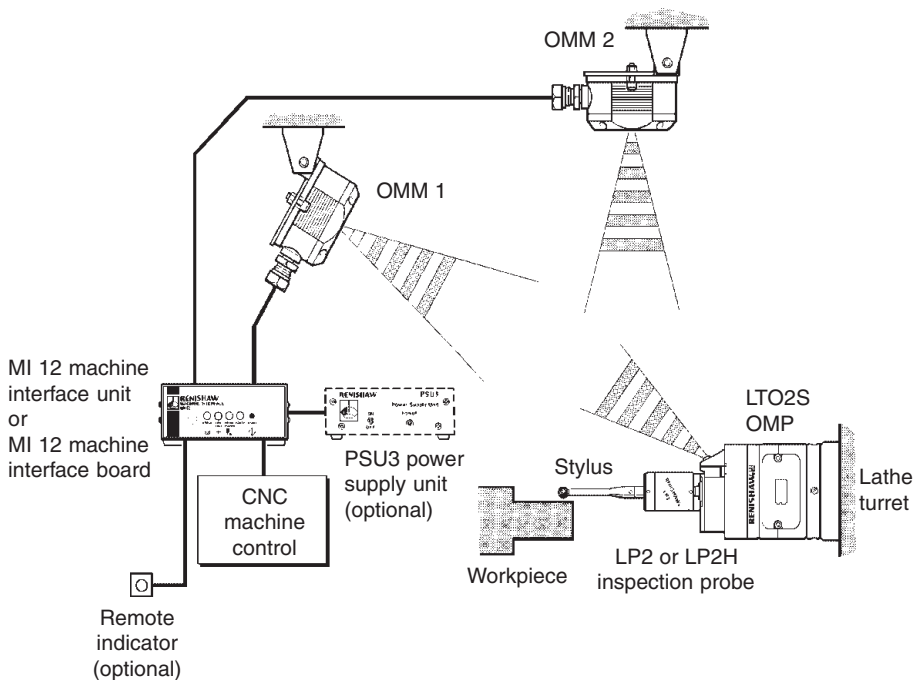
Remote indication

When the inspection probe contacts a surface, a PROBE STATUS LED on the MI 12 changes state and a beep is emitted.

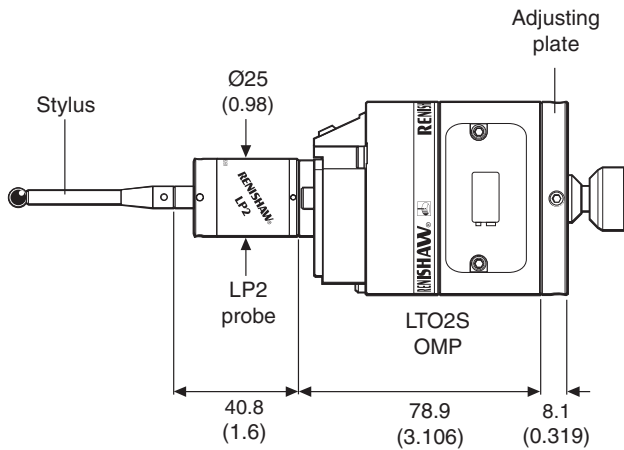
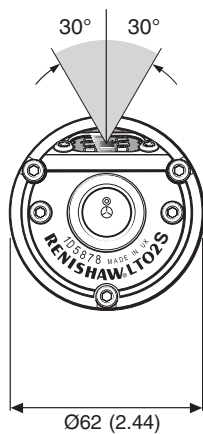
If the MI 12 is hidden from the operator, an optional remote lamp or bleeper may be placed in a position where it is easily seen or heard.

Typical probe system





Dimensions in mm (in)



Environment

PROBE – LTO2S OMM, MI 12 INTERFACE OMI, PSU3	TEMPERATURE
Storage	-10 °C to 70 °C (14 °F to 158 °F)
Operating	5 °C to 50 °C (41 °F to 122 °F)

Operating envelope

For the LTO2S, see pages 11 and 15.

For the LTO2S-R, see page 13.

Natural reflective surfaces within the machine may increase the signal transmission range.

Performance plots in the ambient temperature range 5 °C to 50 °C (41 °F to 122 °F) are shown on pages 11 to 15.

Operation in temperatures of 0 °C to 5 °C or 50 °C to 60 °C (32 °F to 41 °F or 122 °F to 140 °F) will result in some reduction in range.



CAUTION

- Switch power off when working inside electrical components.
- The LTO2S probe system is a precision tool. Always handle it with care.
- Before using the LTO2S, ensure it is firmly secured in its mounting.

Regular maintenance

Although Renishaw probes require little maintenance, the performance is adversely affected if dirt, chips or liquids are allowed to enter the sealed working parts. Therefore keep all components clean and free from grease and oil. Periodically check cables for signs of damage, corrosion or loose connections.

Cleaning

Coolant residue accumulating on the OMP window and on the OMM or OMI windows can have a detrimental effect on transmission performance.

Wipe clean as often as is necessary to maintain unrestricted transmission.

LTO2S and OMM

The diodes of the LTO2S OMP and OMM must be mutually in the others field of view, and within the performance envelope shown on the page opposite.

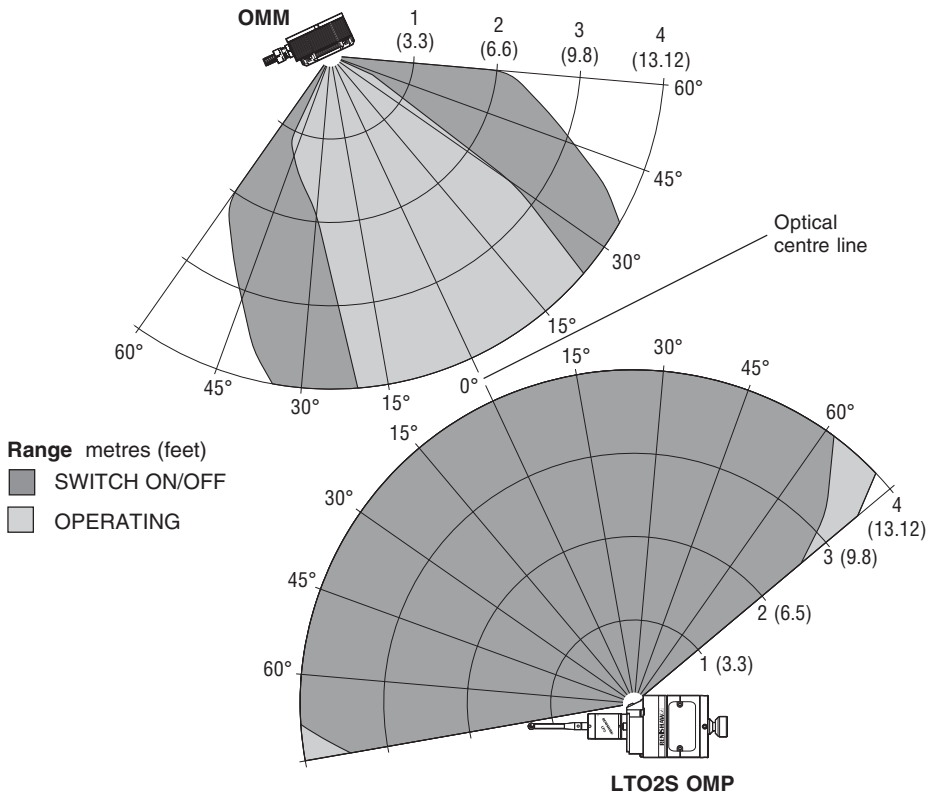
Switch on/off range

The LTO2S OMP must be within 4 m (13.12 ft) of the OMM.

Operating range

The LTO2S OMP must be within 4 m (13.12 ft) of the OMM.

Rotation of the LTO2S OMP window is to be within ± 20 degrees of the optical centreline.



Visible red ('R') OMP model

When a lathe is fitted with two optical signal transmission systems, problems with signal crosstalk between the LTO2S OMPs can occur. To prevent this, one of the OMPs should be an LTO2S-R visible-red ('R') model.

Signals transmitted from this OMP are of a different optical frequency to the signals transmitted from a standard LTO2S model OMP.

Most aspects of an LTO2S-R visible red system are the same as those for an LTO2S system with the following exceptions:

- 1 The only system combination is an LP2, LTO2S-R, OMMR, and MI 12. No 'R' version of the OMI is available.
- 2 Visible red light does not transmit as far as infra red.

LTO2S-R and OMM-R

The diodes of the LTO2S-R OMP and OMM-R must be mutually in the others field of view and within the performance envelope shown on the page opposite.

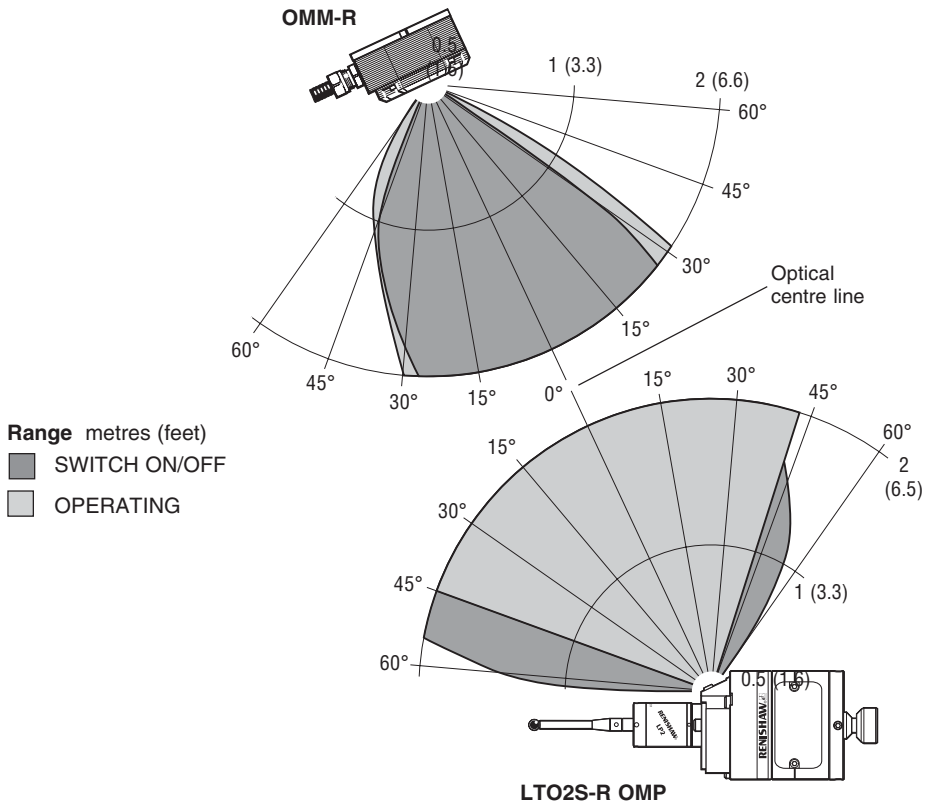
Switch on/off range

The LTO2S-R OMP must be within 2 m (6.6 ft) of the OMM-R.

Operating range

The LTO2S-R OMP must be within 2 m (6.6 ft) of the OMM-R.

Rotation of the LTO2S-R OMP window is to be within ± 15 degrees of the optical centreline.



LTO2S and OMI

The diodes of the LTO2S OMP and OMI must be mutually in the others field of view, and within the performance envelope shown on the page opposite.

Switch on/off range

The LTO2S OMP must be within 4 m (13.12 ft) of the OMI.

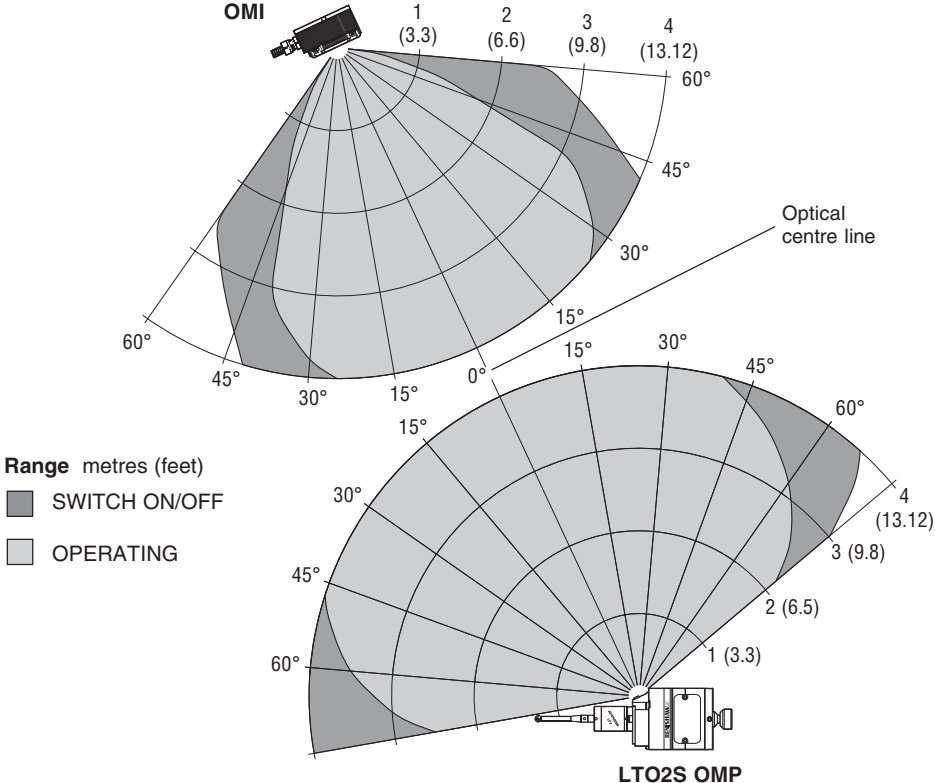
Operating range

The LTO2S OMP must be within 4 m (13.12 ft) of the OMI.

Rotation of the LTO2S OMP window is to be within ± 30 degrees of the optical centreline.

NOTE: LTO2S-R model

This transmission plot is not applicable to the LTO2S-R model. No 'R' version of the OMI is available.



Installation is the responsibility of your Renishaw supplier or the machine tool manufacturer. Information is given in this section to assist in overcoming basic problems. You are recommended to seek specialist advice where this is appropriate.

Cable routing and electrical interference

Care should be taken to ensure that signal cables are routed away from high current sources, e.g. high current cables, axis drive motors and 3-phase transformers.

Optical interference

Renishaw optical transmission systems are designed to be immune from normal optical interference. However there is a level above which powerful light sources will interfere with the optical system.

There are two categories of interference:

- Intermittent light sources
- Local strong continuous light sources

Intermittent light sources

Rotating-type beacons with incandescent light source

This type of beacon will not cause interference unless:

- it is situated within two metres of the OMM, and
- its mirror reflects light directly at the OMM.

Xenon-type beacons

This type of beacon produces fast, very powerful pulses of light and cannot safely be used near the OMM. It is undesirable to operate the system in an environment that contains Xenon beacons, i.e. on machine tools or AGVs.

Arc, MIG or TIG welding

These can produce optical interference similar to that of a Xenon beacon. Xenon beacon restrictions therefore apply.

Other interfering light sources

It is possible that fast changes in light levels, e.g. a match being struck or a lighter being lit, will cause errors if the source is within 500 mm of the OMM window. Abnormal changes in light levels must therefore be avoided.

Local strong continuous light sources

- If fluorescent lamps are used for workpiece lighting, the OMM should be kept at a distance of at least one metre from the source.
- If quartz halogen lamps of greater than 60 W are used, the OMM should be kept at a distance of at least two metres from direct emission from source.
- It should also be noted that direct sunlight should not be allowed to shine on the OMM window, as this could cause errors.

If it is not convenient to maintain these distances and any of the problems listed above are experienced, then a shield (similar to a camera lens hood) can be used to shield the OMM from direct contact with the interference.



CAUTION: If two systems are operating in close proximity to each other, take care to ensure that signals transmitted from the OMP on one machine are not received by the OMM or OMI on the other machine, and vice versa.

OMM and OMI positioning

To assist finding the optimum position of the OMM during system installation, signal strength outputs are available on the MI 12 interface.

OMI signal strength is displayed on an OMI multi-coloured LED.

LTO2S-to-adaptor mounting

To mount the LTO2S assembly in the lathe turret, the LTO2S OMP is secured to a mounting adaptor. Two LTO2S-to-mounting adaptor configurations are available:

- Using the adjusting plate only.
- Using the combination of adjusting plate and centre-ball.

Both configurations allow the stylus on-centre setting to be adjusted.

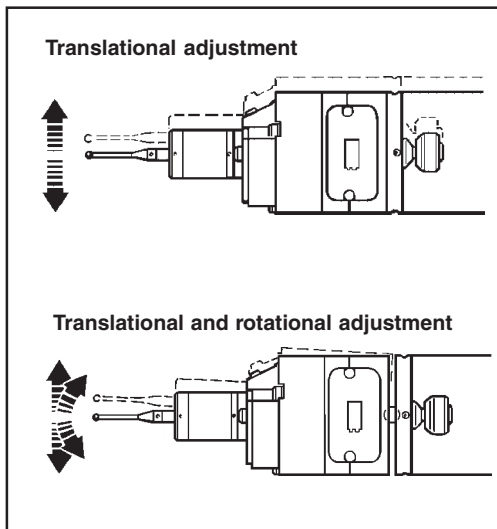
Adjusting plate only

This configuration allows the probe to slide across the shank end face. This is known as translational adjustment.

To adjust the on-centre position using this configuration, see pages 20 to 22.

Adjusting plate and centre-ball

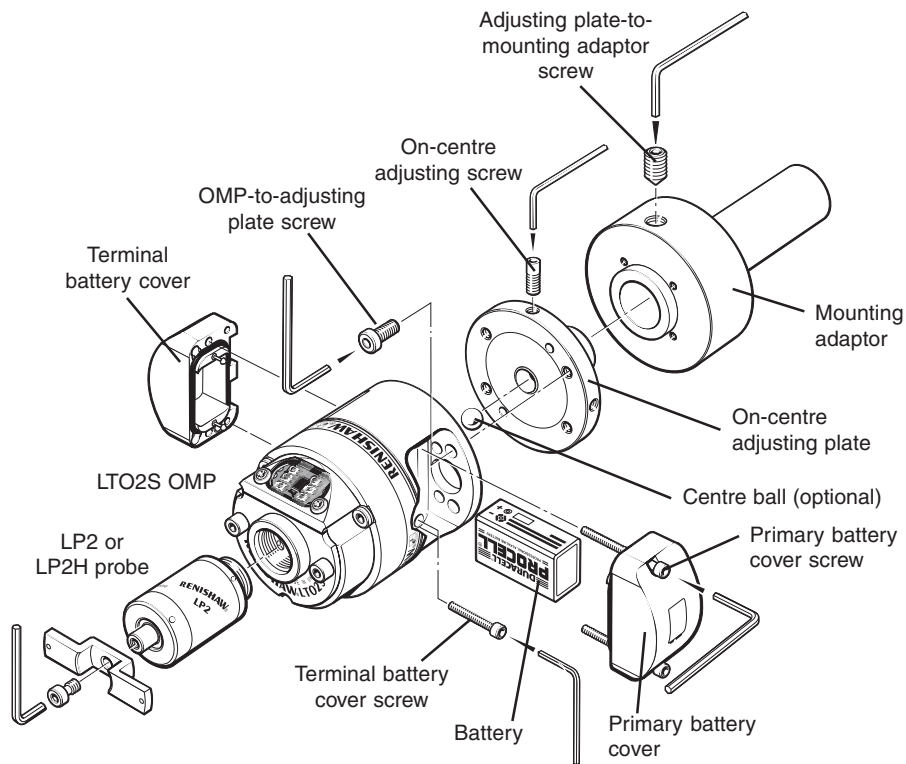
This configuration allows the probe to slide across the shank end face, and also pivot on the adaptor.

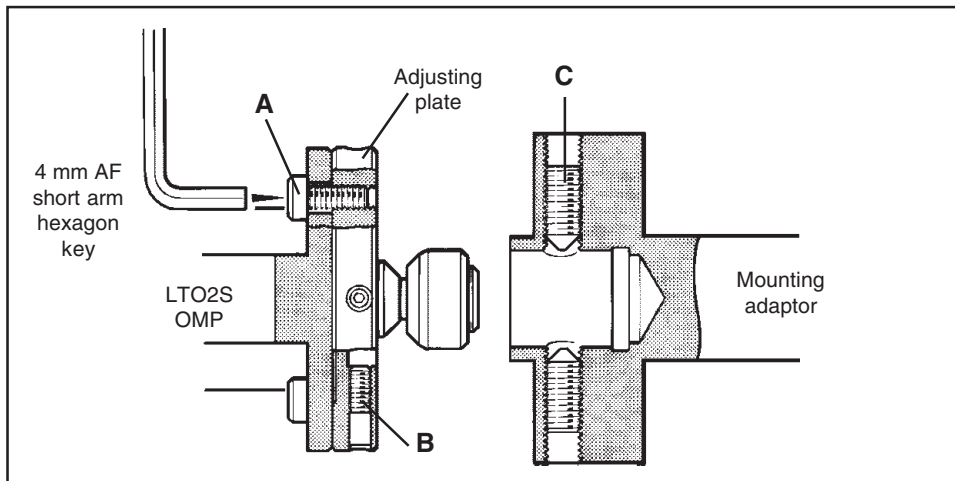


This is known as translational and rotational adjustment.

It is used for applications where the stylus stem must be parallel to the side of a bored hole or edge to avoid stem contact.

To adjust the on-centre position using this configuration, see pages 23 to 25.



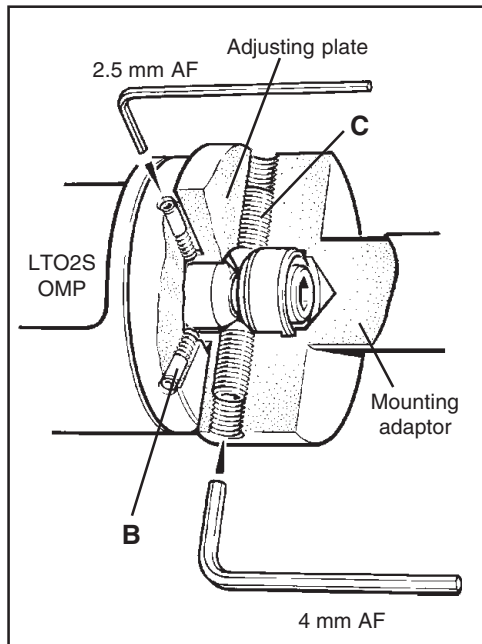


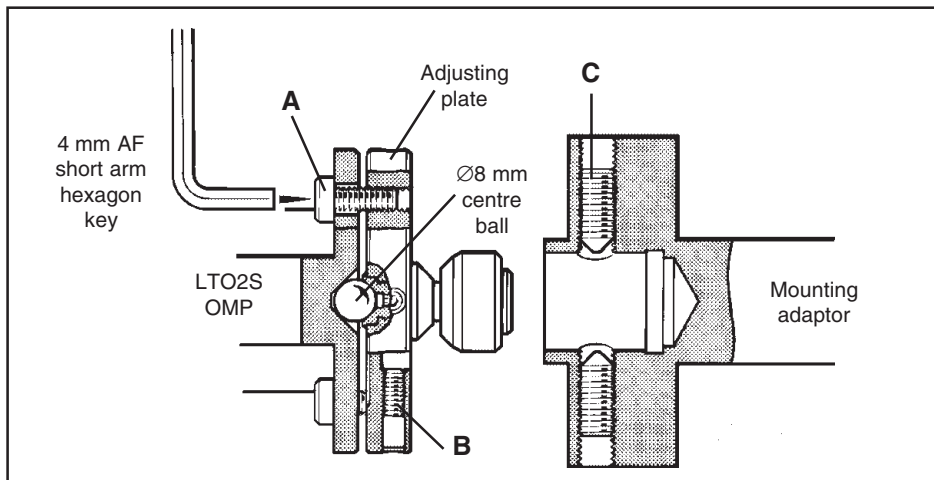
NOTES

- 1 During adjustment, take care not to rotate the LTO2S OMP relative to the mounting adaptor.
 - 2 If a LTO2S/adaptor unit is accidentally dropped, it should be rechecked for on-centre position.
 - 3 Do not hit or tap the LTO2S to achieve on-centre adjustment.
- 1 Remove the primary battery cover and battery (see “Removing and replacing the battery” on page 32).
 - 2 Remove the terminal battery cover (see “Removing and refitting the terminal battery cover” on page 34).
 - 3 Refer to the figure on this page. Tighten the OMP-to-adjusting plate screws **A** to 5.1 Nm (3.76 lbf.ft) using the 4 mm AF hexagon key (supplied in the tool kit).

- 4 Fully slacken the four screws **B**.
- 5 Grease two screws **C** and fit them into the mounting adaptor.
- 6 Fit the LTO2S OMP onto the mounting adaptor and visually position it centrally relative to the adaptor. Partially tighten screws **C** to 2 – 3 Nm (1.47 – 2.2 lbf.ft).
- 7 Fit the LTO2S/adaptor assembly onto the machine turret.
- 8 Rotate the assembly to align the receive diode of the LTO2S with the OMM.
- 9 Refit the terminal battery cover (see “Removing and refitting the terminal battery cover” on page 34).
- 10 Refit the primary battery cover and battery (see “Removing and replacing the battery” on page 32).
- 11 Adjust the on-centre setting as described on page 22.

- 1 Each of the four screws **B** moves the LTO2S OMP relative to the mounting adaptor, in the X or Y direction, as pressure is applied.
Tighten each screw, then back off after each movement.
- 2 When the stylus tip run-out is less than $20\ \mu\text{m}$, fully tighten screws **C** to 6 – 8 Nm (4.4 – 5.9 lbf.ft).
- 3 For final centering, adjust screws **B** to move the LTO2S. Progressively slacken one screw and tighten the opposite screw as the final setting is approached. Use two hexagon keys to do this.
A tip run-out of $5\ \mu\text{m}$ (0.0002 in) should be achievable.
- 4 After the final setting has been achieved, tighten the four screws **B** to 1.5 – 3.5 Nm (1.1 – 2.6 lbf.ft). This is important.

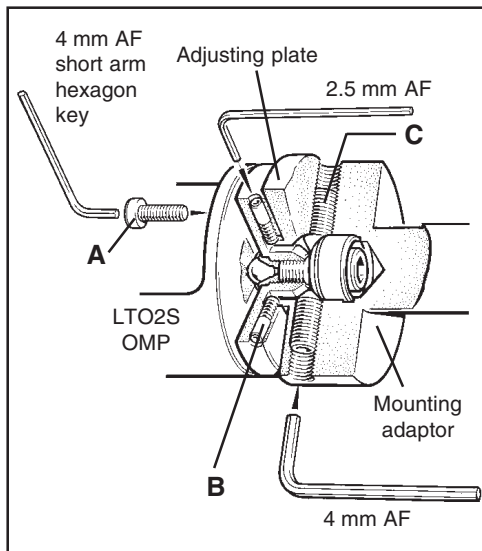


**NOTES**

- 1 During adjustment, take care not to rotate the LTO2S OMP relative to the adaptor.
 - 2 If a LTO2S/adaptor unit is accidentally dropped, it should be rechecked for on-centre position.
 - 3 Do not hit or tap the LTO2S OMP to achieve on-centre adjustment.
- 1 Remove the primary battery cover and battery (see “Removing and replacing the battery” on page 32).
 - 2 Remove the terminal battery cover (see “Removing and refitting the terminal battery cover” on page 34).
 - 3 Remove the on-centre adjusting plate from the LTO2S body.

- 4 Refit the adjusting plate onto the LTO2S body, with the Ø8 mm centre ball located between the adjusting plate and LTO2S. Tighten fixing screws **A** lightly using the 4 mm AF hexagon key (supplied in the toolkit).
- 5 Fully slacken the four screws **B**.
- 6 Grease two screws **C** and fit them into the mounting adaptor.
- 7 Fit the LTO2S, complete with the adjusting plate and centre ball, onto the mounting adaptor and visually position it centrally relative to the adaptor. Partially tighten screws **C** to 2 – 3 Nm (1.47 – 2.2 lbf.ft).
- 8 Fit the LTO2S/adaptor assembly onto the machine turret.
- 9 Rotate the assembly to align the receive diode of the LTO2S with the OMM.
- 10 Adjust the on-centre setting as described on page 25.

- 1 Check the horizontal alignment of the stylus stem relative to the bore hole. If alignment is required, adjust screws **A** and then fully tighten screws **A** to 5.1 Nm (3.76 lbf.ft).
- 2 Each of the four screws **B** moves the LTO2S relative to the mounting adaptor, in the X or Y direction, as pressure is applied. Tighten each screw, then back off after each movement.
- 3 When the stylus tip run-out is less than 20 μm , fully tighten screws **C** to 6 – 8 Nm (4.4 – 5.9 lbf.ft).
- 4 For final centering, adjust screws **B** to move the LTO2S. Progressively slacken one screw and tighten the opposite screw as the final setting is approached. Use two hexagonal keys to do this. A tip run-out of 5 μm (0.0002 in) should be achievable.
- 5 After the final setting has been achieved, tighten the four screws **B** to 1.5 – 3.5 Nm (1.1 – 2.6 lbf.ft). This is important.

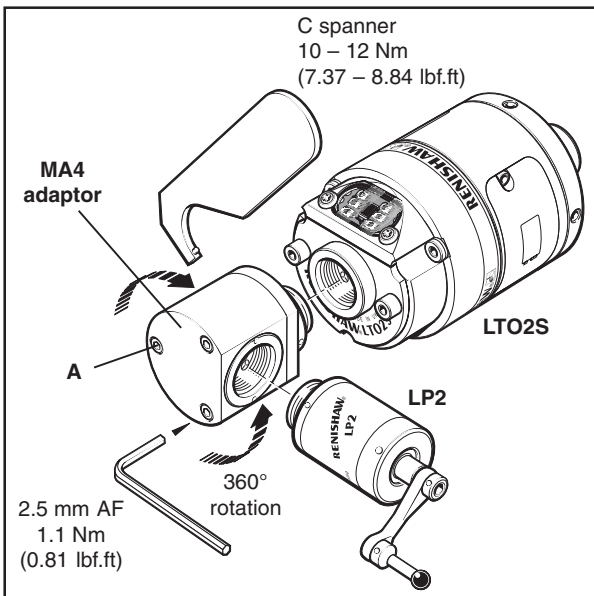


- 6 When on-centre adjustment is complete, refit the terminal battery cover (see "Removing and refitting the terminal battery cover" on page 34).
- 7 Refit the primary battery cover and battery (see "Removing and replacing the battery" on page 32).

MA4 90° adaptor

This adaptor enables the probe to be mounted at 90° to the machine spindle centre line. This extra versatility allows the probe to reach otherwise inaccessible workpiece features.

- 1 Screw the MA4 into the LTO2S OMP and tighten it with the C spanner to 10–12 Nm (7.37–8.84 lbf.ft). The C spanner is also used to tighten the LP2 or LP2H probe in its mounting.
- 2 Slacken the three screws **A**.
- 3 Rotate the MA4 to any position through 360°.
- 4 Tighten the three screws **A** to 1.1 Nm (0.81 lbf.ft).
- 5 Screw the LP2 or LP2H probe into the MA4 adaptor and tighten it with the C spanner to 10–12 Nm (7.37–8.84 lbf.ft).



LPE extension bars (not shown)

Extension bars up to 150 mm long can be fitted between the MA4 and the probe using the C spanner provided.

Modes of operation

The LTO2S has two modes of operation:

- 1 **Standby mode** – the OMP uses only a small current while passively waiting for the switch-on signal. This helps conserve battery life.
- 2 **Operating mode** – this is activated by one of the methods described in “Switch-on options”. Signals are transmitted by the probe only during the operating mode.

LTO2S power on/off

LTO2S power switch on/off occurs only when the LTO2S is located within the switch on/off envelope of the OMP and OMM/OMI.

Debounce time

After the probe is switched on a time delay must occur before it can be switched off. This is known as the debounce time. The delay is factory set to 5 seconds, but it can be reset to 9 seconds by resetting the internal switch. A

similar delay occurs after the probe is switched-off and before it can be switched on again.

Switch-on options

Three options are provided for switching on the LTO2S. These are selected by switches on the MI 12 or OMI (for details, see the MI 12 or OMI guides).

- 1 **Manual start** (Optical-on). This is initiated by the MI 12 start button (on the OMM version only).
- 2 **Machine start** (Optical-on). This is initiated by a software M-code command (*factory set mode*).
- 3 **Auto start** (Optical-on). This causes the system to send an optical start signal once every second and does not require a machine control input.

NOTE: Auto start should **not** be selected when the LTO2S is set to the Optical-on/Optical-off option. (An Auto start signal will force the LTO2T to switch on and then off at 5 or 9 second intervals.)

After the probe is switched on, the debounce time must elapse before the probe can be switched off.

Switch-off options

The LTO2S has two switch-off options. These are selected by setting an internal switch (for details of the switch, see page 30).

1 Optical-on and Timer-off (Timeout)

(factory set mode).

A timer switch automatically returns the probe to the standby mode after either 33 or 134 seconds. The timer is factory set to 134 seconds. The 33 second option is selected by resetting the internal switch.

When the timeout period is set to either 33 seconds or 134 seconds, the timer is reset for a further 33 or 134 seconds each time the probe triggers during the operating mode.

NOTE: A start signal received during the time the probe is on also resets the timer on for another 33 or 134 seconds.

2 Optical-on and Optical-off *(optional)*

Optical switch-off is initiated by a software M-code. Debounce times apply.



IMPORTANT: Only qualified persons should change the switch settings.

Gaining access to the switch

- 1 Remove the two screws (1) that secure the front plate (2) (see the figure on page 30).

NOTE: Wires are attached to a plug on the back of the front plate (2). Do NOT pull off the plate but ease it off carefully.

- 2 Remove the front plate (2), taking care not to strain the wires. The Dual-In-Line (DIL) switch (3) is now accessible.
- 3 If the O-ring shows signs of damage and needs to be replaced, unplug the connector from the plug on the back of the front plate (2).

Switch settings

NOTE: When changing the switch settings:

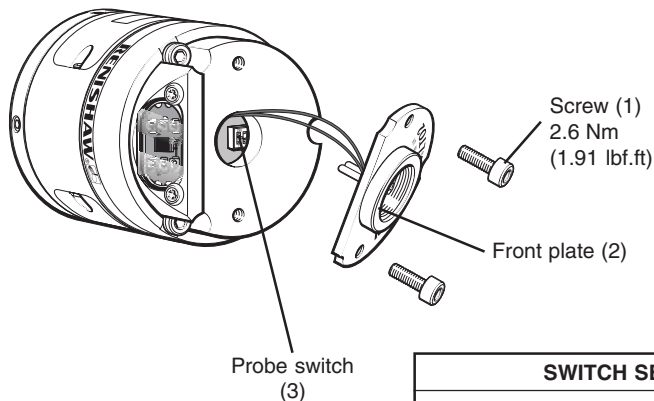
- Do not touch electronic components.
- Do not strain or disconnect wires.
- Do not use the tip of a pencil to change the settings.
- Keep all components clean – do not allow coolant or particles to enter the probe body.

The functions and factory settings of the switches are shown in the figure on page 30.

Refitting the front plate

When the front plate of the probe is removed, the O-ring seal that protects the electronics is disturbed.

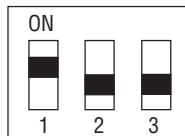
- 1 To ensure that the integrity of sealing is maintained when the front plate is refitted, check the condition of the O-ring and replace it if necessary. Grease the O-ring before fitting it.



- 2 If the connector was unplugged to allow the O-ring to be replaced, refit it to the plug on the back of the front plate (2).
- 3 Refit the front plate (2).
- 4 Refit the two screws (1) and tighten them to 2.4 – 2.6 Nm (1.76 – 1.91 lbf.ft).

SWITCH SETTINGS

- | | | |
|--|--------------------------------|--|
| 1 DEBOUNCE
5 seconds
<i>(factory set)</i> | 2 TIMEOUT
33 seconds | 3 MODE
Optical on
Optical off |
|--|--------------------------------|--|



- | | | |
|--------------------------------|---|--|
| 1 DEBOUNCE
9 seconds | 2 TIMEOUT
134 seconds
<i>(factory set)</i> | 3 MODE
Optical on
Timer off
<i>(factory set)</i> |
|--------------------------------|---|--|

Typical battery life

For an alkaline battery – Duracell MN 1604 or equivalent.

Probe type	Standby life	5% usage (72 minutes per day)		Continuous use	
		Optical on Optical off	Optical on Timer off	Optical on Optical off	Optical on Timer off
LTO2S LTO2S-R	365 days	98 days	80 days	140 hours	110 hours

Probe battery

Power for the LTO2S probe is supplied by a PP3-type 9 V battery.

Low battery indication

When either the MI 12 or OMI low battery LED lights up, the battery voltage is low and the end of useable battery life is approaching.

The low battery LED only lights during the probe operating mode.

The machine control may also be programmed to flag up a low battery alarm.

The OMI or MI 12 interface low battery LED lights when the battery needs to be replaced. Replace the battery as soon as is practicable following a gauging cycle.

Typical battery reserve life

Using an alkaline battery at 5% usage, the probe will typically continue to operate for 8 hours after the MI 12/OMI low battery LED lights up.

Removing the battery

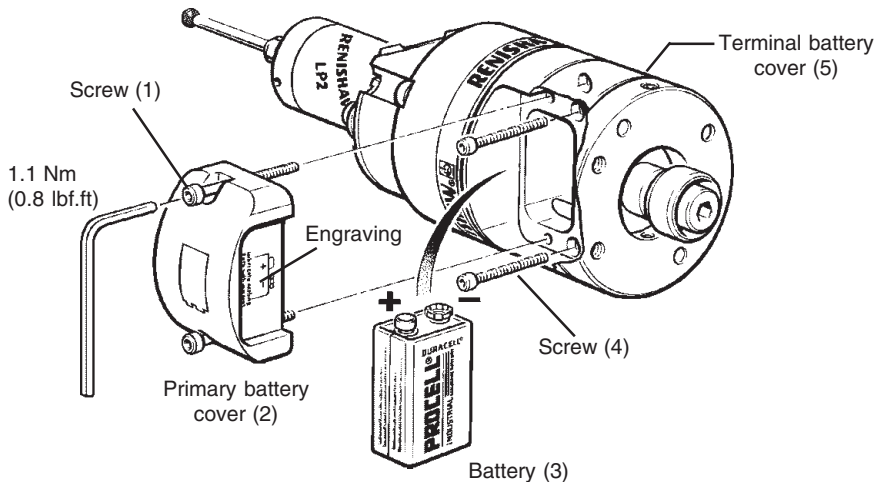
Refer to the figure on the page opposite.

- 1 Slacken the primary cover-securing screws (1) and remove the primary battery cover (2). Take care not to damage the cover seal.
- 2 Remove the battery (3).
There is no need to remove the terminal battery cover (5) when changing the battery.

NOTE: Do not allow coolant or debris to enter the battery compartment

Replacing the battery and refitting the battery cover

- 1 Insert the battery (3), taking care to orientate it as shown on the cover engraving.
- 2 Check that the primary battery cover seal is seated. If a seal is dry, lightly smear it with mineral oil or grease.
- 3 Refit the primary battery cover (2).
- 4 Tighten the battery cover screws (1) to 1.1 Nm (0.8 lbf.ft).



DO NOT leave an exhausted battery in the probe. Dispose of exhausted batteries in accordance with local regulations.

IMPORTANT: Insert the battery as shown on the battery cover engraving.

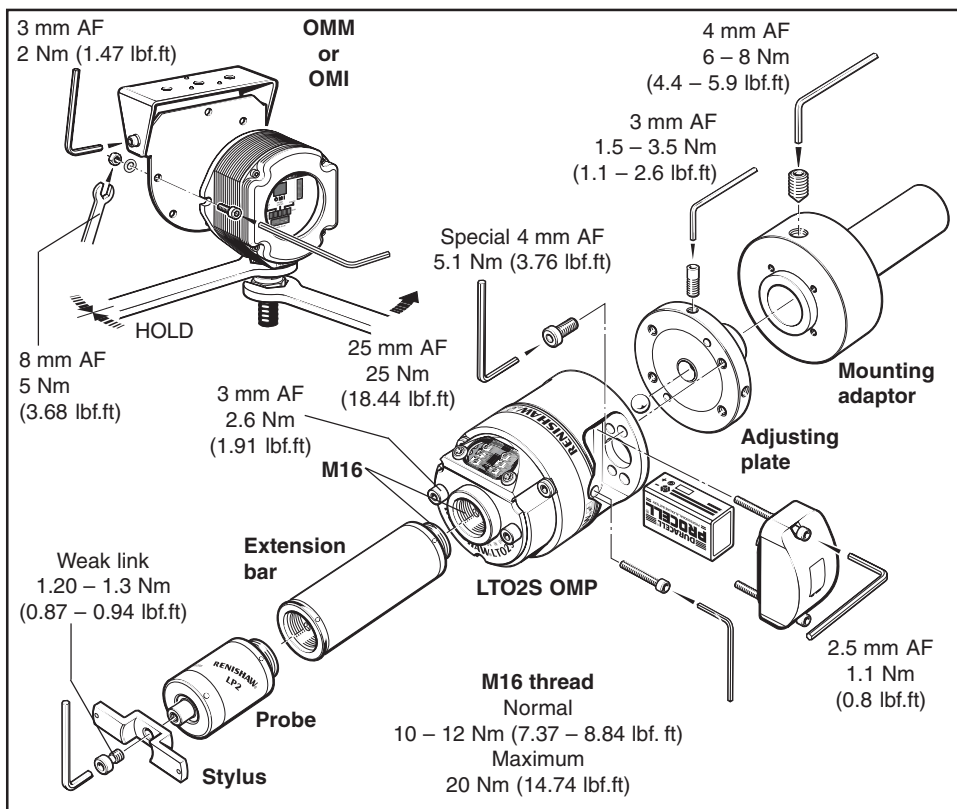
Removing the terminal battery cover

The terminal battery cover must be removed for adaptor mounting and on-centre adjustment (see the figure on page 33).

- 1 Remove the primary battery cover and battery as described in “Removing and replacing the battery” on page 32.
- 2 Slacken the terminal battery cover securing screws (4) and remove the cover (5). Take care not to damage the cover seal.

Refitting the terminal battery cover

- 1 Check that the terminal battery cover seal is seated. If a seal is dry, lightly smear it with mineral oil or grease.
- 2 Refit the terminal battery cover (5). Tighten the cover screws (4) to 1.1 Nm (0.8 lbf.ft).
- 3 Refit the battery and primary battery cover as described in “Removing and replacing the battery” on page 32.



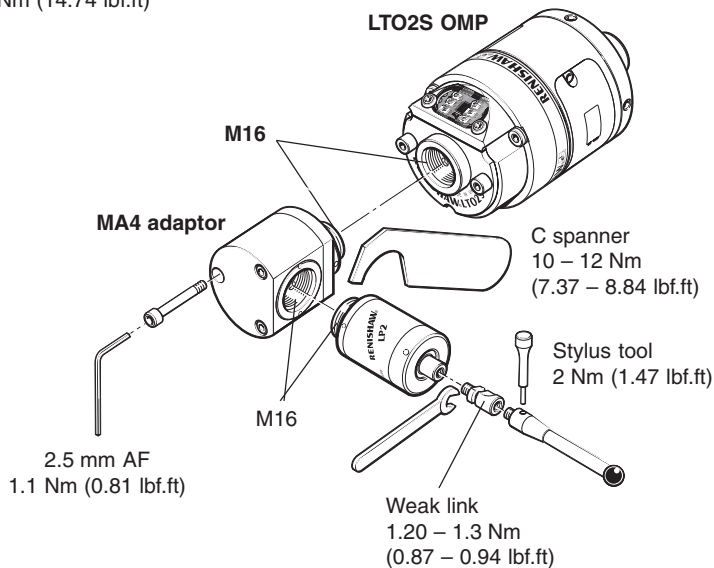
M16 thread

Normal

10 – 12 Nm (7.37 – 8.84 lbf. ft)

Maximum

20 Nm (14.74 lbf.ft)



PROBE FAILS TO SWITCH ON

Probe is already switched on	If necessary, switch off the probe.
Dead battery.	Change battery.
Battery installed incorrectly.	Check battery installation.
Probe is not properly aligned with OMM/OMI.	Check alignment and that the OMM/OMI fixing is secure.
Beam obstructed.	Check that OMM/OMI window is clean. Remove the obstruction.
OMM/OMI signal is too weak.	See the performance envelopes on pages 11, 13 and 15.
No OMI start signal.	See the OMI installation and user's guide.
No power to MI 12 or OMI	Check that a stable 24 V supply is available. Check connections and fuses.

PROBE STOPS IN MID-CYCLE

Beam is obstructed.	Check OMI/MI 12 error LED. Remove the obstruction.
Probe collision.	Find the cause and rectify.
Damaged cable.	Check the cables.

Power supply lost.	Check the power supply.
Probe unable to find the target surface.	Part is missing or out of position.

PROBE CRASHES

Inspection probe using tool setting probe signals.	When two systems are active, isolate the tool setting probe.
Workpiece obstructing probe path.	Review probe software.
Probe length offset missing.	Review probe software.

POOR PROBE REPEATABILITY

Debris on the part.	Clean the part.
Turret repeatability poor.	Verify probe repeatability using a single point move.
Loose mounting of probe/loose stylus.	Check and tighten as appropriate.
Calibration and update of offsets not occurring.	Review probe software.
Calibration and probing speeds not the same.	Review probe software.
Calibrated feature has moved.	Check the position.
Measurement occurs as the stylus leaves the surface.	Review probe software.

POOR PROBE REPEATABILITY

Probing occurs within machine's acceleration and deceleration zones. Review probe software.

Probe feedrate too high. Perform simple repeatability trials at various speeds.

Temperature variation causes excessive machine and workpiece movement. Minimise temperature changes. Increase frequency of calibration.

Machine has poor repeatability due to loose encoders, tight slideways and/or accident damage. Perform health check on the machine.

PROBE FAILS TO SWITCH OFF

Probe is in Timeout mode. Wait a minimum of 2 min 20 seconds for the probe to switch off.

Turret indexed, while the probe is switched on. Restore the turret to the probing position.

Probe is inadvertently switched on by OMM/OMI. Increase the distance between the probe and OMM/OMI. Reduce the OMM/OMI signal strength.

PROBE STATUS LED FAILS TO ILLUMINATE

Battery is incorrectly fitted. Check the battery installation.

MI 12 POWER LED FAILS TO ILLUMINATE WITH POWER ON

Faulty electrical contact. Check all connections.

Fuse blown. Locate and replace blown fuse.

Incorrect power supply. Ensure power supply is 24 V dc.

MI 12 ERROR LED REMAINS ILLUMINATED

Beams is not aligned. Check optical alignment.

Beams is obstructed. Clear obstruction.

Probe is not switched on. Check that it is switched on.

MI 12 LOW BATTERY LED REMAINS ILLUMINATED

Battery is incorrectly fitted. Check the battery installation.

Battery dead. Replace the battery.

PROBE STATUS LED REMAINS ILLUMINATED

Battery voltage below useable level. Replace the battery.

PROBE IS TRANSMITTING SPURIOUS READINGS

Damaged cables.	Check and replace the cable if damage is found.
Electrical or optical interference.	Move transmission cables away from other cables carrying high currents.
System malfunctioning or inducing intermittent errors.	Shield from intense light sources, e.g. xenon beams. Electrically isolate the OMM from the machine to prevent any possibility of earth loop. Ensure there are no arc welders, stroboscopes or other high intensity light sources in close proximity to the probe system.
Poorly regulated power supply.	Ensure the power supply is correctly regulated.
Excessive machine vibration.	Eliminate vibration.
Loose mountings or styli.	Check and tighten loose connections.
Low LP2 spring pressure.	Increase the spring pressure.

PROBE FAILS TO RESEAT CORRECTLY

Probe trigger occurred on reseat.	Move the stylus clear of the workpiece.
Inner probe diaphragm is damaged.	Return to the supplier if the inner diaphragm is damaged.

Type	Part No.	Description
LTO2S system kit	A-2030-0204	LTO2S system – comprising LTO2S OMP, LP2 probe, OMM, mounting bracket, MI 12 machine interface unit, and PS3-1C 50 mm stylus
LTO2S system kit	A-2030-0213	LTO2S system – comprising LTO2S OMP, LP2H probe, OMM, mounting bracket, MI 12 machine interface unit, and PS3-1C 50 mm stylus
LTO2S system kit	A-2115-0030	LTO2S system – comprising LTO2S OMP, LP2 probe, OMI, mounting bracket, and PS3-1C 50 mm stylus
LTO2S system kit	A-2115-0031	LTO2S system – comprising LTO2S OMP, LP2H probe, OMI, mounting bracket, and PS3-1C 50 mm stylus
LTO2S OMP kit	A-2030-0183	LTO2S OMP, 9 V battery, adaptor plate assembly, centering ball, probe tool kit, and user's guide
Battery	P-BT03-0001	9 V alkaline battery – Duracell MN1604
Probe tool kit	A-2107-0040	Probe tool kit – comprising stylus tool and various hexagonal keys
Adaptor plate	A-2107-0031	Shank adaptor plate assembly
Ball	P-BA03-0800	Ball for on-centre adjustment
LP2	A-2063-6098	LP2 probe complete with two C spanners and TK1 tool kit.
LP2H	A-2064-0002	LP2H probe complete with two C spanners and TK1 tool kit.
Service kit	A-2063-7542	LP2 service kit comprises: front cover, eyelid seal, spring and O-ring.

Type	Part No.	Description
MA4 adaptor Extension bar Extension bar Extension bar Stylus C spanner	A-2063-7600 A-2063-7001 A-2063-7002 A-2063-7003 A-5000-3709 A-2063-7587	MA4 90° adaptor. LPE1 – extension bar Ø25 x 50 mm long. LPE2 – extension bar Ø25 x 100 mm long. LPE3 – extension bar Ø25 x 150 mm long. Ceramic PS3-1C stylus 50 mm long with Ø6 mm ruby ball. C spanner.
LTO2S-R OMP kit OMMR	A-2030-0193 A-2031-0181	<p>Parts specific to the LTO2S-R (visible red) system only</p> <p>LTO2S OMP, 9 V battery, adaptor plate assembly, centering ball, probe tool kit, and user's guide</p> <p>Optical receiver for LTO2S-R system</p>
OMM Mounting brkt OMI MI 12 MI 12B Panel mtg PSU3	A-2033-0576 A-2033-0830 A-2115-0001 A-2075-0142 A-2075-0141 A-2033-0690 A-2019-0018	<p>OMM, OMI, MI 12 and PSU3</p> <p>Optical module machine (OMM) complete with cable</p> <p>Mounting bracket for OMM / OMI / OMMR</p> <p>Optical module interface (OMI) complete with cable</p> <p>MI 12 machine interface unit</p> <p>MI 12 machine interface board</p> <p>Panel mounting kit for MI 12 machine interface unit</p> <p>PSU3 power supply unit, 85 V – 264 V input</p>

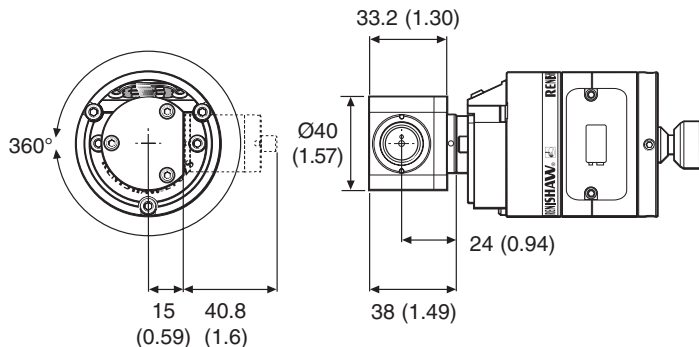
The MA4 90° adaptor and extension bars are described in Renishaw data sheet AEH H-2000-2120.

Dimensions mm (in)

MA4 90° adaptor

The adaptor enables the LP2 probe to be mounted at 90° to the machine turret, and set through 360°.

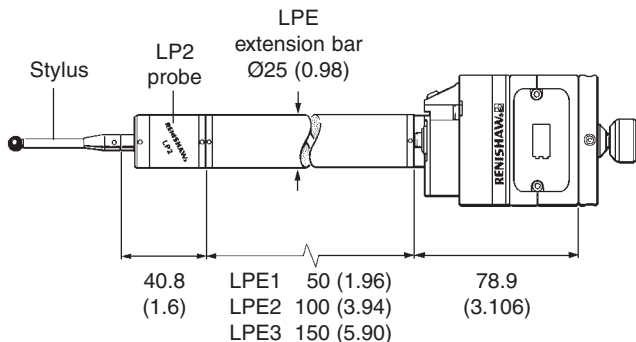
The MA4 uses the same M16 thread as the LP2.



LPE extension bars

Further reach may be obtained by fitting an LPE extension bar between the LP2 probe and LTO2S OMP.

Extension bars use the same M16 thread as the LP2 probe. Only one extension bar is permitted per installation.



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