

# OTS optical tool setter



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# Contents

<b>Before you begin</b> .....	1.1
Before you begin .....	1.1
Disclaimer .....	1.1
Trade marks .....	1.1
Warranty .....	1.1
Changes to equipment .....	1.1
CNC machines .....	1.1
Care of the probe .....	1.1
Patents .....	1.2
EU declaration of conformity .....	1.3
FCC Information to user (USA only) .....	1.3
WEEE directive .....	1.3
Safety .....	1.4
<b>OTS basics</b> .....	2.1
Introduction .....	2.1
OTS types .....	2.1
Modulated transmission .....	2.1
Multi probe system with OMM-2 with an OSI, OMI-2T or OMI-2H .....	2.1
Single probe system with OMM-2 with an OSI, OMI-2T, OMI-2H or OMI-2 .....	2.1
Trigger Logic™ .....	2.1
Operation .....	2.2
Software routines .....	2.2
Achievable set-up tolerances .....	2.2
Recommended rotating tool feedrates .....	2.2
Probe modes .....	2.3
Configurable settings .....	2.4
Switch-on method .....	2.4
Optical start configuration .....	2.4
Switch-off method .....	2.4
Enhanced trigger filter .....	2.4
Optical power .....	2.4
OTS dimensions .....	2.5

OTS specification . . . . .	2.6
Typical battery life . . . . .	2.7
<b>System installation . . . . .</b>	<b>3.1</b>
Typical probe system with an OMM-2 with OSI, OMI-2T or OMI-2H receiver . . . . .	3.1
Operating envelopes . . . . .	3.1
Positioning and performance envelope for the OMM-2, OMI-2T, OMI-2H or OMI-2. . . . .	3.2
Typical probe system with an OMM-2C . . . . .	3.3
Introduction . . . . .	3.3
Performance envelope of OMM-2C with OTS . . . . .	3.4
Preparing the OTS for use . . . . .	3.5
Fitting the stylus, break stem and captive link . . . . .	3.5
Installing the ½AA batteries . . . . .	3.6
Installing the AA batteries . . . . .	3.7
Mounting the OTS on a machine table . . . . .	3.8
Aligning the modules . . . . .	3.9
Stylus adjustment . . . . .	3.10
Square stylus only . . . . .	3.12
Calibrating the OTS . . . . .	3.15
Why calibrate a probe? . . . . .	3.15
<b>Trigger Logic™ . . . . .</b>	<b>4.1</b>
Reviewing the probe settings . . . . .	4.1
Probe settings record . . . . .	4.2
Changing the probe settings . . . . .	4.3
Operating mode . . . . .	4.4
<b>Maintenance . . . . .</b>	<b>5.1</b>
Maintenance . . . . .	5.1
Cleaning the probe . . . . .	5.1
Changing the ½AA batteries . . . . .	5.2
Changing the AA batteries . . . . .	5.3
Battery types . . . . .	5.4
Routine maintenance . . . . .	5.5
Eyelid removal/replacement . . . . .	5.6
<b>Fault-finding . . . . .</b>	<b>6.1</b>
<b>Parts list . . . . .</b>	<b>7.1</b>

# Before you begin

## Before you begin

### Disclaimer

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**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.

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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 probe

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

### Patents

Features of the OTS probe, and other similar Renishaw products, are the subject of one or more of the following patents and/or patent applications:

- EP 0974208
- EP 1130557
- EP 1373995
- EP 1425550
- EP 1503524
- EP 1701234
- EP 1734426
- EP 1804020
- EP 1988439
- JP 4237051
- JP 4773677
- JP 4851488
- US 6472981
- US 6839563
- US 6860026
- US 6941671
- US 7145468
- US 7486195
- US 7812736

## EU declaration of conformity



Renishaw plc declares under its sole responsibility that the OTS is in conformity with all relevant Union legislation.

The full text of the EU declaration of conformity is available at [www.renishaw.com/mtpdoc](http://www.renishaw.com/mtpdoc)

## 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

The OTS is supplied with either two non-rechargeable AA alkaline batteries or two ½AA lithium-thionyl chloride batteries (approved to IEC 62133) depending on the version supplied. Once the charge in these batteries is depleted, do not attempt to recharge them.



The use of this symbol on the batteries, packaging or accompanying documents indicates that used batteries should not be mixed with general household waste. Please dispose of the used batteries at a designated collection point. This will prevent potential negative effects on the environment and human health which could otherwise arise from inappropriate waste handling. Please contact your local authority or waste disposal service concerning the separate collection and disposal of batteries. All lithium and rechargeable batteries must be fully discharged or protected from short circuiting prior to disposal.

Please ensure replacement batteries are of the correct type and are fitted in accordance with the instructions in this manual (see Section, 5 “Maintenance”), and as indicated on the product. For specific battery operating, safety and disposal guidelines, please refer to the battery manufacturer’s literature.

- Ensure that all batteries are inserted with the correct polarity.
- Do not store batteries in direct sunlight or rain.
- Do not heat or dispose of batteries in a fire.
- Avoid forced discharge of the batteries.
- Do not short-circuit the batteries.
- Do not disassemble, pierce, deform or apply excessive pressure to the batteries.
- Do not swallow the batteries.
- Keep the batteries out of the reach of children.

- Do not get batteries wet.
- Do not mix new and used batteries or battery types, as this will result in reduced life and damage to the batteries.
- If a battery is damaged, exercise caution when handling it.

Please ensure that you comply with international and national battery transport regulations when transporting batteries or the products.

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**NOTE:** Lithium batteries are classified as dangerous goods and strict controls apply to their shipment by air. To reduce the risk of shipment delays, if you need to return the products to Renishaw for any reason, do not return any batteries.

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

The OTS 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 in 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.

## 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.

OTS is ranked Risk Group: Exempt (safe by design).

The product was evaluated and classified using the following standard:

BS EN 62471:2008 (IEC 62471:2006)	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.

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# OTS basics

## Introduction

The OTS is a tool setter probe with optical signal transmission, suitable for use on small to medium machining centres. It is designed to resist optical interference, false triggering and shock.

## OTS types

The OTS is available in two versions; one with ½ AA batteries and the other with AA batteries. This allows the use of a common battery type for both the OTS and the spindle probe.

- i.e. OTS with ½ AA batteries with an OMP40-2/ OMP400.
- or
- OTS with AA batteries with an OMP60.

Both versions work in conjunction with any modulated spindle probe.

## Modulated transmission

To minimise the effects of light interference, the OTS operates using modulated transmission, and must be used with a modulated receiver.

## Multi probe system with OMM-2 with an OSI, OMI-2T or OMI-2H

The OMM-2 with an OSI, OMI-2T or OMI-2H are the recommended interfaces to use with the OTS, as they provide substantially increased resistance to light interference whilst providing the user with greater flexibility to operate a multi-probe system.

The OTS can be configured to use one of three coded start commands, named Probe 1, Probe 2 and Probe 3.

## Single probe system with OMM-2 with an OSI, OMI-2T, OMI-2H or OMI-2

A single OTS can be used with an OMM-2 with an OSI, OMI-2T, OMI-2H or OMI-2 interface.

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**NOTE:** When used with an OMI-2, the OTS must be reconfigured as Probe 1.

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## Trigger Logic™

Trigger Logic (see Section, 4 “Trigger Logic”) allows the user to view and select all available mode settings in order to customise a probe to suit a specific application. Trigger Logic is activated by battery insertion and uses a sequence of stylus deflections (triggering) to systematically lead the user through the available choices to allow selection of the required mode options.

The Trigger Logic app simplifies this process with clear, interactive instructions and informative videos and is available for download on the following platforms:



or



Current probe settings can be reviewed by removing the batteries for a minimum of 5 seconds, and then replacing them to activate the Trigger Logic review sequence.

## Operation



The tool is driven in the machine Z axis for tool length measurements and broken tool detection.

Rotating tools are set in the machine's X and Y axes for tool radius offsets.

Screw adjusters allow the stylus to be aligned with the machine's axes.

### Software routines

Software routines and software programs for tool setting are available from Renishaw for various machine controllers: see the *Probe software for machine tools – programs and features* data sheet (Renishaw part no. H-2000-2298).

This data sheet can be downloaded from [www.renishaw.com/mtp](http://www.renishaw.com/mtp)

## Achievable set-up tolerances

The tolerances to which tools can be set depend upon the flatness and parallelism of the stylus tip setting. A value of 5 µm (0.0002 in) front to back and side-to-side is easily achievable over the flat portion of the stylus tip, and 5 µm (0.0002 in) parallelism is easily achievable with the axes of a square tip stylus. This setting accuracy is sufficient for the majority of tool setting applications.

### Recommended rotating tool feedrates

Cutters should be rotated in reverse to the cutting direction. Renishaw tool setting software calculates the spindle speed and axis feedrates automatically using the following information.

#### First touch – machine spindle rev/min

Rev/min for the first move against the probe stylus:

Diameters below 24 mm: 800 rev/min is used.

Diameters from 24 mm to 127 mm: rev/min is calculated using a surface speed of 60 m/min (197 ft/min).

Diameters above 127 mm: 150 rev/min is used.

#### First touch – machine feedrate

The feedrate (f) is calculated as follows:

$$f = 0.16 \times \text{rev/min} \quad f \text{ units mm/min (diameter set).}$$

$$f = 0.12 \times \text{rev/min} \quad f \text{ units mm/min (length set).}$$

#### Second touch – machine feedrate

800 rev/min, 4 mm/min (0.16 in/min) feedrate.

## Probe modes

The OTS probe has three modes:

**Standby mode** – Probe is waiting for a switch-on signal.

**Operational mode** – OTS is ready for use. It is activated using the switch-on method (see “Switch-on method” on page 2.4).

**Configuration mode** – Trigger Logic™ may be used to configure the following OTS settings:

- Optical start configuration
- Enhanced trigger filter setting
- Optical power

For more information, see “Configurable settings” on page 2.4.

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**NOTE:** A visual indication of currently selected probe settings is provided on battery insertion, by the multicolour LED located within the probe window (see Section, 4 “Trigger Logic”).

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## Configurable settings

### Switch-on method

Typically optical probe systems switch on in less than 0.5 seconds. Please refer to the interface user's guide for full details.

### Optical start configuration

The OTS can be configured to either Probe 1, Probe 2 or Probe 3 identification. For more information, see "Changing the probe settings" on page 4.3.

The OTS is factory set to Probe 2 so that it can be used in a system with modulated spindle probes.

Typically the OTS is used in Probe 2.

A twin tool setter application would require one of the OTS probes to be reconfigured to Probe 1.

A triple tool setter application would require one of the OTS probes to be reconfigured to Probe 1, and another to Probe 3.

### Switch-off method

A timer automatically switches the probe off 90 minutes after the last trigger if not turned off by an M code.

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**NOTE:**

After being switched on, the OTS must be on for 1 second minimum before being switched off.

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### Enhanced trigger filter

Probes subjected to high levels of vibration or shock loads may output signals without having contacted any surface. The enhanced trigger filter improves the probe's resistance to these effects.

When the filter is enabled, a constant nominal 7 ms delay is introduced to the probe output.

It may be necessary to reduce the approach speed to allow for the increased stylus overtravel during the extended time delay.

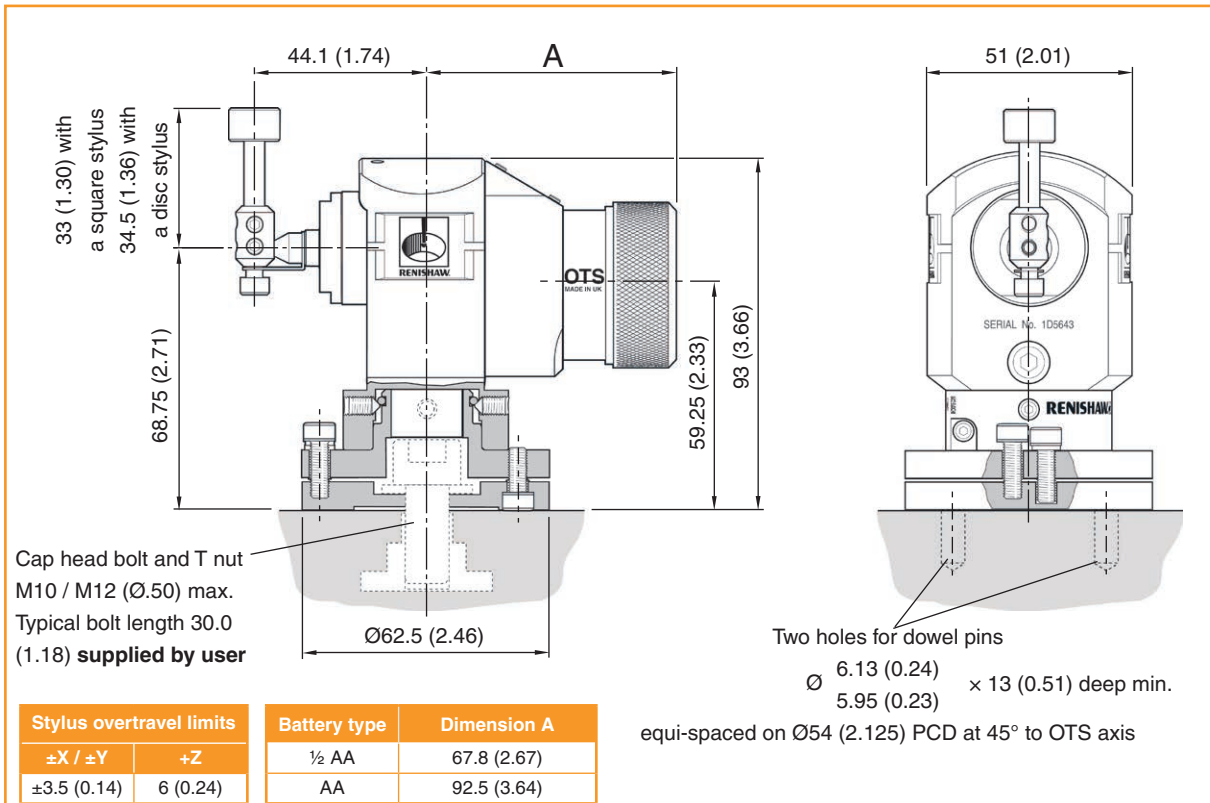
The OTS is factory set to Enhanced trigger filter off.

### Optical power

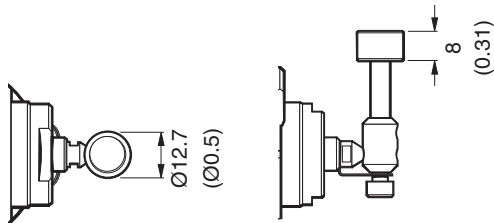
Where the separation distance between the OTS and the receiver is small, low optical power may be selected (see page 4.3). In this setting, the optical transmission operating range will be reduced by approximately 40%. Battery life will also be increased.

The OTS is factory set to standard optical power.

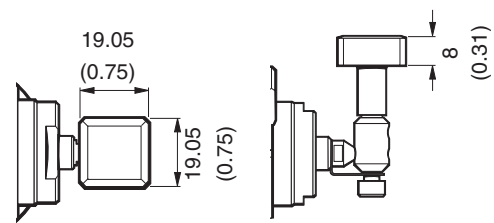
## OTS dimensions



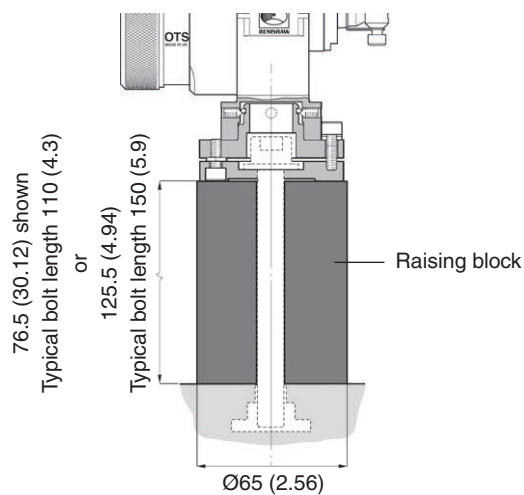
**Disc stylus**  
Ø12.7 mm × 8 mm (Ø0.5 in × 0.31 in)  
Tungsten carbide 75 Rockwell C



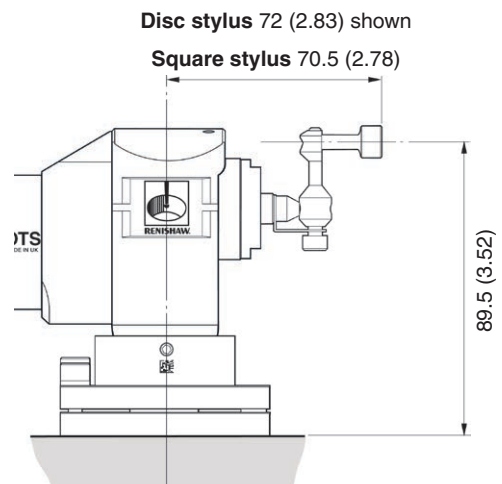
**Square stylus**  
19.05 mm × 19.05 mm (0.75 in × 0.75 in)  
Ceramic 75 Rockwell C



### Raising block



### Cranked horizontal stylus adaptor kit



Dimensions given in mm (in)

## OTS specification

Variant		½ AA OTS	AA OTS
<b>Principal application</b>		Tool measuring and broken tool detection on small to medium machining centres.	
<b>Dimensions</b>	Length	122.0 mm (4.08 in)	143.6 mm (5.65 in)
	Diameter	60.0 mm (2.36 in)	60.0 mm (2.36 in)
	Height	103.3 mm (4.06 in)	103.3 mm (4.06 in)
<b>Weight with disc stylus</b>	With batteries	870 g (30.69 oz)	950 g (33.51 oz)
	Without batteries	850 g (29.98 oz)	900 g (31.75 oz)
<b>Transmission type</b>		Infrared optical transmission (modulated)	
<b>Compatible interfaces</b>		OMI-2, OMI-2T, OMI-2H, OMM-2C, OMM-2 with OSI	
<b>Switch-on methods</b>		Optical on	
<b>Switch-off methods</b>		Optical off	
<b>Operating range</b>		Up to 5 m (16.4 ft)	
<b>Sense directions</b>		±X, ±Y, +Z	
<b>Unidirectional repeatability</b>		1.0 µm (40 µin) 2σ (see note 1)	
<b>Stylus trigger force</b> (see notes 2 and 3)		1.30 N to 2.40 N, 133 gf to 245 gf (4.68 ozf to 8.63 ozf depending on the sense direction)	
<b>Stylus overtravel</b>		XY plane +Z plane	±3.5 mm (0.14 in) 6 mm (0.23 in)
<b>Environment</b>	IP rating	IPX8, BS EN 60529:1992+A2:2013 (IEC 60529:1989+A1:1999+A2:2013)	
	IK rating	IK01 (BS EN IEC 62262: 2002) [for glass window]	
	Storage temperature	-10 °C to +70 °C (+14 °F to +158 °F)	
	Operating temperature	+5 °C to +55 °C (+41 °F to +131 °F)	
<b>Battery types</b>	½ AA type - standard	2 × ½AA 3.6 V lithium-thionyl chloride (LTC)	
	AA type - standard	2 × AA Alkaline	
	AA type - optional	2 × AA 3.6 V lithium-thionyl chloride (LTC)	
<b>Low battery indication</b>	Blue flashing LED in conjunction with normal red or green probe status LED		
<b>Dead battery indication</b>	Constant red		
<b>Typical battery life</b>	See the table below.		

Note 1 Performance specification is tested at a standard test velocity of 480 mm/min (18.9 in/min) with a 35 mm stylus. Significantly higher velocity is possible depending on application requirements.

Note 2 Trigger force, which is critical in some applications, is the force exerted on the component by the stylus when the probe triggers. The maximum force applied will occur after the trigger point (overtravel). The force value depends on related variables including measuring speed and machine deceleration.

Note 3 These are the factory settings: manual adjustment is not possible.



## Typical battery life

Battery type (× 2)	Standby life	5% usage (72 minutes/day)		Continuous use	
		Standard power	Low power	Standard power	Low power
½ AA LTC (standard)	320 days	140 days	170 days	300 hours	400 hours
AA Alkaline (standard)	530 days	210 days	250 days	400 hours	550 hours
AA LTC (optional)	730 days	300 days	350 days	600 hours	800 hours

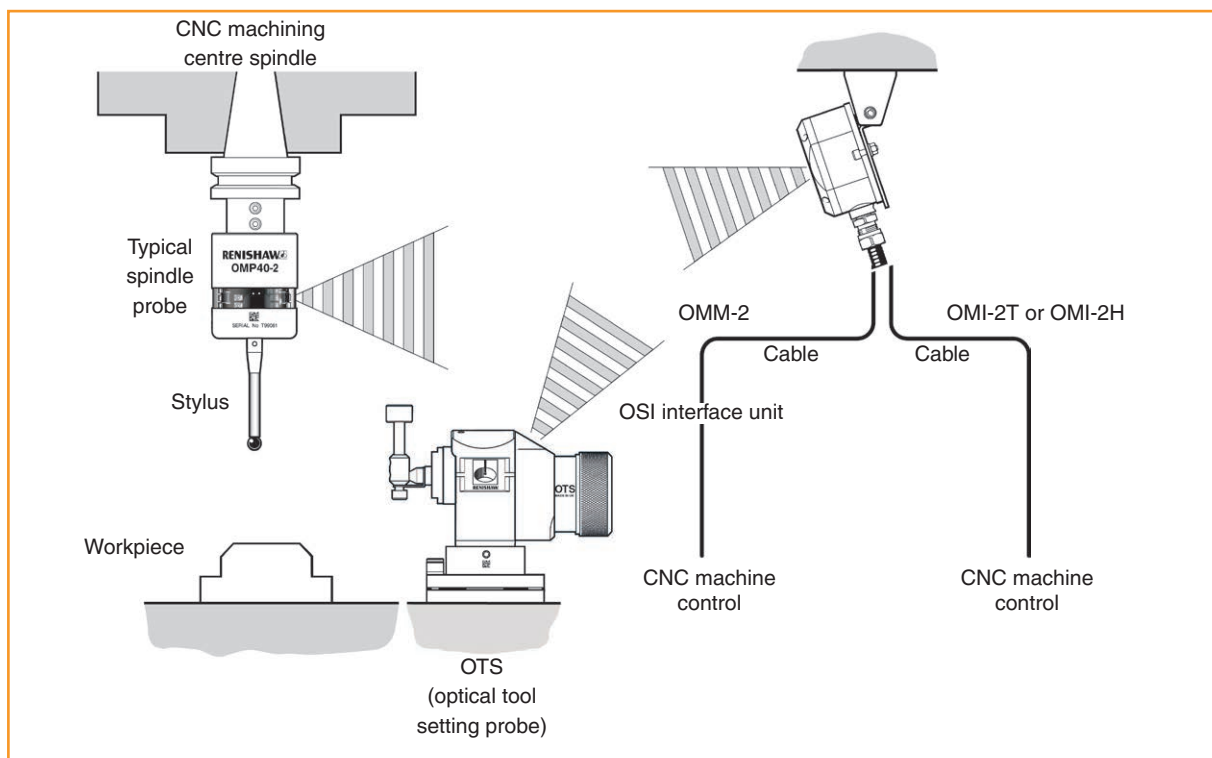
Lithium-thionyl chloride (LTC)

AA battery types are also designated as LR6 or MN1500

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# System installation

## Typical probe system with an OMM-2 with OSI, OMI-2T or OMI-2H receiver



### Operating envelopes

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

Coolant residue accumulating on the OTS or OMM-2, OMI-2T, OMI-2H or OMI-2 windows may reduce the signal transmission range. Wipe clean as often as is necessary to maintain unrestricted transmission.

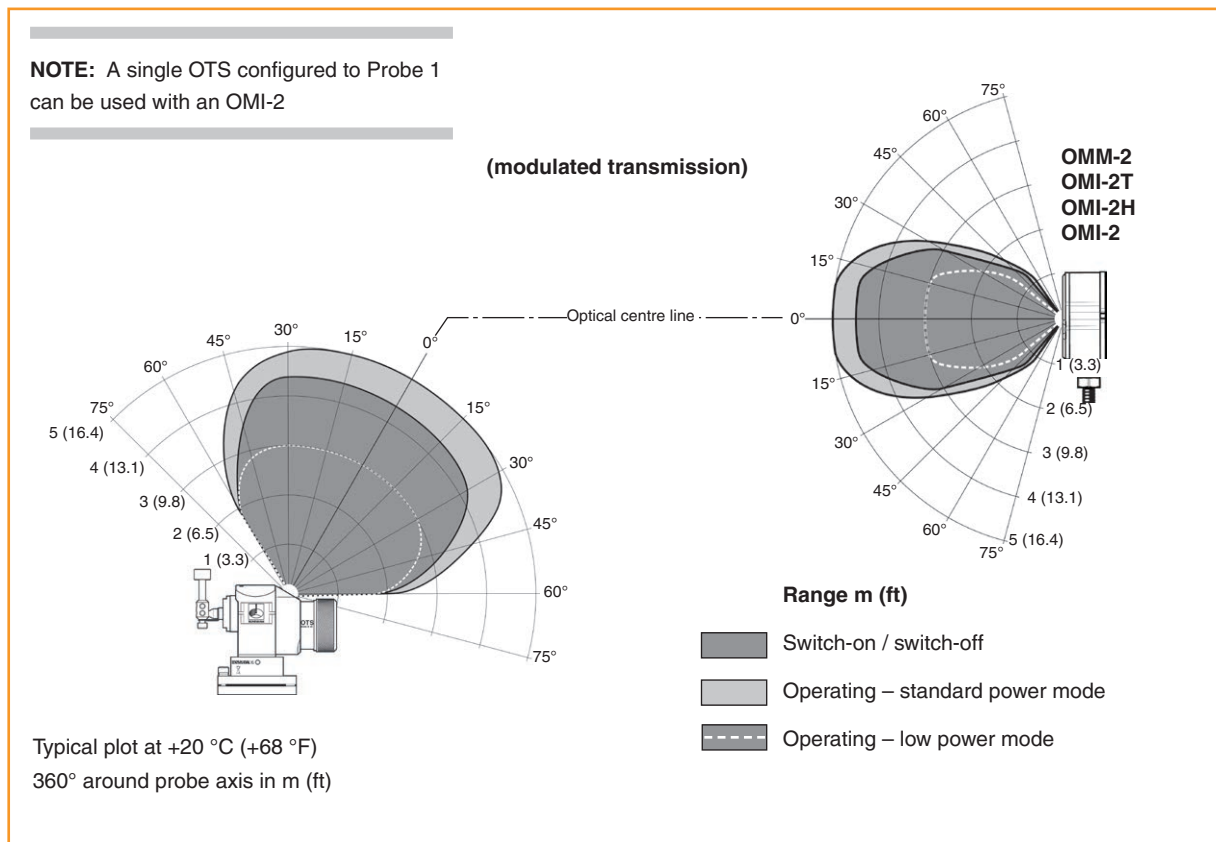
**WARNING:** Ensure the machine tool is in a safe condition and power is removed before removing covers. Only qualified persons should adjust switches.

**CAUTION:** If two systems are operating in close proximity to each other, take care to ensure that the signals transmitted from the OTS on one machine are not picked up by the receiver on the other machine, and vice versa. When this is found to be the case, it is recommended that the OTS low optical power setting is selected, along with the low range setting on the receiver.

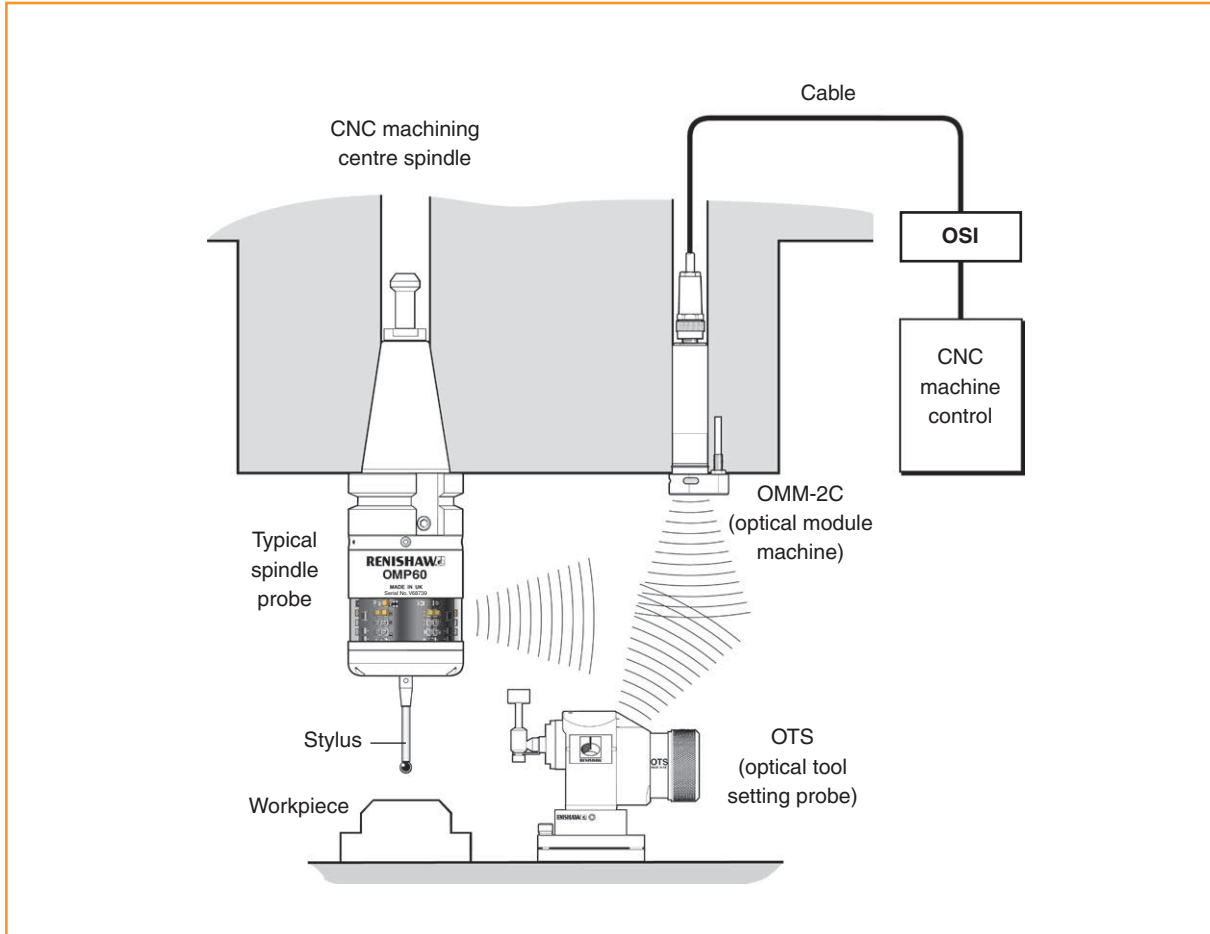
## Positioning and performance envelope for the OMM-2, OMI-2T, OMI-2H or OMI-2

To assist in finding the optimum position for the OMM-2, OMI-2T, OMI-2H or OMI-2, signal strength is displayed on the OMM-2 / OMI-2T / OMI-2H / OMI-2 multicoloured LED.

The diodes of the OTS and the OMM-2 / OMI-2T / OMI-2H / OMI-2 must be in each other's field of view and within the performance envelope shown. The OTS performance envelope is based on the optical centre line of the OMM-2, / OMI-2T or OMI-2H / OMI-2 being at 0° and vice versa.



## Typical probe system with an OMM-2C



### Introduction

**WARNING:** Ensure the machine tool is in a safe condition and power is removed before removing covers. Only qualified persons should adjust switches.

The OMM-2C should be mounted as near to the machine spindle as possible (as shown above).

When mounting the OMM-2C, it is important that the sealing ring forms a tight seal around the rim of the bore into which the body of the OMM-2C is to be located.

**CAUTION:** Make sure the sealing ring and air fitting screw (if applicable) is clean and lubricated prior to being mounted in the machine spindle.

**NOTE:** Do not overtighten the mounting screw. Maximum torque is 1.5 Nm (1.11 lbf.ft.).

### Performance envelope of OMM-2C with OTS

Reflective surfaces within the machine cabinet may increase the signal transmission range.

Coolant residue accumulating on the windows of the OMM-2C and OTS will have a detrimental effect on transmission performance. Wipe the windows clean as often as necessary to maintain unrestricted transmission.

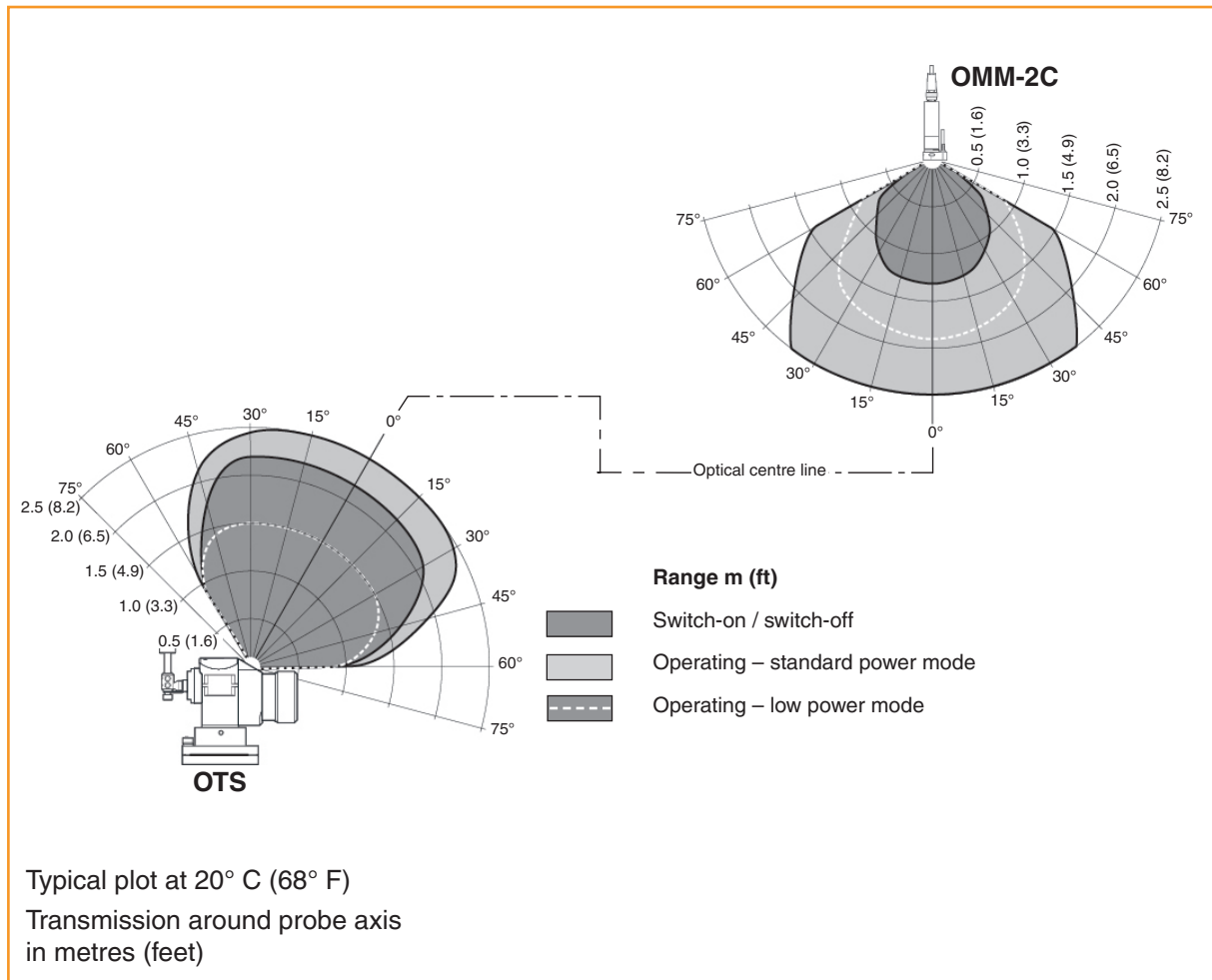
For best system performance, ensure the OMM-2C is mounted in a position which is not directly in front of a light source.

The probe system should be positioned so that the signal transmission is maintained when the OTS is positioned below the machine spindle.

The OTS and OMM-2C may deviate from the optical centre line, provided opposing light cones always overlap, with transmitters and receivers in the other's field of view (eye-to-eye).

In multiple probe mode applications, OTS may be configured as Probe 1, Probe 2 or Probe 3.

**CAUTION:** If two systems are operating in close proximity, take care to ensure that the signals transmitted from the OTS on one machine are not received by the OMM-2C on another machine and vice versa. When this is found to be the case it is recommended that the OTS low power setting is selected.



## Preparing the OTS for use

### Fitting the stylus, break stem and captive link

**1**

5 mm A/F (thin)  
2.5 Nm – 2.7 Nm  
(1.84 lbf.ft – 1.99 lbf.ft)

Stylus

Captive link

Break stem

2 mm A/F  
1.0 Nm – 1.2 Nm  
(0.74 lbf.ft – 0.89 lbf.ft)



**2**

Support bar

2 mm A/F  
1.0 Nm – 1.2 Nm  
(0.74 lbf.ft – 0.89 lbf.ft)



**3**

3 mm A/F  
2.5 Nm – 2.7 Nm  
(1.84 lbf.ft – 1.99 lbf.ft)



#### Stylus weak link break stem

A stylus weak link break stem is incorporated in the stylus mounting, to protect the probe mechanism from damage in the event of excessive stylus overtravel or a collision.

#### Captive link

In the event of the break stem breaking, the captive link ties the stylus to the probe, which prevents the stylus falling into the machine.

**NOTE:** Always hold the support bar in position to counteract twisting forces and avoid over-stressing the stylus break stem.

## Installing the ½AA batteries

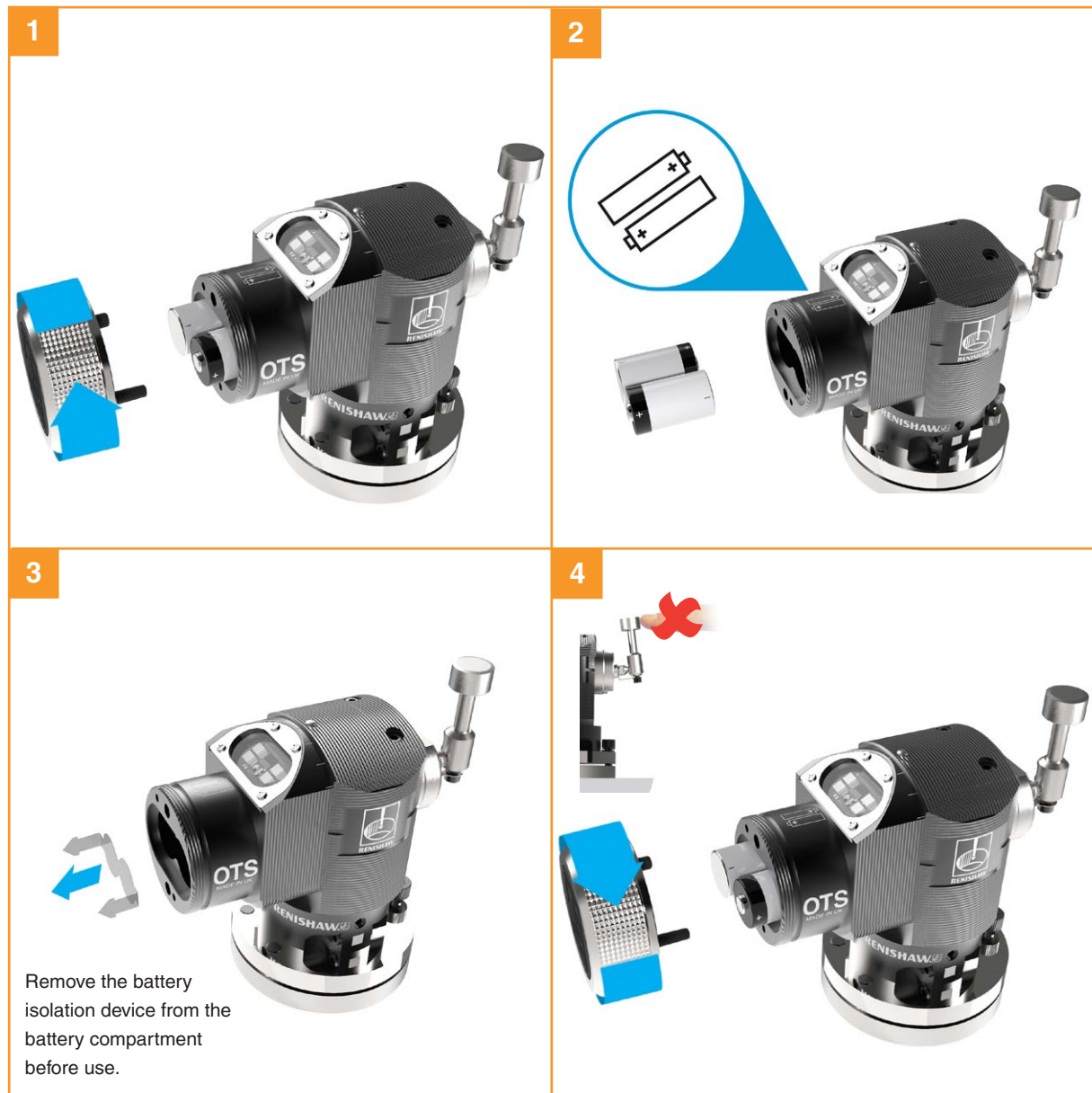
### NOTES:

See Section, 5 “Maintenance” for a list of suitable battery types.

If dead batteries are inadvertently inserted, the LEDs will remain a constant red.

Do not allow coolant or debris to enter the battery compartment. When inserting batteries, check that the battery polarity is correct.

After the batteries have been inserted, the LEDs will display the current probe settings (for details, see Section, 4 “Trigger Logic”).





## Installing the AA batteries



### NOTES:

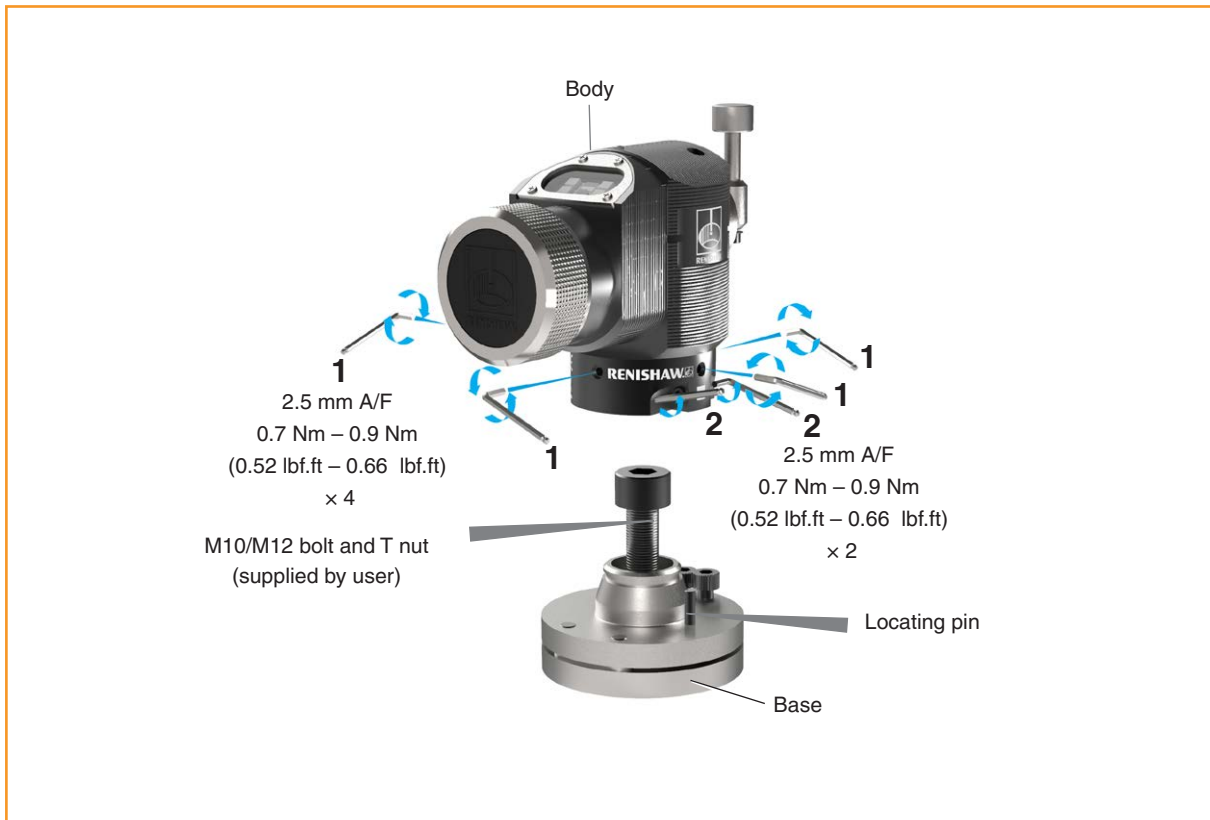
See Section, 5 “Maintenance” for a list of suitable battery types.

If dead batteries are inadvertently inserted, the LEDs will remain a constant red.

Do not allow coolant or debris to enter the battery compartment. When inserting batteries, check that the battery polarity is correct.

After the batteries have been inserted, the LEDs will display the current probe settings (for details, see Section, 4 “Trigger Logic”).

## Mounting the OTS on a machine table



1. Select a position for the OTS on the machine table. Position to minimise the possibility of collision and ensure the optical window faces towards the receiver.
2. Separate the base from the body by slackening four screws **1** and two screws **2** using a 2.5 mm A/F hexagon key.
3. Fit the cap head bolt and T nut (not supplied by Renishaw) and tighten to secure the base to the machine table.

**NOTE:** A smaller washer may be fitted for a smaller bolt by disassembling and separating the base plates.

4. Refit the body onto the base and tighten screws **1** and **2**.

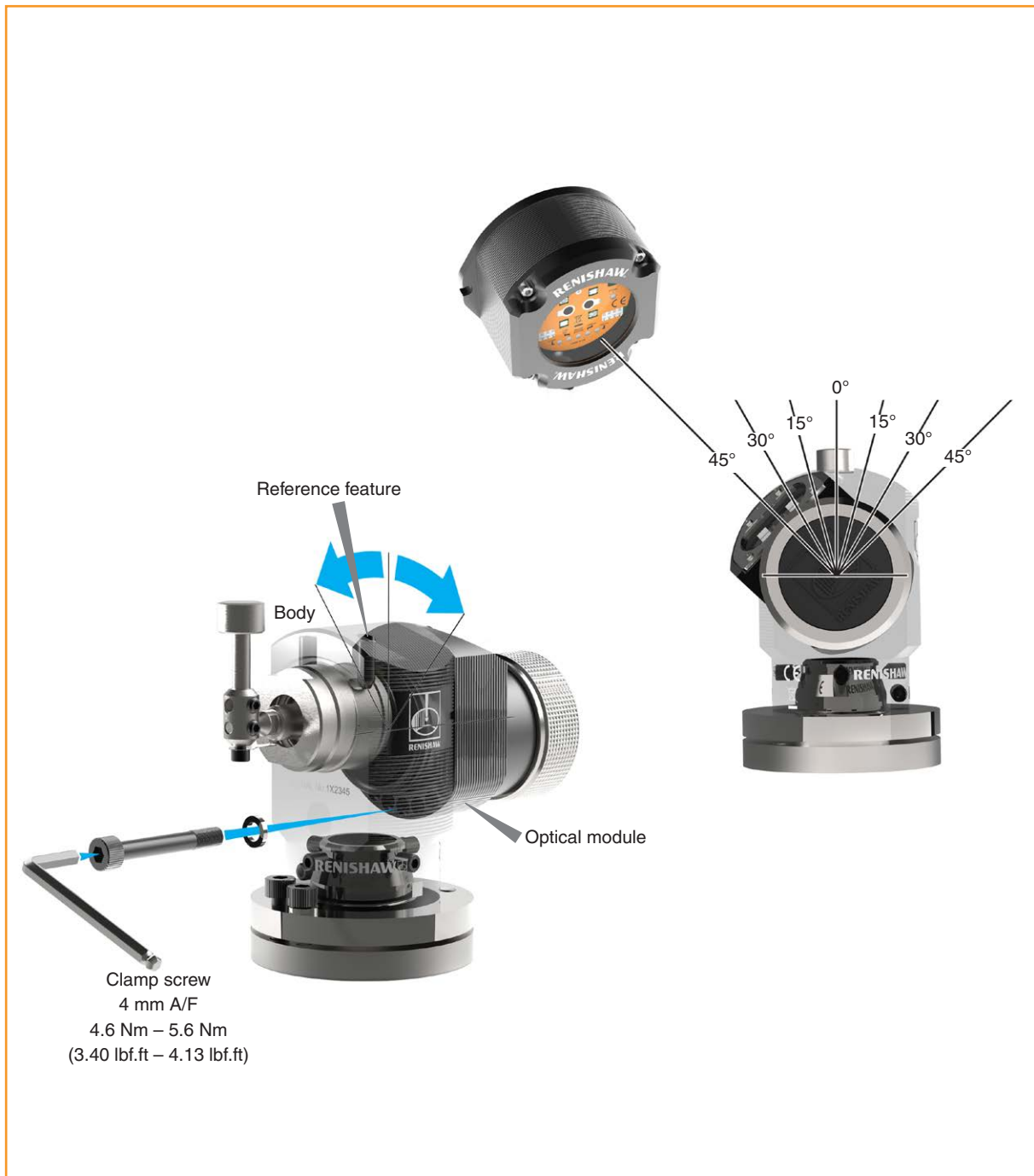
**NOTE:** If a square stylus is fitted fine rotational adjustment is required. For more information on square stylus rotational adjustment see, "Square stylus only" on page 3.12.

### Dowel pins

Two dowel pins (supplied in the tool kit) may be fitted on installations where there is a requirement to remove and remount the tool setter.

To fit the dowel pins, drill two holes in the machine table to correspond with the two probe base holes. Place the dowel pins in the holes and refit the probe base. For more information on fitting the dowel pins see, "OTS dimensions" on page 2.5.

## Aligning the modules



The optical module can be set in one of seven positions at 15° increments, to allow the optical window to point towards the receiver.

1. To align the optical module, first slacken and partially pull out the clamp screw.



2. Rotate the optical module to line up a reference mark on the optical housing with the reference feature on top of the body.

3. Relocate the clamp screw and tighten.

## Stylus adjustment

The top surface of the stylus must be set level, front to back and side to side.

### Key to the symbols

	Round stylus
	Square stylus

## Side-to-side level adjustment



Side-to-side level adjustment is obtained by alternately adjusting grub screws, which causes the probe module to rotate and change the stylus level setting.

When a level stylus surface is obtained, tighten the grub screws.

## Front-to-back level adjustment



### To raise front

Slacken adjusting/locking screw **2** and adjust height adjusting screw **1** until the stylus is level.

Then fully tighten screw **2**.

### To lower front

Slacken height adjusting screw **1** and adjusting/locking screw **2** until the stylus is level.

Then fully tighten screw **1**.

## Square stylus only

Rotational adjustment allows the stylus to be aligned with the machine axes.

### Coarse rotational adjustment



Slacken grub screw **1**, rotate the stylus by hand to obtain alignment, then fully tighten the grub screw.

**NOTE:** Always hold the support bar in position to counteract twisting forces and avoid over-stressing the stylus break stem.

## Fine rotational adjustment



Slacken the four body locking screws 2.



Tighten the opposing grub screws 3 against a locating pin fixed to the base.

Alternately slacken and retighten these grub screws to achieve fine rotational adjustment of the stylus.

When this is achieved, lightly tighten the grub screws.

6



2  
2,5 mm A/F  
0.7 Nm – 0.9 Nm  
(0.52 lbf.ft – 0.66 lbf.ft)  
x 4

Fully retighten the four body locking screws 2.



## Calibrating the OTS

### Why calibrate a probe?

A probe is just one component of the measurement system which communicates with the machine tool. Each part of the system can introduce a constant difference between the position that the stylus touches and the position that is reported to the machine. If the probe is not calibrated, this difference will appear as an inaccuracy in the measurement. Calibration of the probe allows the probing software to compensate for this difference.

During normal use, the difference between the touch position and the reported position does not change, but it is important that the probe is calibrated in the following circumstances:

- when a probe system is to be used for the first time;
- when a new stylus is fitted to the probe;
- when it is suspected that the stylus has become distorted or that the probe has been crashed;
- at regular intervals to compensate for mechanical changes of your machine tool;

When your probe is assembled and mounted on the machine table, it is necessary to align the stylus faces with the machine axes to avoid probing errors when setting tools. It is worth taking care with this operation – you should try to get the faces aligned to within 0.010 mm (0.0004 in) for normal use. This is achieved by manually adjusting the stylus with the adjusting screws provided, and using a suitable instrument such as a DTI clock mounted in the machine spindle.

When the probe has been correctly set up on the machine, it is time to calibrate the probe. Calibration cycles are available from Renishaw for this task. The purpose is to establish the probe stylus measuring face trigger point values under normal measuring conditions.

The calibration values are stored in macro variables for computation of the tool size during tool setting cycles.

Values obtained are axis trigger positions (in machine co-ordinates). Any errors due to machine and probe triggering characteristics are automatically calibrated out in this way. These values are the electronic trigger positions under dynamic operating conditions, and not necessarily the true physical stylus face positions.

---

**NOTE:** Poor repeatability of probe trigger point values indicates that either the probe/stylus assembly is loose or a machine/probe fault exists. Further investigation is required.








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## Probe settings record

This page is provided to note your probe's settings.

			✓ tick	✓ tick
			Factory settings	New settings
<b>Enhanced trigger filter</b>	Off		✓	
	On			
<b>Probe identification</b>	Probe 1			
	Probe 2		✓	
	Probe 3			
<b>Optical power setting</b>	Low power			
	Standard power		✓	

Factory settings only for kits:-

A-5401-2001

A-5401-2011

A-5514-2001

A-5514-2011

OTS serial no .....

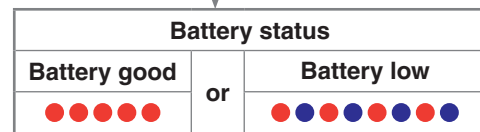
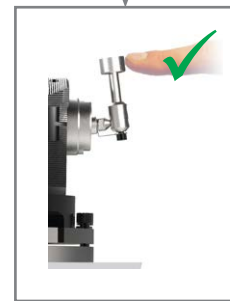
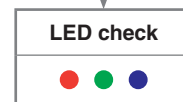
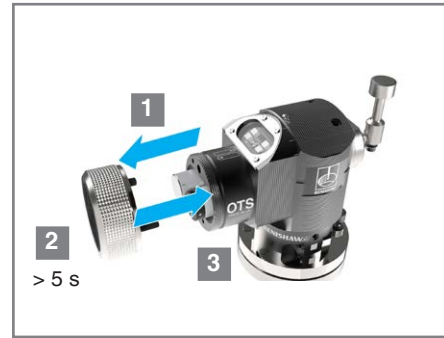
## Changing the probe settings

Insert the batteries or, if they have already been installed, remove them for five seconds and then refit them.

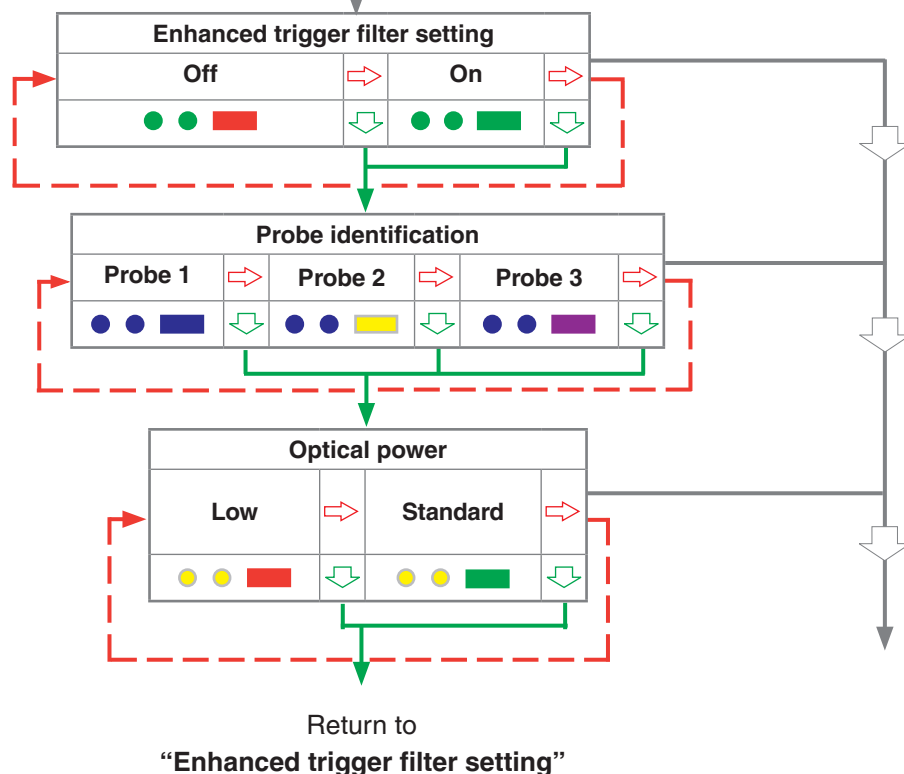
Following the LED check, immediately deflect the stylus and hold it deflected until five red flashes have been observed (if the battery power is low, each red flash will be followed by a blue flash).

Keep the stylus deflected until the “**Enhanced trigger filter**” setting is displayed, then release it. The probe is now in configuration mode and Trigger Logic™ is activated.

**CAUTION:** Do not remove the batteries whilst in configuration mode. To exit, leave the stylus untouched for more than 20 seconds.



Key to the symbols	
●	LED short flash
■	LED long flash
⇒	Deflect the stylus for less than 4 seconds to move to the next menu option.
⇩	Deflect the stylus for more than 4 seconds to move to the next menu.
⇩	To exit, leave the stylus untouched for more than 20 seconds.



## Operating mode



### Probe status LED

LED colour	Probe status	Graphic hint
Flashing green	Probe seated in operating mode	● ● ●
Flashing red	Probe triggered in operating mode	● ● ●
Flashing green and blue	Probe seated in operating mode – low battery	● ● ● ● ● ●
Flashing red and blue	Probe triggered in operating mode – low battery	● ● ● ● ● ●
Constant red	Battery dead	■
Flashing red or Flashing red and green or Sequence when batteries are inserted	Unsuitable battery	● ● ● ● ● ● ● ● ● ● ● ● ● ● ●

**NOTE:** Due to the nature of lithium-thionyl chloride batteries, if a “low battery” LED warning is ignored, it is possible for the following sequence of events to occur:

1. When the probe is active, the batteries discharge until battery power becomes too low for the probe to operate correctly.
2. The probe stops functioning, but then reactivates as the batteries recover sufficiently to provide the probe with power.
3. The probe begins to run through the LED review sequence (see “Reviewing the probe settings” on page 4.1).
4. Again, the batteries discharge and the probe ceases to function.
5. Again, the batteries recover sufficiently to provide the probe with power, and the sequence repeats itself.

# Maintenance

5.1

## 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 an authorised Renishaw Service Centre.

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

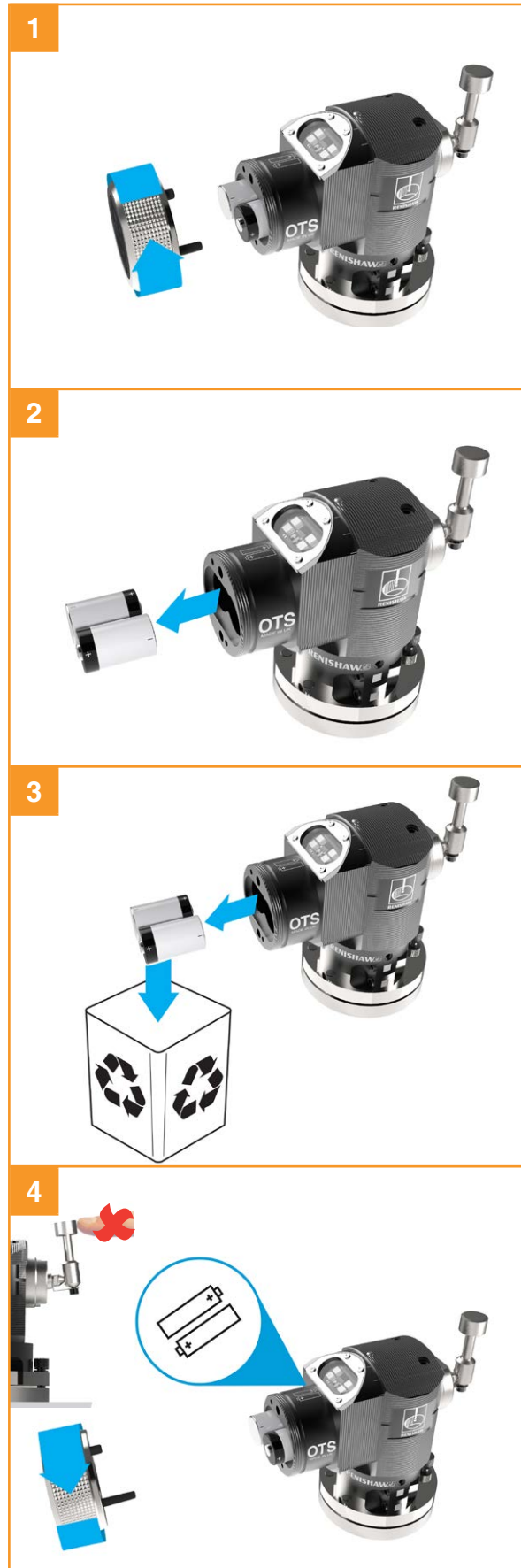
## Cleaning the probe

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



**CAUTION:** The OTS has a glass window. Handle with care if broken to avoid injury.

## Changing the ½AA batteries



### CAUTIONS:

Do not leave dead batteries in the probe.

When changing batteries, do not allow coolant or debris to enter the battery compartment.

When changing batteries, check that the battery polarity is correct.

Take care to avoid damaging the battery cassette gasket.

Only use specified batteries.

Please dispose of dead batteries in accordance with local regulations. Never dispose of batteries in a fire.

### NOTES:

After removing the old batteries, wait more than 5 seconds before inserting the new batteries.

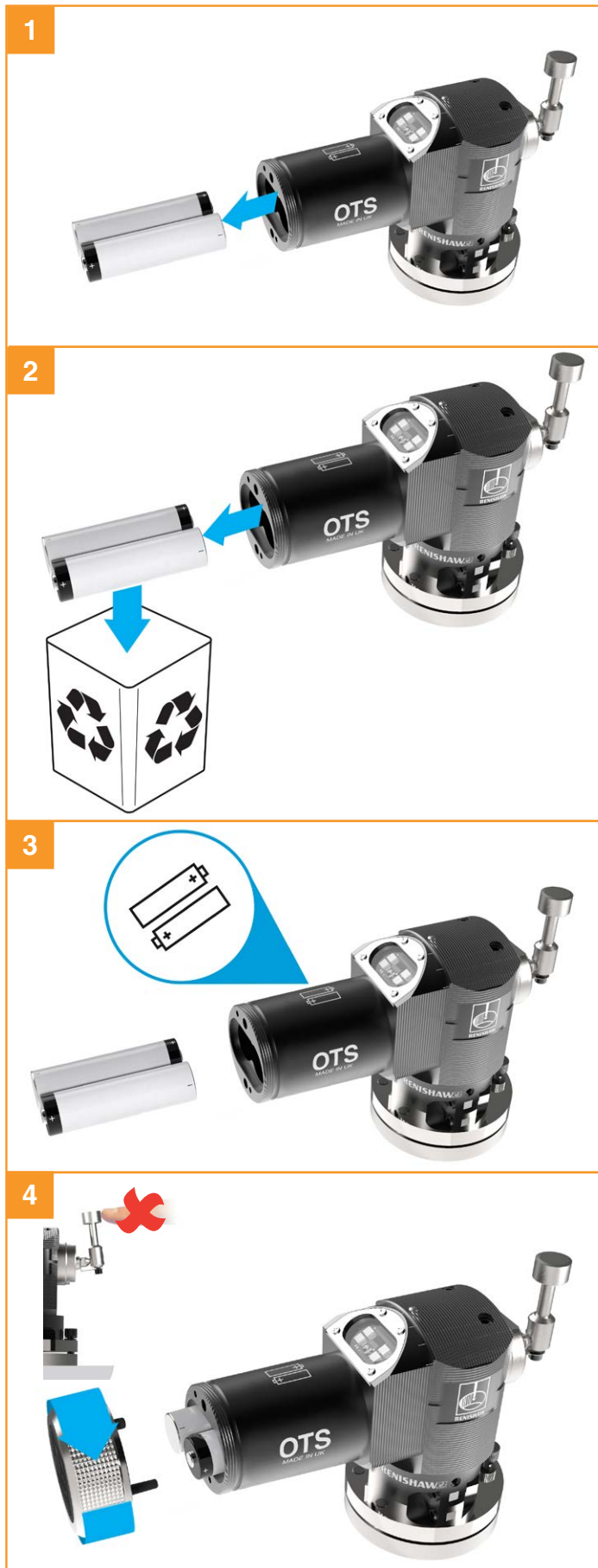
Do not mix new and used batteries or battery types, as this will result in reduced life and damage to the batteries.

Always ensure that the cassette gasket and mating surfaces are clean and free from dirt before reassembly.

If dead batteries are inadvertently inserted, the LEDs will remain a constant red.



## Changing the AA batteries



### CAUTIONS:

Do not leave dead batteries in the probe.

When changing batteries, do not allow coolant or debris to enter the battery compartment.

When changing batteries, check that the battery polarity is correct.

Take care to avoid damaging the battery cassette gasket.

Only use specified batteries.

Please dispose of dead batteries in accordance with local regulations. Never dispose of batteries in a fire.

### NOTES:

After removing the old batteries, wait more than 5 seconds before inserting the new batteries.

Do not mix new and used batteries or battery types, as this will result in reduced life and damage to the batteries.

Always ensure that the cassette gasket and mating surfaces are clean and free from dirt before reassembly.

If dead batteries are inadvertently inserted, the LEDs will remain a constant red.

## Battery types

### ½ AA lithium-thionyl chloride (3.6 V) × 2 supplied with probe



<p>✓ <b>Ecocel:</b> EB1426  <b>Saft:</b> LS14250,  LS14250C  <b>Tadiran:</b> SL-750  <b>Xeno:</b> XL-050F</p>	<p>✗ <b>Dubilier:</b> SB-AA02  <b>Maxell:</b> ER3S  <b>Sanyo:</b> CR14250SE  <b>Tadiran:</b> SL-350/S, SL-550/S,  TL-4902, TL-5902,  TL2150, TL-5101  <b>Varta:</b> CR 1/2 AA</p>
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### \* AA Alkaline (1.5 V) × 2 supplied with probe



✓ All AA alkaline batteries

### AA lithium-thionyl chloride (3.6 V) × 2 (optional type)



<p>✓ <b>Saft:</b> LS14500  <b>Tadiran:</b> SL-760/S,  TL-5903/S, TLH-2100/S  <b>Xeno:</b> XL-060F</p>
---

\* AA battery types are also designated as LR6 or MN1500.

**NOTE:** Maximum battery life is achieved when lithium-thionyl chloride batteries are used.

## Routine maintenance

The probe is a precision tool and must be handled with care.

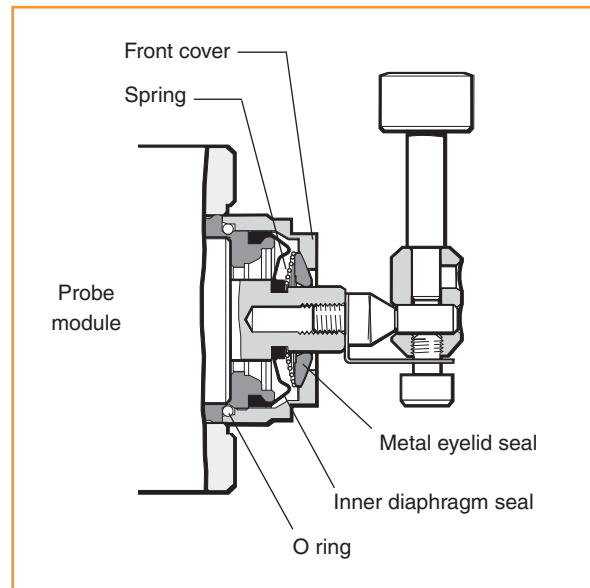
Ensure the probe is firmly secured to its mounting.

The probe requires minimal maintenance as it is designed to operate as a permanent fixture on CNC machining centres, where it is subject to a hot chip and coolant environment.

1. Do not allow excessive waste material to build up around the probe.
2. Coolant residue accumulating on the transmission window will have a detrimental effect on transmission performance (see “Cleaning the probe” on page 5.1).
3. Keep all electrical connections clean.
4. The probe mechanism is protected by an outer metal eyelid seal and an inner flexible diaphragm seal.

Approximately once a month, inspect the probe inner diaphragm seal (see “Eyelid removal/replacement” on page 5.6). If it is pierced or damaged, please contact Renishaw.

The service interval may be extended or reduced depending on usage and operating environment.



## Eyelid removal/replacement



1. Remove the stylus/break stem assembly using the 5 mm A/F spanner.
2. Use a 24 mm or 15/16 in spanner to remove the probe's front cover. This will expose the metal eyelid seal, spring and inner diaphragm seal. Remove the metal eyelid and spring.

---

**CAUTION:** These may fall out.

---

3. Wash inside the probe using clean coolant.

---

**CAUTION:** (DO NOT use sharp objects to clean out debris.)

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4. Inspect the diaphragm seal for signs of piercing or damage. In the event of damage, return the probe to your supplier for repair, as coolant entering the probe mechanism could cause the probe to fail.
5. Refit the spring and metal eyelid (the spring's largest diameter is against the metal eyelid).
6. Refit the remaining components.

# Fault-finding

Symptom	Cause	Action
<b>Probe fails to power up (no LEDs illuminated or fails to indicate current probe settings).</b>	Dead batteries.	Change batteries.
	Unsuitable batteries.	Fit suitable batteries.
	Batteries inserted incorrectly.	Check battery insertion / polarity.
	Batteries removed for too short a time and probe has not reset.	Remove batteries for a minimum of 5 seconds.
	Poor connection between battery cassette mating surfaces and contacts.	Remove any dirt and clean the contacts before reassembly.
<b>Probe fails to switch on.</b>	Wrong optical start configuration selected.	Reconfigure.
	Dead batteries.	Change batteries.
	Unsuitable batteries.	Fit suitable batteries.
	Batteries inserted incorrectly.	Check battery insertion / polarity.
	Optical/magnetic interference.	Check for interfering lights or motors.  Consider removing interfering source.
	Transmission beam obstructed.	Check that probe receiver windows are clean and remove any obstruction.
	Probe out of range / not aligned with receiver.	Check alignment and if receiver fixing is secure.
No receiver start signal.	Refer to the relevant user's guide.  Review installation wiring.	
<b>Probe switches-on unexpectedly.</b>	Probe receiving switch-on signal from receiver on adjacent machine.	Reduce switch-on range on receiver on adjacent machine.

Symptom	Cause	Action
<b>Machine stops unexpectedly during a probing cycle.</b>	Optical communication obstructed.	Check interface / receiver and remove obstruction.
	Interface / receiver / machine fault.	Refer to interface / receiver / machine user's guide.
	Dead batteries.	Change batteries.
	False probe trigger.	Enable enhanced trigger filter.
	Unable to find target surface.	Check that the tool has not broken.
	Adjacent probe.	Reconfigure adjacent probe to low power mode and reduce range of receiver.
<b>Probe crashes.</b>	Tool length offset incorrect.	Review offsets.
	Controller wired to respond to inspection probe instead of tool setter.	Review installation wiring.

Symptom	Cause	Action
<b>Poor probe repeatability and/or accuracy.</b>	Debris on part or stylus.	Clean part and stylus.
	Loose probe mounting on machine bed or loose stylus.	Check and tighten as appropriate.
	Excessive machine vibration.	Enable enhanced trigger filter. Eliminate vibrations.
	Calibration out of date and/or incorrect offsets.	Review probing software.
	Calibration and probing speeds not the same.	Review probing software.
	Measurement occurs as stylus leaves surface.	Review probing software.
	Measurement occurs within the machine's acceleration and deceleration zone.	Review probing software and probe filter settings.
	Probing speed too high or too slow.	Perform simple repeatability trials at various speeds.
	Temperature variation causes machine and workpiece movement.	Minimise temperature changes.
	Machine tool faulty.	Perform health checks on machine tool.

Symptom	Cause	Action
<b>Probe fails to switch off.</b>	Optical/magnetic interference.	Check for interfering lights or motors.  Consider removing the interfering source.  Check that the probe and receiver windows are clean, and remove any obstruction.
	Probe out of range.	Check position of receiver.  Increase receiver signal start range.  Review performance envelopes.
<b>Probe goes into Trigger Logic™ configuration mode and cannot be reset.</b>	Probe was triggered when batteries were inserted.	Do not touch the stylus or stylus mounting face during battery insertion.



# Parts list

Type	Part number	Description
OTS (½ AA)	A-5401-2001	OTS probe with disc stylus, ½ AA lithium-thionyl chloride batteries, tool kit and quick-start guide. Set to: optical on / optical off / filter off /Probe 2 start / standard power.
OTS (½ AA)	A-5401-2011	OTS probe with square stylus, ½ AA lithium-thionyl chloride batteries, tool kit and quick-start guide. Set to: optical on / optical off/filter off /Probe 2 start / standard power.
OTS (AA)	A-5514-2001	OTS probe with disc stylus, AA alkaline batteries, tool kit and quick-start guide. Set to: optical on / optical off / filter off / Probe 2 start / standard power.
OTS (AA)	A-5514-2011	OTS probe with square stylus, AA alkaline batteries, tool kit and quick-start guide. Set to: optical on / optical off / filter off Probe 2 start / standard power.
½ AA batteries	P-BT03-0007	½ AA battery – lithium-thionyl chloride – supplied as standard with probe (pack of two).
AA battery	P-BT03-0005	AA battery – alkaline – supplied as standard with probe (two required).
AA battery	P-BT03-0008	AA battery – lithium-thionyl chloride (two required).
Disc stylus	A-2008-0382	Disc stylus (tungsten carbide, 75 Rockwell C) Ø12.7 mm (Ø0.5 in).
Square stylus	A-2008-0384	Square tip stylus (ceramic tip, 75 Rockwell C) 19.05 mm x 19.05 mm (0.75 in x 0.75 in).
Break stem	A-5003-5171	Stylus protection kit comprising: break stem (x1), captive link (x1), support bar (x1), M4 screw (x2), M4 grub screw (x3), hexagon keys: 2.0 mm (x1), 3.0 mm (x1) and spanner 5.0 mm (x1).
Stylus holder kit	A-2008-0389	Stylus holder kit comprising stylus holder and screws.
Battery cap	A-5401-0301	OTS battery cap assembly.
Seal	A-4038-0301	Battery housing seal.
Tool kit	A-5401-0300	Kit comprising : break stem (x 1), captive link (x 2), support bar (x 1), M4 screw (x 2), M4 grub screw (x 3), spirol pin (x 2), hexagon keys: 2.0 mm A/F (x 1), 2.5 mm A/F (x 1), 3.0 mm A/F (x 1), 4.0 mm A/F (x 1) and spanner 5.0 mm A/F (x 1).

Type	Part number	Description
OMI-2	A-5191-0049	OMI-2 with 8 m (26.25 ft) cable, tool kit and quick-start guide.
OMI-2	A-5191-0050	OMI-2 with 15 m (49 ft) cable, tool kit and quick-start guide.
OMI-2T	A-5439-0049	OMI-2T with 8 m (26.25 ft) cable, tool kit and quick-start guide.
OMI-2T	A-5439-0050	OMI-2T with 15 m (49 ft) cable, tool kit and quick-start guide.
OMM-2	A-5492-0049	OMM-2 with 8 m (26.25 ft) cable, tool kit and quick-start guide.
OMM-2	A-5492-0050	OMM-2 with 15 m (49 ft) cable, tool kit and quick-start guide.
OSI interface	A-5492-2000	OSI (multiple probe mode) with DIN rail mounting, terminal block and quick-start guide.
OSI interface	A-5492-2010	OSI (single probe mode) with DIN rail mounting, terminal block and quick-start guide.
Mounting bracket	A-2033-0830	OMI-2T/OMI-2H/OMI-2 mounting bracket with fixing screws, washers and nuts.
Raising block	M-2033-7347	Raising block Ø65 mm (Ø2.55 in) × 76.5 mm (3.0 in) tall.
Raising block	M-2033-7189	Raising block Ø65 mm (Ø2.55 in) × 125.5 mm (4.94 in) tall.
Stylus adaptor kit	A-2008-0448	Adaptor kit to position stylus in horizontal attitude.
<b>Publications.</b> These can be downloaded from our web site at <a href="http://www.renishaw.com">www.renishaw.com</a> .		
OTS	H-5514-8500	Quick-start guide: for rapid set-up of the OTS probe.
OTS	H-5514-8504	Installation guide: for set-up of the OTS probe.
OMI-2	H-5191-8500	Quick-start guide: for the rapid set-up of the OMI-2 optical machine interface.
OMI-2T	H-5439-8500	Quick-start guide: for the rapid set-up of the OMI-2T optical machine interface.
OMM-2	H-5492-8550	Quick-start guide: for the rapid set-up of the OMM-2 optical machine module.
OSI	H-5492-8500	Quick-start guide: for the rapid set-up of the OSI optical system interface.
OMM-2C	H-5991-8500	Quick-start guide: for the rapid set-up of the OMM-2C optical machine module.
Styli	H-1000-3200	Technical specifications guide: Styli and accessories – or visit our Web shop at <a href="http://www.renishaw.com/shop">www.renishaw.com/shop</a> .
Software list	H-2000-2298	Data sheet: probe software for machine tools – programs and features.

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