Installation and user's guide
H-2000-5059-05-A

RENISHAW
apply innovation™

MP10 probe system

Disclaimer

Considerable effort has been made to ensure that the contents of this document are free from inaccuracies and omissions. However, Renishaw makes no warranties with respect to the contents of this document and specifically disclaims any implied warranties. Renishaw reserves the right to make changes to this document and to the product described herein without obligation to notify any person of such changes.

Trademarks

Renishaw® and the probe emblem used in the RENISHAW logo are registered trademarks of Renishaw plc in the UK and other countries.

apply innovation is a trademark of Renishaw plc.

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

Renishaw part no: H-2000-5059-05-A

Issued: 08.05

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.

Installation and users guide - English

SAFETY

Before working inside machines, ensure machine is in a safe condition

Switch off power before making electrical connections, changing probe and receiver settings and replacing components

ASSOCIATED SYSTEM HANDBOOKS

Description	Part No.
Optical module machine (OMM)	H-2000-5044
MI 12 interface unit	H-2000-5073
Optical machine interface (OMI)	H-2000-5062
PSU3 power supply unit	H-2000-5057

WARRANTY

Equipment requiring attention under warranty must be returned to your supplier. No claims will be considered where Renishaw equipment has been misused, or repairs or adjustments have been attempted by unauthorised persons.

CHANGES TO EQUIPMENT

Renishaw reserves the right to change specifications without notice.

CNC MACHINE

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

CARE OF THE PROBE

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

PROBE IP RATING X8

PATENT NOTICE

Features of MP10 probes and features of similar probes are the subject of one or more of the following patents and/or patent applications:

EP 0337669	JP 2,945,709	US 5,150,529
EP 0390342	JP 2,944,401	US 5,040,931
EP 0695926		US 5,669,151

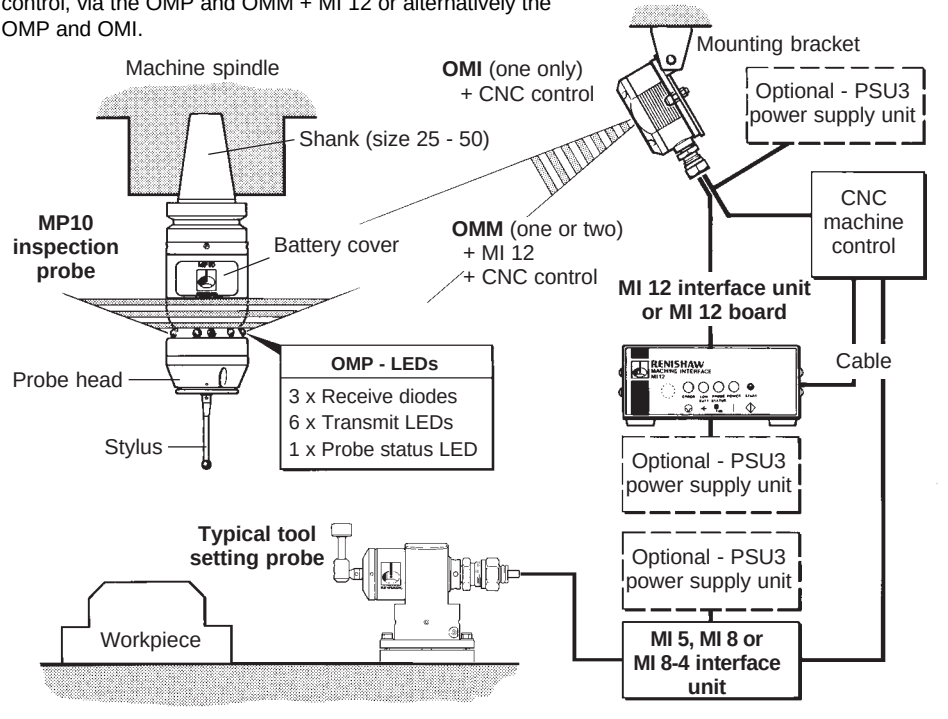
Contents

TYPICAL PROBE SYSTEMS

A workpiece set-up and inspection probe is in effect another tool in the system. A probe cycle may be included at any stage of the machining process.
Signals are transmitted between the probe and the machine control, via the OMP and OMM + MI 12 or alternatively the OMP and OMI.

SEE PAGES 1-38, 1-39 & 1-40

OMM - Optical module machine
OMP - Optical module probe
OMI - Optical machine interface



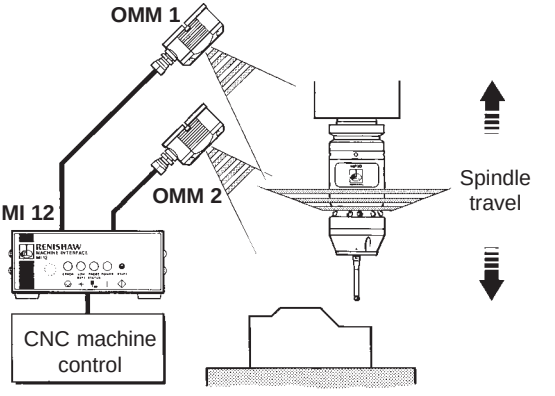
TWO OMMs AND REMOTE INDICATOR

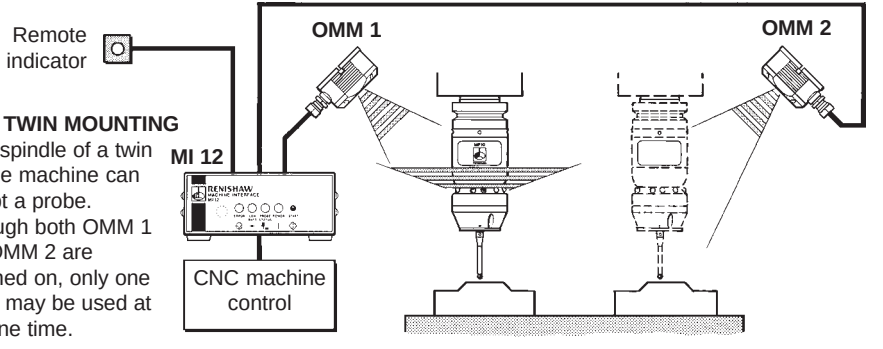
OMM TANDEM MOUNTING

Installations with exceptionally long spindle travel, may require a second OMM to cover signal reception over the full working envelope of the probe.
The reception cones of OMM 1 and OMM 2 overlap, so they act as one receiver.

REMOTE INDICATOR

When the probe contacts a surface an MI 12 LED changes state and a bleep is emitted.
If the MI 12 is hidden from the operator, a remote lamp or bleeper may be placed in a position where it is easily seen or heard.





OMM TWIN MOUNTING

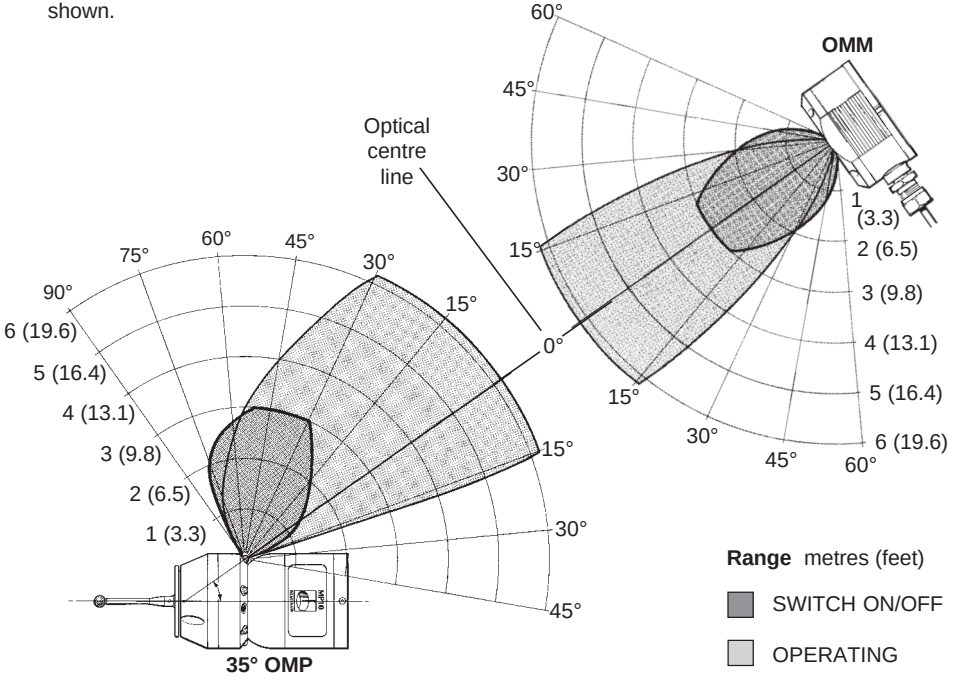
Each spindle of a twin spindle machine can accept a probe.
Although both OMM 1 and OMM 2 are switched on, only one probe may be used at any one time.

PERFORMANCE ENVELOPE

MP10 35° OUTPUT PROBE + OMM
Probe and OMM diodes must be mutually in each others field of view, and within the performance envelope shown.

SWITCH-ON/OFF RANGE
The OMP must be within 3 m (9.8 ft) of the OMM.

OPERATING RANGE
The OMP must be within 6 m (19.6 ft) of the OMM.



PERFORMANCE ENVELOPE

MP10 70° OUTPUT PROBE + OMM

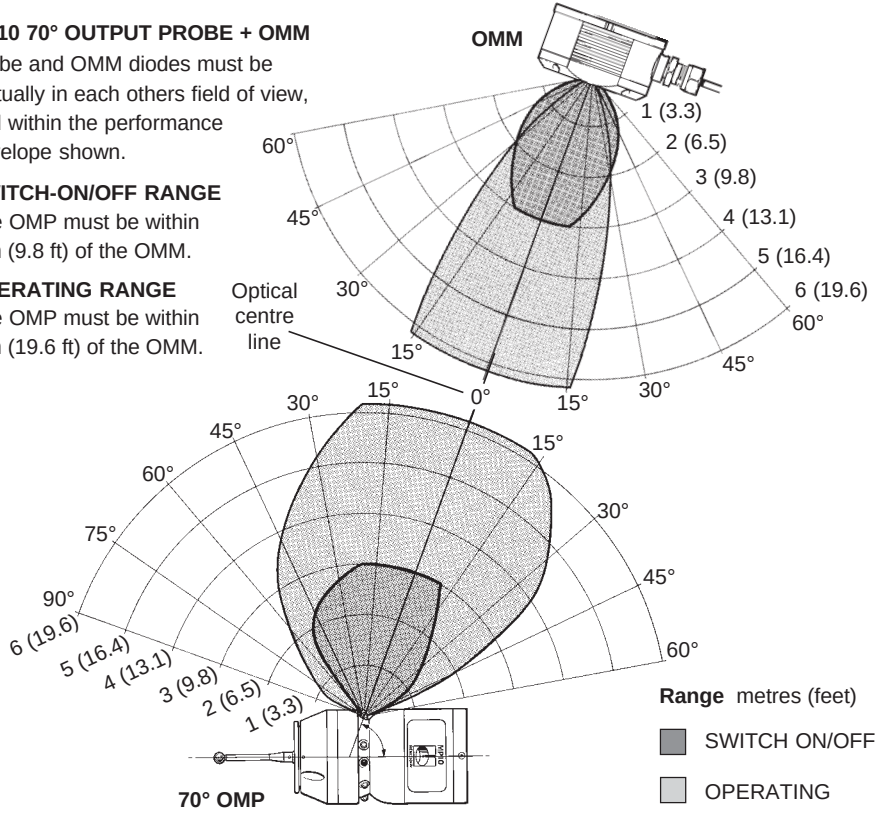
Probe and OMM diodes must be mutually in each others field of view, and within the performance envelope shown.

SWITCH-ON/OFF RANGE

The OMP must be within 3 m (9.8 ft) of the OMM.

OPERATING RANGE

The OMP must be within 6 m (19.6 ft) of the OMM.



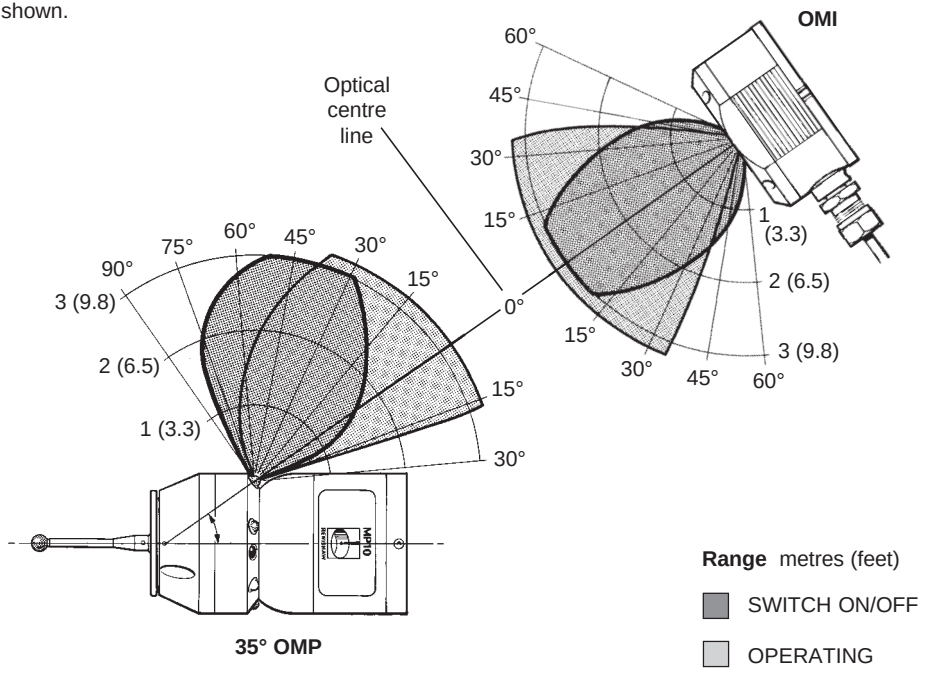
PERFORMANCE ENVELOPE

MP10 35° OUTPUT PROBE + OMI

Probe and OMI diodes must be mutually in each others field of view, and within the performance envelope shown.

SWITCH-ON/OFF RANGE and OPERATING RANGE

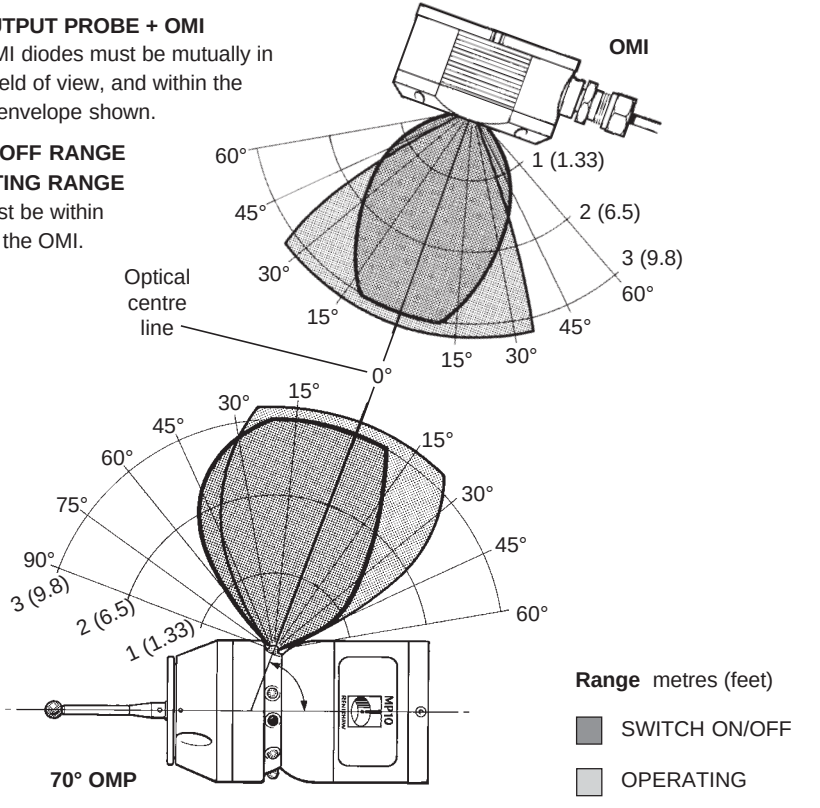
The OMP must be within 3 m (9.8 ft) of the OMI.



PERFORMANCE ENVELOPE

MP10 70° OUTPUT PROBE + OMI
Probe and OMI diodes must be mutually in each others field of view, and within the performance envelope shown.

SWITCH-ON/OFF RANGE and OPERATING RANGE
The OMP must be within 3 m (9.8 ft) of the OMI.



SYSTEM PERFORMANCE

PROBE REPEATABILITY

Maximum 2 sigma (2σ) value

Repeatability of 1.0 µm (0.00004 in) is valid for test velocity of 480 mm/min (1.57 ft/min) at stylus tip, using stylus 50 mm (1.97 in) long.

STYLUS TRIGGER FORCE

Set at factory using stylus 50 mm (1.97 in) long.
X and Y trigger forces vary around the stylus seating.

X/Y direction lowest force	0.75 N/75 gf (2.64 ozf)
X/Y direction highest force	1.4 N/140 gf (4.92 ozf)
Z direction	4.2 N/420 gf (14.83 ozf)

STYLUS OVERTRAVEL

See page 1-21.

ENVIRONMENT

PROBE/OMP 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

Natural reflective surfaces within the machine may increase the signal transmission range.
Coolant residue accumulating on the OMP diodes and OMM or OMI window, will have a detrimental effect on transmission performance. Wipe clean as often as is necessary to maintain unrestricted transmission.
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.

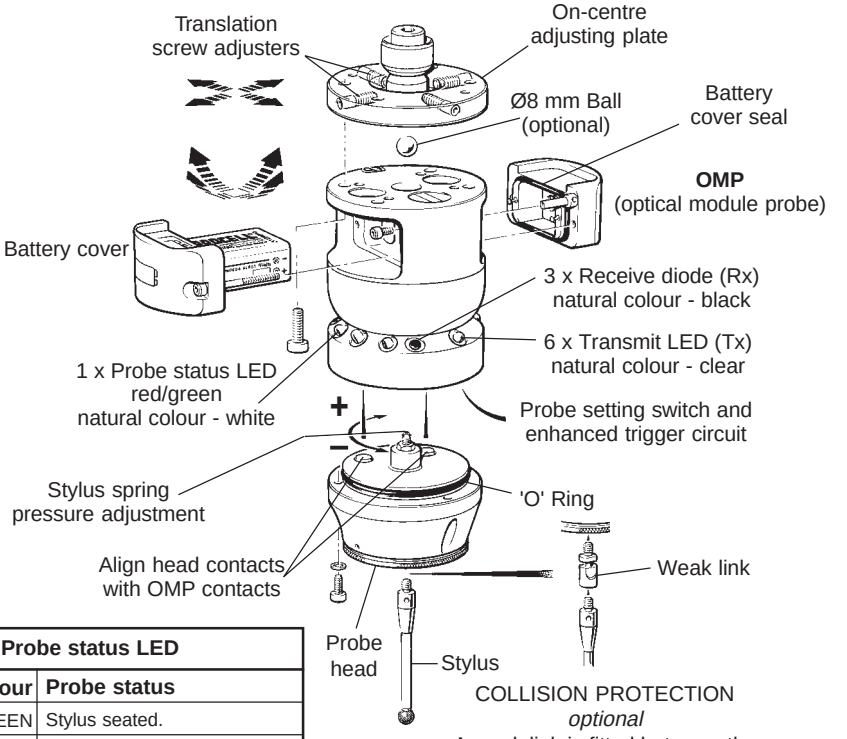
WARNING

If two systems are operating in close proximity 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 POSITION

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 multicoloured LED.

MP10 FEATURES

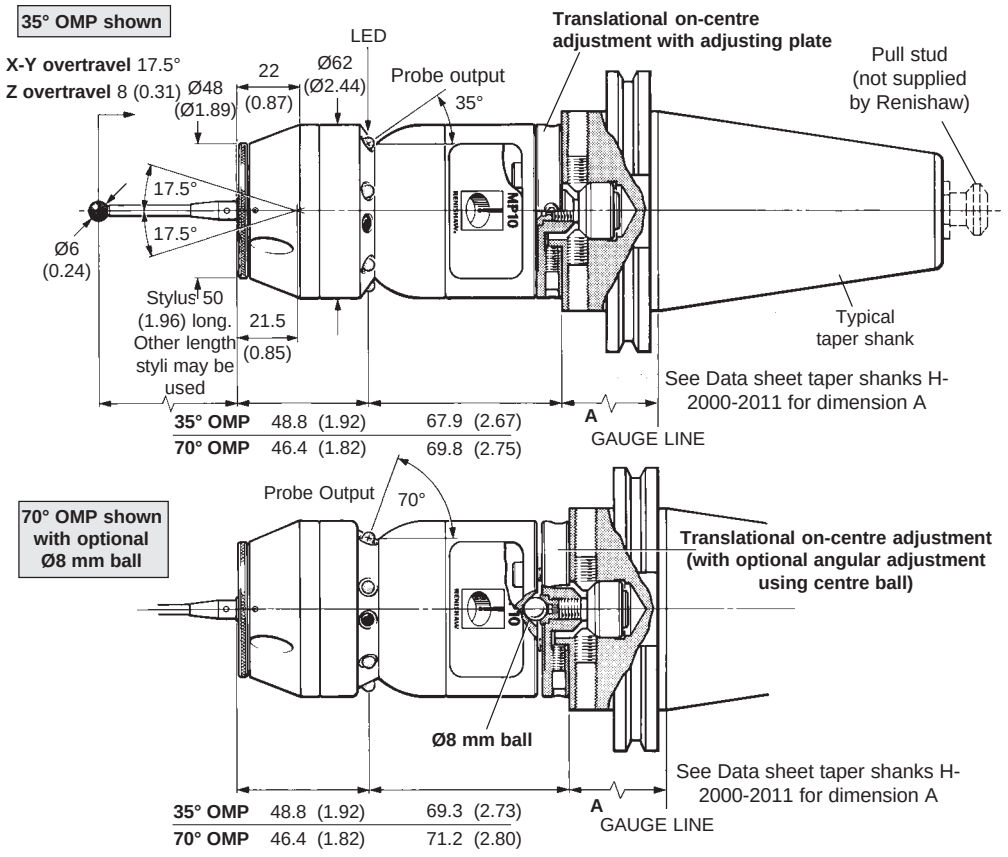


Probe status LED	
LED colour	**Probe status**
Flashing GREEN	Stylus seated.
Flashing RED	Stylus deflected (triggered).
Constant RED	Battery dead. (replace battery to continue).

COLLISION PROTECTION
optional

A weak link is fitted between the probe and stylus, to protect the probe in the event of excessive stylus overtravel.

MP10 dimensions mm (in)



MODES OF OPERATION

Modes of operation

The MP10 has two modes of operation.

1. Stand-by mode - The OMP uses a small current, while passively waiting for the switch on signal.
2. Operating mode - Activated by one of the methods described below. Probe signals are only transmitted during the operating mode.

MP10 power on/off

MP10 power switch on/off, only occurs when the MP10 is located within the switch on/off envelope of the OMP and OMM/OMI.

Debounce time

After the probe is switched on there is a time delay before it can be switched off. This delay is factory set to 5 sec or it can be reset to 9 sec by switching the internal probe switch. A similar delay occurs after switch off, before it can be switched on again.

SWITCH-ON	SWITCH-OFF
Switch-on options are selected by MI 12 or OMI switch settings - see MI 12 or OMI handbook. 1. **Manual start** (optical-on) - MI 12 start button. 2. **Machine start** (optical-on) - optical switch-on via software M code command - *factory set.* 3. **Auto start** (optical-on) 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 MP10 is set to the optical-on / optical-off option. (An auto start signal will force the MP10 to switch on then off at 5 or 9 second intervals). Following switch-on, debounce time must elapse, before the probe is switched off.	Switch-off options are selected by operating an internal probe switch - see opposite. **1. Optical-on and timer-off** (time out) *factory set.* A timer switch automatically returns the probe to the stand-by mode after 33 or 134 seconds. The timer is factory set to 134 seconds. The 33 second option is selected by resetting the internal probe switch. The timer is reset for a further 33 or 134 seconds on, 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 for a further 33 or 134 seconds on. **2. Optical-on and optical-off** (*optional)* Optical switch-off is commanded by a software M code. Debounce times apply.

OPTIONS SETTING SWITCH AND ENHANCED TRIGGER CIRCUIT

Only qualified persons should change settings

Remove the probe head to gain access to the switches and sockets.

OPTIONS SETTING SWITCH

System settings are shown opposite.

ENHANCED TRIGGER CIRCUIT

Probes subjected to high levels of vibration or shock loads, may release spurious readings. The enhanced trigger circuit improves the probes resistance to these effects.

When the circuit is enabled, a constant nominal 7 millisecond delay is introduced to the probe output.

It may be necessary to revise program software to allow for the increased stylus overtravel.

To activate the enhanced trigger circuit, the wire link is transferred manually :

From SKT 1-2 (factory set)
To SKT 3-2 (enabled)

TAKE CARE

KEEP ALL COMPONENTS CLEAN - DO NOT ALLOW COOLANT OR PARTICLES TO ENTER THE PROBE.

DO NOT TOUCH ELECTRONIC COMPONENTS WHEN CHANGING SWITCH SETTINGS.

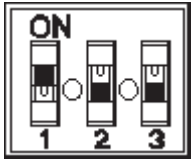
OPTIONS SETTING SWITCH

1 DEBOUNCE
5 seconds
(factory set)

2 TIME-OUT
33 seconds

3 MODE
Optical on
Optical off
(factory set)
A-2033-1115/1116

see page 1-42



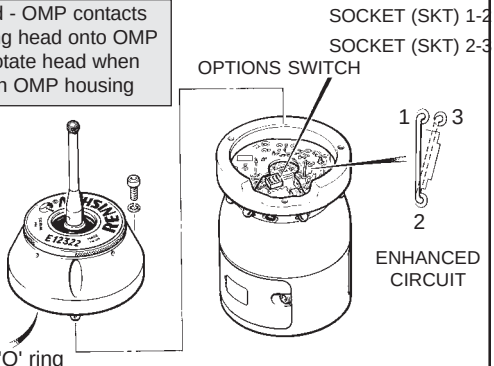
1 DEBOUNCE
9 seconds

2 TIME-OUT
134 seconds
(factory set)

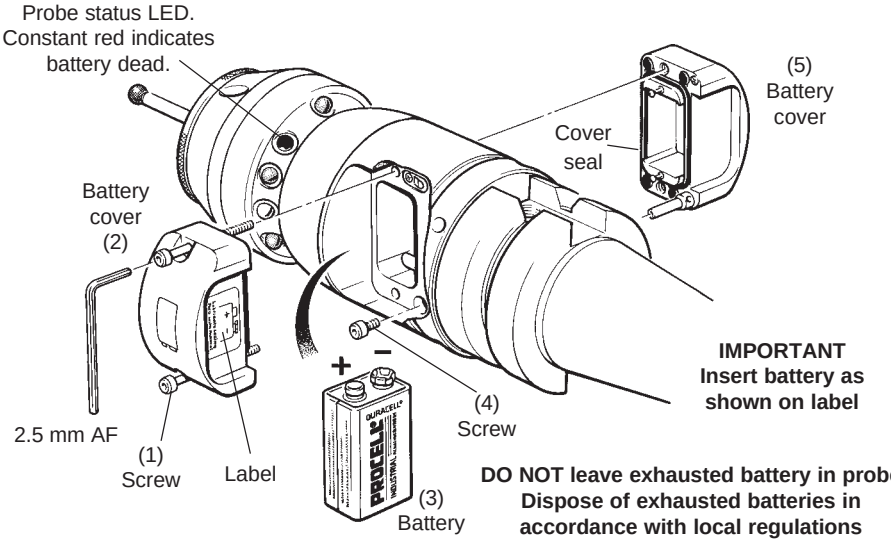
MODE
3 Optical on
Time out
(factory set)
A-2033-1099/1100

ENHANCED TRIGGER CIRCUIT

Align head - OMP contacts **before** fitting head onto OMP
Do not rotate head when located in OMP housing



BATTERY COVERS AND BATTERY



To replace exhausted battery - remove cover

1. Slacken screws (1) and remove battery cover (2).
2. Remove battery (3).
   Do not remove second cover, to change battery.

Probe/shank mounting and stylus on-centre adjustment - remove second cover

3. Remove screw (4) and battery cover (5).
   - see pages 1-17 and 1-19.

To replace battery covers

4. Check that battery cover seals are seated, and lubricate seals lightly with a mineral oil or grease.
5. Replace cover (5) - *with Renishaw logo*.
6. Replace battery with polarity as shown on label,
7. Replace battery cover (1) - *with battery symbol*.
   Tighten battery cover screws to 1.1 Nm (0.8 lbf.ft).

BATTERY LIFE EXPECTANCY

Alkaline battery

Duracell type MN 1604 or equivalent

STAND-BY LIFE	5% USAGE - 72 min/day		CONTINUOUS USE	
	OPTICAL ON OPTICAL OFF	OPTICAL ON TIMER OFF	OPTICAL ON OPTICAL OFF	OPTICAL ON TIMER OFF
Minimum	Minimum	Minimum	Minimum	Minimum
365 days	98 days	80 days	140 hrs	110 hrs

Probe battery

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

The Probe status LED indicates when the battery has come to the end of its useful life.

Low battery indication

When MI 12 or OMI low battery LED lights up, battery voltage is low and the end of useable battery life is approaching.
(The low battery LED will only light up during the probe operating mode)
- see APPENDIX pages 1-39 and 1-40.

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

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.

Dead battery indication

When the battery voltage drops below the threshold where performance can be guaranteed, the MP10 probe status LED will change to constant red.

The probe output relay will also be forced into its open state, causing the machine to stop, until a new battery is inserted.

The probe will revert to the stand-by mode after changing the battery.

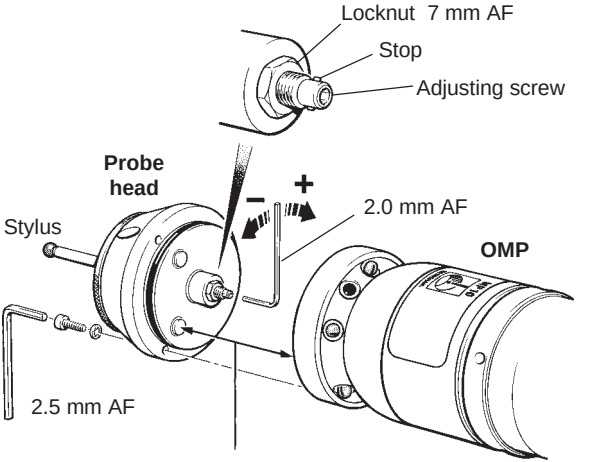
STYLUS SPRING PRESSURE ADJUSTMENT - Gauging force

Spring pressure within the probe causes the stylus to sit in one unique position, and return to this position following each stylus deflection. Stylus pressure is set by Renishaw. The user should only adjust spring pressure in special circumstances e.g. excessive machine vibration or insufficient pressure to support the stylus weight.

To adjust spring pressure, remove the probe head to gain access to the spring pressure adjusting screw. Slacken the locknut, and turn the adjusting screw anticlockwise to reduce pressure (more sensitive) or clockwise to increase pressure (less sensitive).

A stop prevents damage, which could be caused by overtightening the adjusting screw.

Finally tighten the locknut to 1 Nm (0.74 lbf.ft) and replace the probe head.



Align contact pins before connecting probe head.

DO NOT rotate probe head when located in OMP housing

ENSURE THAT THE OMP IS KEPT CLEAN.

DO NOT ALLOW COOLANT OR PARTICLES TO ENTER THE PROBE.

STYLUS SPRING PRESSURE ADJUSTMENT AND USE OF STYLI OTHER THAN CALIBRATION STYLUS TYPE, MAY CAUSE REPEATABILITY TO

SHANK MOUNTING AND STYLUS ON-CENTRE ADJUSTMENT

Two probe/shank mounting configurations are used to obtain the stylus on-centre setting.

1. **Adjusting plate**
   Translational adjustment allows the probe to slide across the shank end face.
2. **Combination of adjusting plate and centre ball**
   Translational adjustment + centre ball pivot, for applications where the stylus stem must be parallel to the side of a bored hole, to avoid stem contact.

Stylus on-centre adjustment

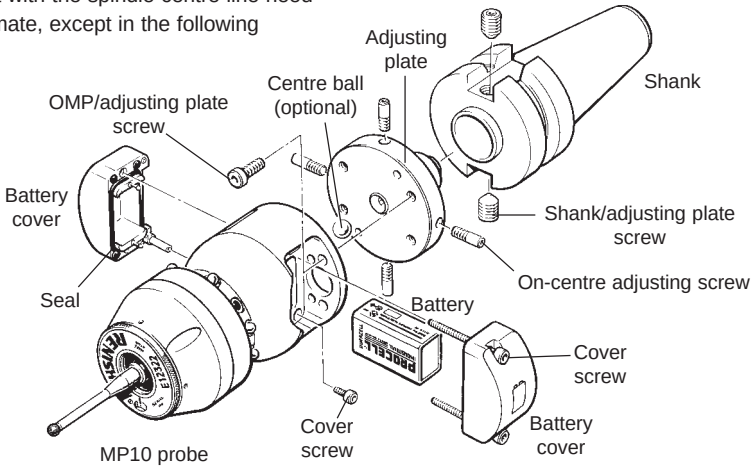
Stylus alignment with the spindle centre line need only be approximate, except in the following circumstances.

1. When probe vector software is used.
2. When the machine control software cannot compensate for an offset stylus.

How to check stylus position

Stylus tip and stem position are established using a low force (less than 0.2 Nm/ 0.045 lbf) dial test indicator or setting gauge.

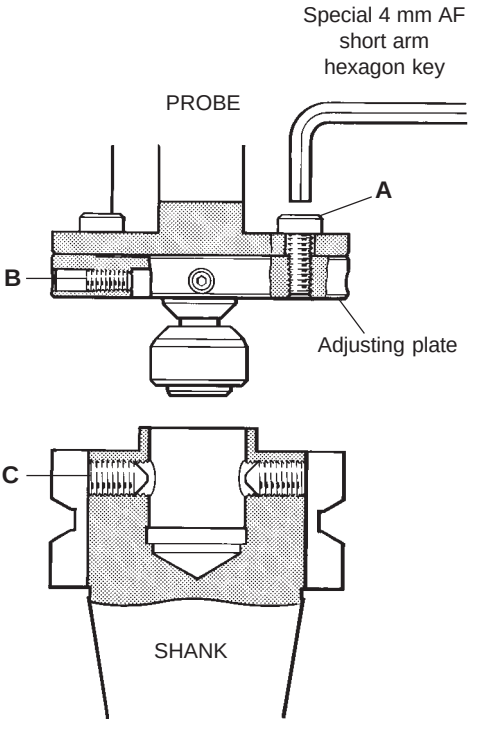
Alternatively rotate the stylus ball against a flat surface. Alignment is good when the stylus ball maintains a consistent distance from the flat surface.



PROBE/SHANK MOUNTING WITH ADJUSTING PLATE

Stage 1 Probe/shank mounting

1. Remove battery covers and battery - see page 1-13.
2. Tighten probe/adjusting plate screws **A** to 5.1 Nm (3.76 lbf.ft) using special 4 mm AF hexagon key (supplied in tool kit).
3. Fully slacken four screws **B**.
4. Grease two screws **C**, and fit into shank.
5. Fit probe onto the shank, and visually position the probe centrally relative to the shank.
   Partially tighten screws **C** to 2 - 3 Nm (1.47 - 2.2 lbf.ft).
6. Mount the probe/shank assembly into machine spindle.



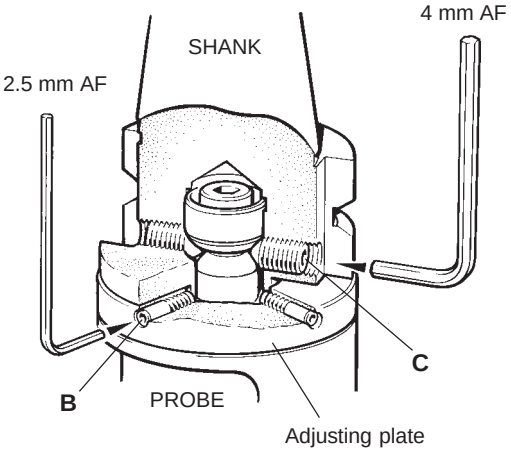
Note :

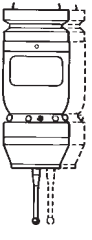
1. DURING ADJUSTMENT CARE SHOULD BE TAKEN NOT TO ROTATE THE PROBE RELATIVE TO THE SHANK.
2. IF A PROBE/SHANK UNIT IS ACCIDENTALLY DROPPED, IT SHOULD BE CHECKED FOR ON-CENTRE POSITION.
3. DO NOT HIT OR TAP THE PROBE TO ACHIEVE ON-CENTRE ADJUSTMENT.

STYLUS ON-CENTRE ADJUSTMENT WITH ADJUSTING PLATE

Stage 2 on-centre adjustment

7. Each of the four screws **B** will move the probe relative to the shank, in the X or Y direction as pressure is applied. Tighten individually, backing off after each movement.
8. 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).
9. For final centering use screws **B** to move the probe, progressively slackening on one side and tightening the opposite screw, as the final setting is approached, using two hexagon keys. Tip run out of 5 µm (0.0002 in) should be achievable.
10. It is important that all four screws **B** are tight or tightened to 1.5 - 3.5 Nm (1.1 - 2.6 lbf.ft) once the final setting has been achieved.
11. When on-centre adjustment is completed, replace battery and covers - see page 1-13.

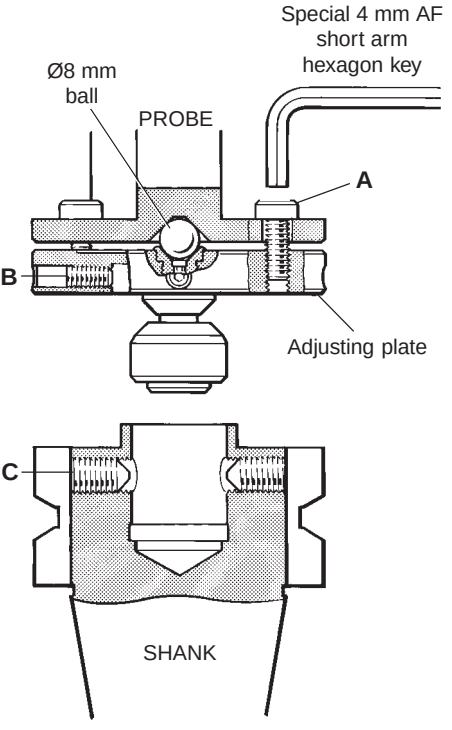




PROBE/SHANK MOUNTING WITH ADJUSTING PLATE + CENTRE BALL

Stage 1 Probe/shank mounting

1. Remove the battery covers and battery - see page 1-13. Then remove the adjusting plate from the probe body.
2. Refit the adjusting plate onto the probe body, with the Ø8 mm centre ball located between the adjusting plate and probe. Tighten fixing screws **A** lightly using special 4 mm AF hexagon key (supplied in toolkit).
3. Fully slacken screws **B**.
4. Grease screws **C**, and fit into shank.
5. Fit the probe with adjusting plate and ball onto the shank and visually position the probe centrally relative to the shank. Partially tighten, screws **C** to 2 - 3 Nm (1.47 - 2.2 lbf.ft)
6. Mount the probe/shank assembly into the machine spindle.



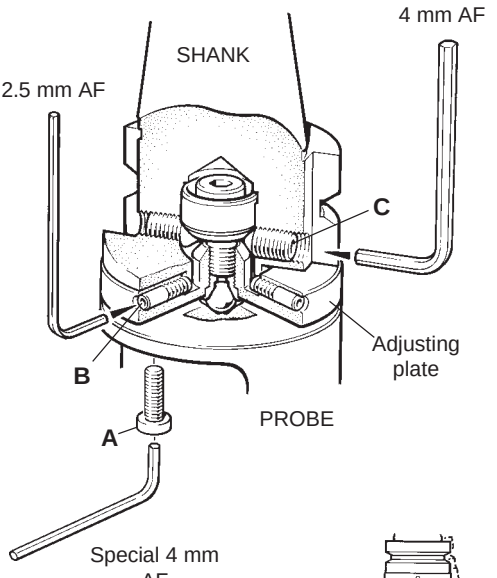
Note :
1. DURING ADJUSTMENT CARE SHOULD BE TAKEN NOT TO ROTATE THE PROBE RELATIVE TO THE SHANK.
2. IF A PROBE/SHANK UNIT IS ACCIDENTALLY DROPPED, IT SHOULD BE CHECKED FOR ON-CENTRE POSITION.
3. DO NOT HIT OR TAP THE PROBE TO ACHIEVE ON-CENTRE ADJUSTMENT.

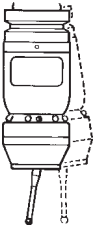
STYLUS ON-CENTRE ADJUSTMENT WITH ADJUSTING PLATE + CENTRE BALL

Stage 2 On-centre adjustment

7. Check the stylus for vertical alignment relative to the bore hole. Adjust screws **A** if alignment is required, and then fully tighten screws **A** to 5.1 Nm (3.76 lbf.ft).
8. Each of the four screws **B** will move the probe relative to the shank, in the X or Y direction as pressure is applied. Tighten individually, backing off after each movement.
9. 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).
10. For final centering use screws **B** to move the probe, progressively slackening on one side and tightening the opposite screw, as the final setting is approached, using two hexagon keys.

    Tip run out of 5 µm (0.0002 in) should be achievable.
11. It is important that all four screws **B** are tight or tightened to 1.5 - 3.5 Nm (1.1 - 2.6 lbf.ft) once the final setting has been achieved.
12. When on-centre adjustment is completed, replace battery and covers - see page 1-13.





PROBE MOVES

A probe trigger signal is generated when the probe is in the operating mode and the stylus is driven against a surface and is deflected. The machine control records the probe contact position and instructs machine motion to stop.

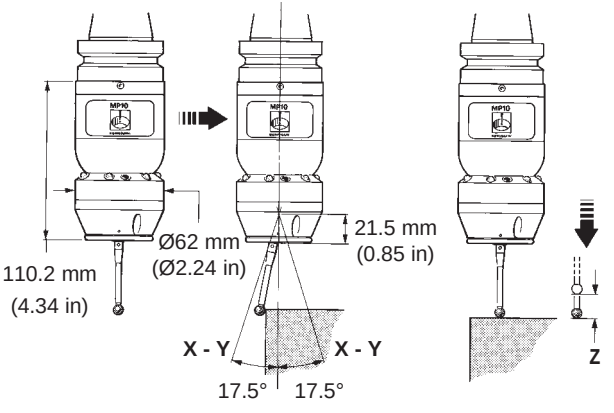
High probing speeds are desirable, however a probing velocity must be chosen which allows the machine to stop within the limits of stylus overtravel. Follow feed rate guidelines given by supplier.

To ensure a trigger signal is given, drive the probe against the workpiece to a target beyond the expected surface, but within the limits of stylus overtravel.

After the probe's stylus touches the surface, reverse clear of the surface.

Probe gauging moves should be made at constant speed.

Single and double touch
If the probe operating sequence is based on a single touch, then the probe may be returned to its start point, following a gauging move.



Stylus overtravel limits		
Stylus length	**X - Y**	**Z**
50 mm (1.96 in)	21.5 mm (0.84 in)	8 mm (0.31 in)
100 mm (3.93 in)	36.5 mm (1.43 in)	8 mm (0.31 in)

Single and double touch (continued)
With some types of controllers, it is an advantage to use the two touch method. The first move finds the surface quickly. Then the probe is reversed to a position clear of the surface, before making the second touch at a slower feed rate, thereby recording the surface position at a higher resolution.

Gauging speed
Gauging speeds are not limited by the transmission system delay, which has a repeatability of less than 2 µs. System delays are constant for each direction measurement is taken. These delays are automatically cancelled out and need not be taken into account, provided a datum move is made in the same direction and velocity as each measurement move.

Signal delay times

1. **Error signal delay**
   A delay of 48 ms maximum for the OMM + MI 12 or 41 ms maximum for the OMI, will elapse between an error occurring and the output indicating error.

2. **Probe signal delay**
   The speeds will be limited by the ability of the machine tool control system to process the probe interface signal, and bring the machine to a halt within the probe overtravel limits.
   There is a nominal delay of 140 µs with a repeatability of 2 µs for each interface, from the time the probe actually operates to the MI 12/OMI interface indicating a probe change of state.
   Enabling the enhanced trigger circuit will add a further nominal 7 milliseconds.

SOFTWARE REQUIREMENTS

VERIFY YOUR SOFTWARE

1-1 Does your software have calibration routines which compensate for stylus on centre errors? If not you must set the probe stylus on centre mechanically.

Note : When using probe styli which are not on spindle centre. Spindle orientation positioning repeatability is important to avoid probe measurement errors.

1-2 Does your software compensate for probe triggering characteristics in all measuring directions.

2-1 JOB SET-UP REQUIREMENTS

Does the software automatically adjust the program coordinate system to the relevant set-up feature on the component.

3-1 INSPECTION REQUIREMENTS

Simple to use canned cycles for standard features :

Bore/boss. Web/pocket. Single surface.

Simple to use canned cycles for optional features :

Angle measurement.
Vector 3 point bore/boss.
Vector single surface.

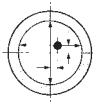
Good software will allow the following functions :

- Update work coordinate systems for positioning.
- Report measured sizes and update tool offsets for automatic tool offset compensations.
- Print data in the form of an inspection report to an external PC/printer.
- Set tolerances on features.

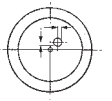
SOFTWARE FOR MACHINING CENTRES
Simple to use canned cycles for basic features

CALIBRATION

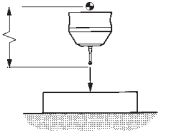
Probe XY offset



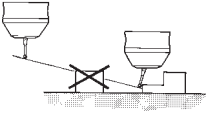
Stylus ball radius



Probe length



PROBE COLLISION PROTECTION

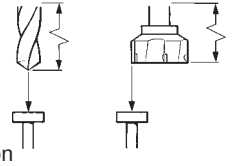


TOOL SETTING PROBE

Length setting (rotating and non rotating)

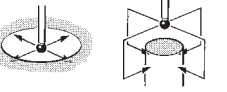
Diameter setting (rotating)

Broken tool detection

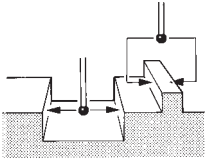


INSPECTION

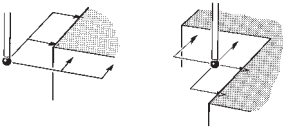
Bore and boss measure



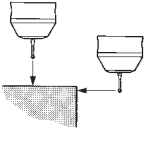
Web and pocket measure



Internal and external corner find



XYZ single surface position



Inspection printout

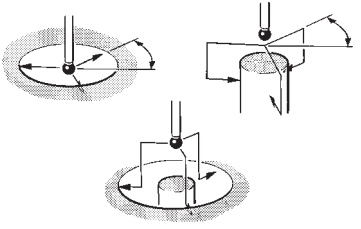
COMPONENT No. 1

OFFSET NO.	NOMINAL DIMENSION	TOLERANCE	DEVIATION FROM NOMINAL	COMMENTS
99	1.5000	.1000	.0105	
97	200.0000	.1000	.2054	OUT OF TOL

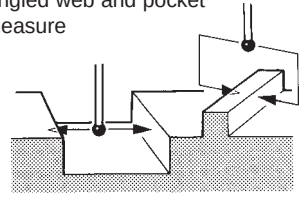
SOFTWARE FOR MACHINING CENTRES
Simple to use canned cycles for additional features

INSPECTION

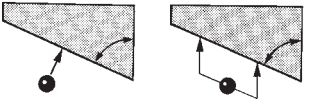
Bore and boss (three point)



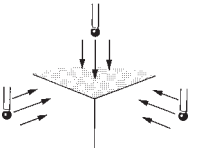
Angled web and pocket measure



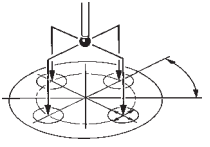
Angled surface measure



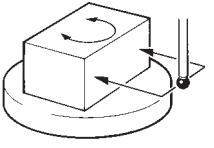
Stock allowance



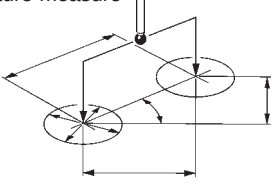
Bore and boss on PCD



4th axis measure

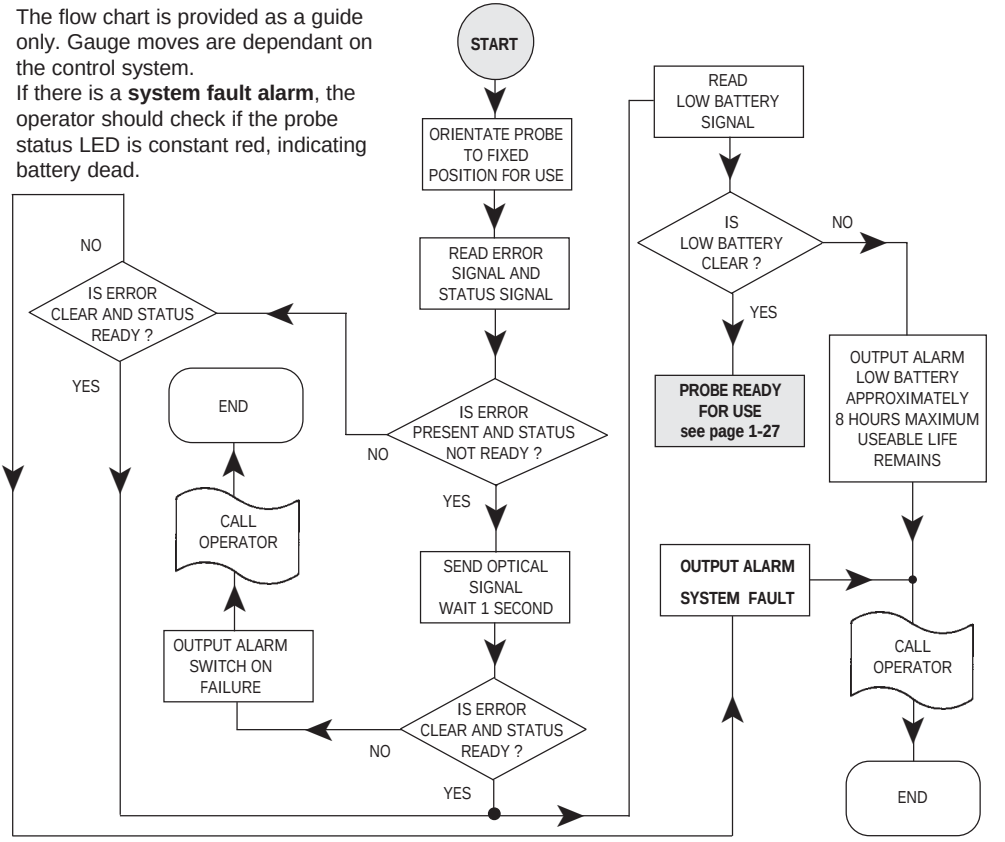


Feature to feature measure



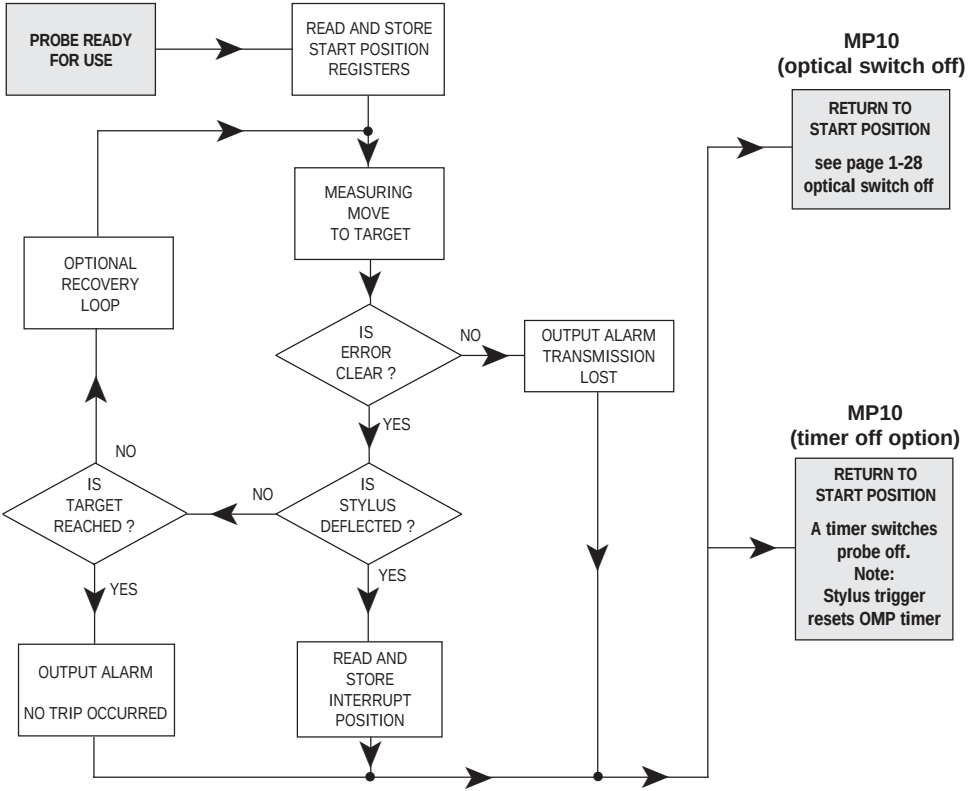
MP10 - OPTICAL ON

The flow chart is provided as a guide only. Gauge moves are dependant on the control system.
If there is a **system fault alarm**, the operator should check if the probe status LED is constant red, indicating battery dead.



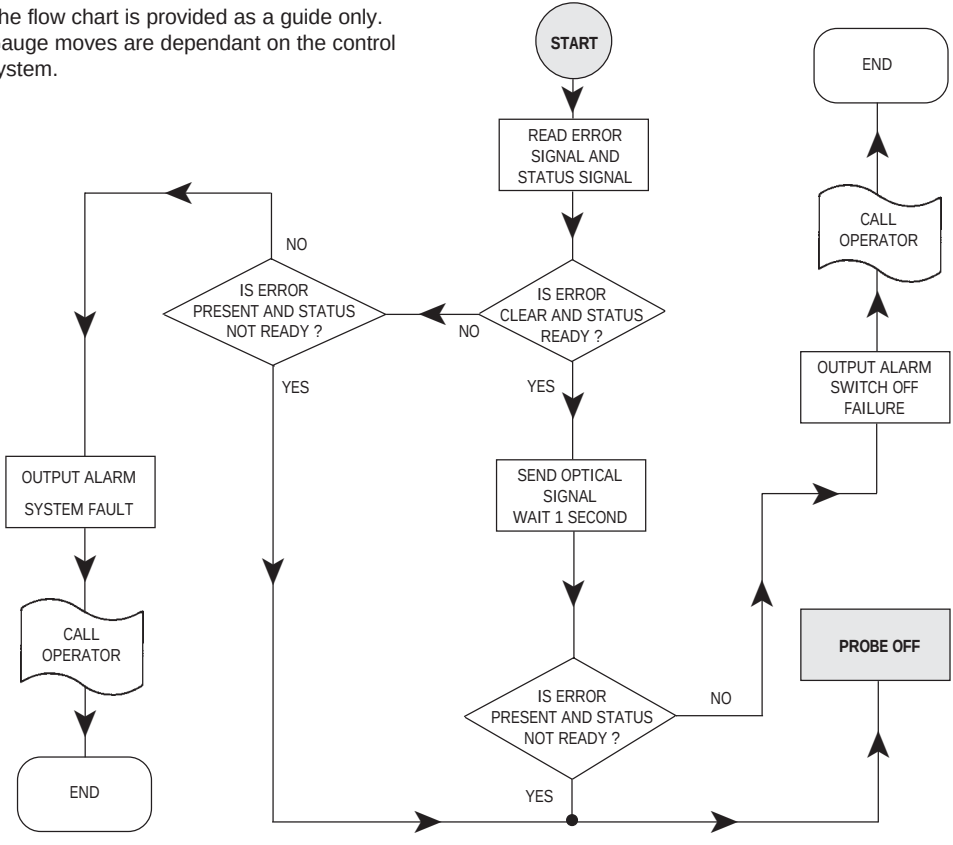
GAUGING MOVES FOR PROBE

The flow chart is provided as a guide only.
Gauge moves are dependant on the control system.



MP10 - OPTICAL OFF

The flow chart is provided as a guide only. Gauge moves are dependant on the control system.



THE PROBE IS A PRECISION TOOL HANDLE WITH CARE
ENSURE THE PROBE IS FIRMLY SECURED IN ITS MOUNTING

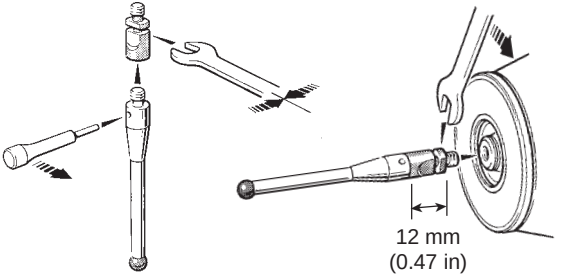
Although Renishaw probes require little maintenance, their performance will be adversely affected if dirt, chips or liquids are allowed to enter the sealed working parts. Therefore keep all components clean and free from grease and oil. Periodically check cables for signs of damage, corrosion or loose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

WEAK LINK FOR STYLI WITH STEEL SHAFT - optional

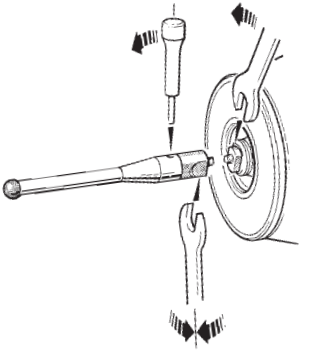
In the event of excessive stylus overtravel the weak link stem is designed to break, thereby protecting the probe from damage.

Fitting stylus with weak link onto probe

Take care to avoid stressing the weak link during assembly - see page 1-32



To remove a broken stem



Note: THE WEAK LINK IS NOT USED WITH CERAMIC SHAFT STYLI

DIAPHRAGM INSPECTION

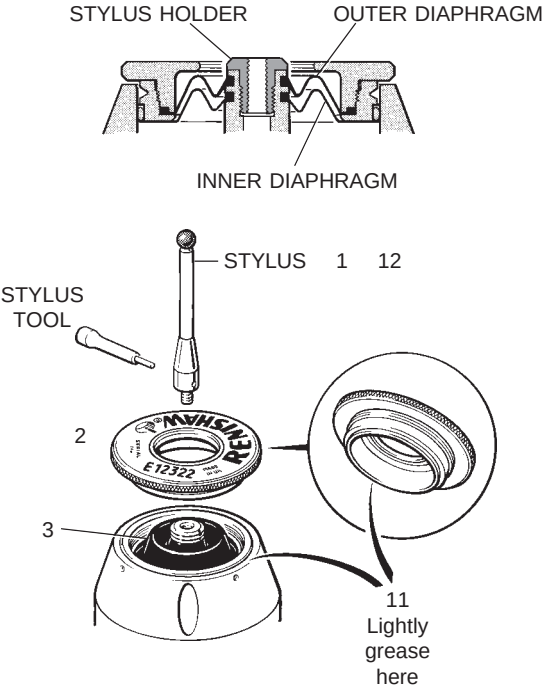
PROBE DIAPHRAGMS

The probe mechanism is protected from coolant and debris by two diaphragms. These provide adequate protection under normal working conditions.

The user should periodically check the outer diaphragm, for signs of damage and coolant leakage. If this is evident replace the outer diaphragm.

The outer diaphragm is resistant to coolant and oils. However, if the outer diaphragm is damaged, the inner diaphragm could become weakened with prolonged immersion in certain coolants and oils.

The user must not remove the inner diaphragm. If damaged, return the probe to your supplier for repair.



WARNING: NEVER ATTEMPT TO REMOVE DIAPHRAGM WITH METAL OBJECTS

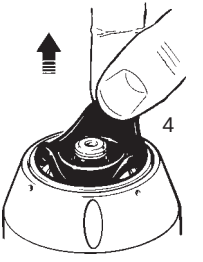
OUTER DIAPHRAGM INSPECTION

1. Remove the stylus.
2. Unscrew the front cover.
3. Inspect outer diaphragm for damage.
4. To remove outer diaphragm, grip near the middle and pull upwards.

INNER DIAPHRAGM INSPECTION

5. Inspect inner diaphragm for damage.

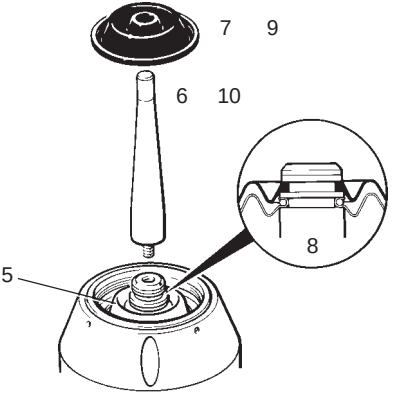
If damaged return the probe to your supplier for repair.



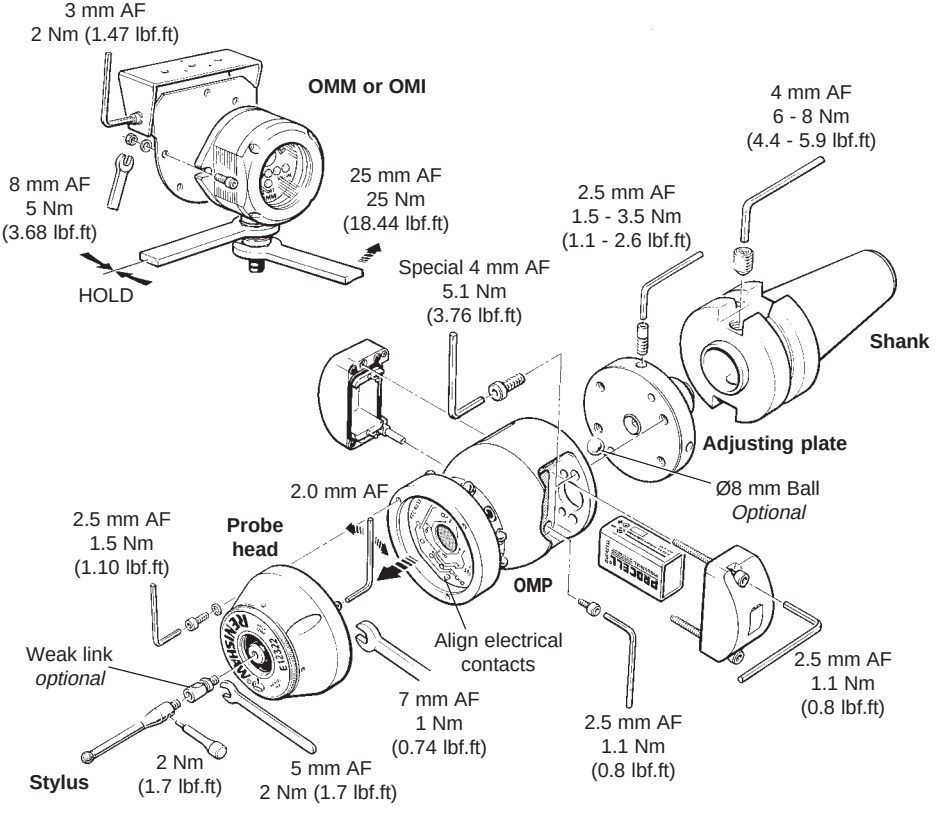
WARNING: DO NOT REMOVE INNER DIAPHRAGM.

OUTER DIAPHRAGM REPLACEMENT

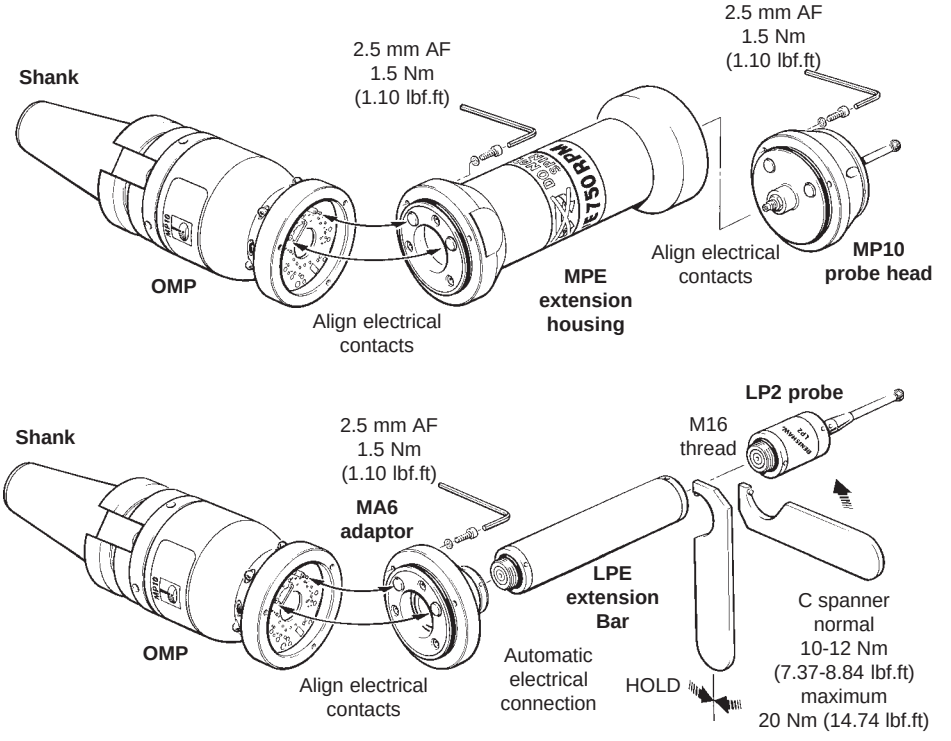
6. Screw tool fully into stylus holder.
7. Fit new diaphragm.
8. The diaphragm must locate centrally in the stylus holder groove.
9. Press diaphragm to expel trapped air.
10. Remove tool.
11. Lightly smear medium grease on front cover lower surface, then refit cover and tighten.
12. Refit stylus.



SCREW TORQUE VALUES - Nm (lbf.ft)



SCREW TORQUE VALUES - Nm (lbf.ft)



FAULT FINDING - If in doubt, consult your probe supplier.

PROBE FAILS TO SWITCH ON	
Probe is already switched on.	If necessary switch probe off.
Dead battery.	Change battery.
Battery installed incorrectly.	Check battery installation.
Probe not properly aligned with OMM/OMI.	Check alignment and if OMM/OMI fixing is secure.
Beam obstructed.	Check if OMM/OMI window is clean/ remove obstruction.
OMM/OMI signal too weak.	See performance envelope. See pages 1-4 and 1-6.
No OMI start signal	See page 1-40.
No power to MI 12 or OMI	Check if stable 24 V supply is available. Check connections and fuses.
PROBE STOPS IN MID-CYCLE	
Beam obstructed.	Check OMI/MI 12 error LED. Remove obstruction.
Probe collision.	Find cause and rectify.
Damaged cable.	Check cables.
Power supply lost.	Check power supply.
Probe unable to find target surface.	Part missing or out of position.

PROBE CRASHES	
Inspection probe using tool setting probe signals.	When two systems active, isolate tool setting probe.
Workpiece obstructing probe path.	Review probe software.
Probe length offset missing.	Review probe software.
POOR PROBE REPEATABILITY	
Debris on part.	Clean part.
Tool change repeatability poor.	Verify probe repeatability using single point move.
Loose mounting of probe on shank/loose stylus.	Check and tighten as appropriate.
Probe orientated 180° from calibrated position, or due to M19 orientation.	Verify probe position, check on-centre setting.
Calibration and update of offsets not occuring.	Review probe software.
Calibration and probing speeds not the same.	Review probe software.
Calibrated feature has moved.	Check position.
Measurement occurs as stylus leaves surface.	Review probe software.

FAULT FINDING - If in doubt, consult your probe supplier.

POOR PROBE REPEATABILITY (continued)	
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 machine.
PROBE FAILS TO SWITCH OFF	
Probe in time out mode.	Wait a minimum 2 min 20 sec for probe to switch off.
Probe placed in carousel, during time out mode can be reset by carousel activity.	User lighter styli. Review use of time out mode.
Probe is inadvertently switched on by OMM/OMI.	Increase distance between probe and OMM/OMI. Reduce OMM/OMI signal strength.
No line of sight between probe and OMM/OMI.	Ensure line of sight is maintained.

PROBE STATUS LED FAILS TO ILLUMINATE	
Battery installed incorrectly.	Check 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 Vdc.
MI 12 LOW BATTERY LED REMAINS ILLUMINATED	
Battery installed incorrectly.	Check battery installation.
Battery dead.	Replace battery.
PROBE STATUS LED REMAINS ILLUMINATED	
Battery voltage below useable level.	Replace battery.

FAULT FINDING - If in doubt, consult your probe supplier.

PROBE IS TRANSMITTING SPURIOUS READINGS

Damaged cables.	Check and replace cable if damage is found.
Electrical interference.	Move transmission cables away from other cables carrying high currents.
System malfunction or inducing intermittent errors.	Shield from intense light sources e.g. xenon beams.
	Electrically isolate 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 power supply.	Ensure power supply is correctly regulated.
Excessive machine vibration.	Eliminate vibration.
Loose mountings or styli.	Check and tighten loose connections.

PROBE FAILS TO RESEAT CORRECTLY

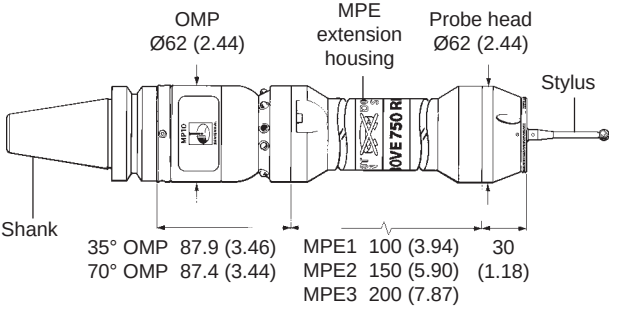
Probe trigger occurred on reseat.	Move stylus clear of workpiece.
Inner and/or outer probe diaphragm is damaged.	Inspect/replace outer diaphragm. Return to supplier if inner diaphragm is damaged.

APPENDIX 1
ADAPTOR AND EXTENSIONS

A maximum of one extension housing or extension bar is permitted per installation

EXTENSION HOUSING

Extension housings allow deeper access into workpiece features. Extension housings fit between the OMP and probe head.



dimensions mm (in)

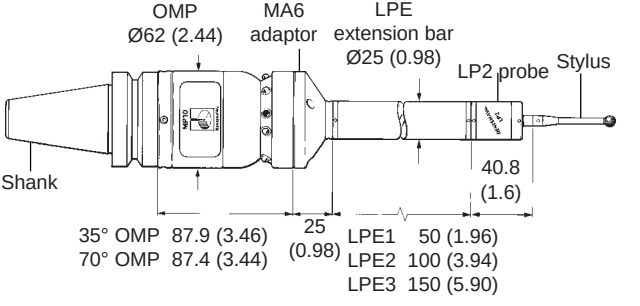
ADAPTOR + EXTENSION BAR

Features with restricted access can be probed using an LP2 probe.

The MA6 adaptor allows an LP2 probe to be used in place of the MP10 probe head, which is removed and replaced with an MA6 + LP2.

Further reach is obtained by adding an LPE extension between the MA6 adaptor and LP2 probe.

MP10 probe head replaced with
MA6 adaptor + LPE extension + LP2 probe

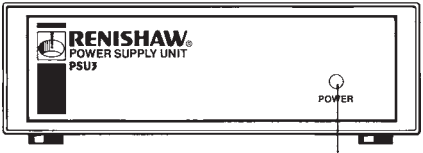


APPENDIX 2
PSU3 POWER SUPPLY UNIT

The PSU3 is fully described in
User's guide H-2000-5057

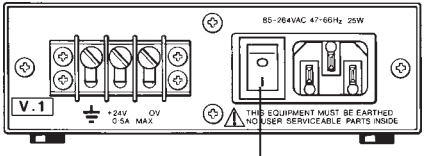
The PSU3 provides a +24 V supply for Renishaw interface units when a power supply is not available from the CNC machine control.

Front View



Power LED
When the green LED is lit, the power supply is on.

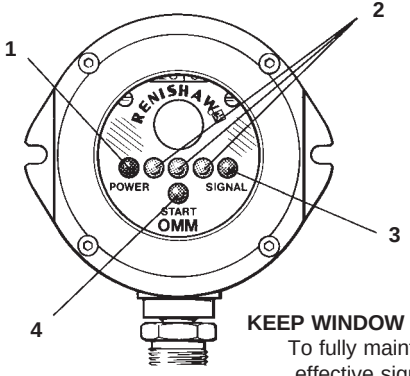
Rear View



Mains switch
On/off

APPENDIX 3
OMM (OPTICAL MODULE MACHINE)

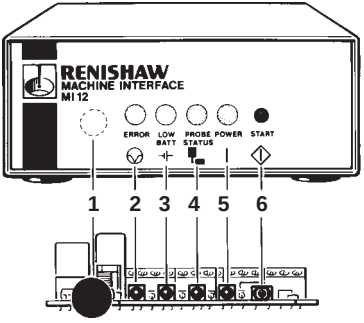
The OMM is fully described in
User's guide H-2000-5044



KEEP WINDOW CLEAN
To fully maintain effective signal transmission

1. **Red LED**
   Lit when power is on.
2. **LEDs x 3**
   Transmit infrared control signals to the probe.
3. **Green LED**
   Lit when signal is received from the probe.
4. **Yellow LED**
   Lit when the MI 12 sends a start, error, reset signal to the probe.

APPENDIX 4
MI 12 INTERFACE UNIT
The MI 12 is fully described in
User's guide H-2000-5073



MI 12

MI 12-B

1. **Audible indicator (bleeper)**
   The speaker is behind the front panel.

2. **LED error**
   Lit when optical beam obstructed, probe out of range, probe switched off, etc.

3. **LED low battery**
   Replace probe battery as soon as practicable, after this LED lights up.

4. **LED probe status**
   Lit when probe is seated.
   Off when stylus is deflected or an error has occurred.

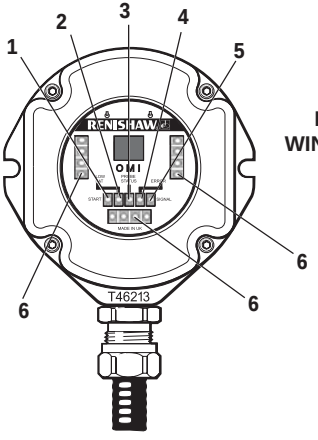
5. **LED power**
   Lit when power is on.

6. **Start button - switch SW1**
   Manual start push button.
   Press button to switch system to operating mode. Alternatively a signal from the machine control can be used for the same purpose.

APPENDIX 5
OMI (OPTICAL MACHINE INTERFACE)
The OMI is fully described in
User's guide H-2000-5062

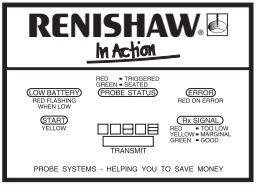
1. **LED (yellow) – START signal status.**
   Lit when a START signal is transmitted to the probe.
   This LED will either flash once when a machine controlled START signal is commanded, or flash continuously at one second intervals when the system is set to 'Auto–Start' mode and is awaiting a probe 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 commence flashing on and off 4 times per second.
   Replace the OMP battery as soon as is practicable after the LED starts flashing.



KEEP THE WINDOW CLEAN

MAGNETIC LABEL



To assist the machine operator, a summary of OMI LED activity is provided on a magnetic label. The label is simply placed on an easily viewed flat metal surface.

3. LED (red, green) – PROBE STATUS.

This bicolour LED is lit when the OMI 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) – ERROR.

Lit when an error condition exists.

i.e. optical beam obstructed, probe out of optical range, probe has switched off or battery is exhausted.

When an error condition exists the probe status output will be held in a triggered state and the probe status LED will be RED.

The error LED illuminating will coincide with the error output device changing state.

5. LED (red, yellow, green) – Infrared SIGNAL strength received from probe.

As long as there is power to the system, this LED will always be lit. It is a tricolour LED and indicates as follows :

Red - Signal received from the probe is *either* too weak *or* not there at all (i.e. no signal).

Yellow - Signal received is marginal. i.e. The OMI is at the edge of its operating envelope. Correct operation in this region cannot be guaranteed.

Green - Signal received is good and system will operate correctly.

Note :

1. During a start transmission, the SIGNAL LED will change through red to yellow and green.
   This is the normal power up sequence.
2. The SIGNAL LED will flash (yellow or green) if optical interference is being received whilst the probe is not transmitting.

6. LED x 3 groups (clear)

These LEDs transmit infrared control signals to the probe.

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

Type	Part No.	Description
MP10 kit	A-2033-1101	MP10 35° probe + battery, stylus, OMM, MI 12 interface and toolkit.
MP10 kit	A-2033-1102	MP10 70° probe + battery, stylus, OMM, MI 12 interface and toolkit.
MP10	**A-2033-1099**	MP10 35° probe + battery and Ø8 mm centre ball - **factory set to time out**.
MP10	**A-2033-1100**	MP10 70° probe + battery and Ø8 mm centre ball - **factory set to time out**.
MP10	**A-2033-1115**	MP10 35° probe + battery and Ø8 mm centre ball - **factory set to optical off**.
MP10	**A-2033-1116**	MP10 70° probe + battery and Ø8 mm centre ball - **factory set to optical off**.
MP10 OMP	A-2085-0080	MP10 35° OMP kit and accessories.
MP10 OMP	A-2085-0081	MP10 70° OMP kit and accessories.
		ACCESSORIES
Stylus	A-5000-3709	PS3-1C ceramic stylus 50 mm long with Ø6 mm ball.
		- Styli are fully listed in Renishaw Styli guide H-1000-3200.
W link kit	A-2085-0068	Weak link kit comprising: Two stylus weak link stems and spanner.
Weak link	M-2085-0069	Stylus weak link stem.
Spanner	P-TLO9-0007	Spanner for stylus weak link stem.
Battery	P-BT03-0001	9V alkaline battery.
DK1	A-2051-7105	Probe outer diaphragm replacement kit.
Shank mtg	A-2107-0123	Stainless steel shank adaptor kit.
Tool kit	A-2085-0020	Probe tool kit for MP10 comprising: Ø1.98 mm stylus tool and hexagon keys 1.5 mm AF, 2.0 mm AF, 2.5 mm AF (two), 3.0 mm AF and 4.0 mm AF (short).
OMM	A-2033-0576	OMM complete with cable Ø5.1 mm x 25 m (Ø0.2 in x 82 ft).
Win kit	A-2115-0002	OMM/OMI window replacement kit.

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

Type	Part No.	Description
		ACCESSORIES continued
MP10	A-2085-0064	MP10 battery replacement kit.
PCB kit	A-2031-0043	OMM PCB replacement kit.
OMI	A-2115-0001	OMI complete with cable 8 m long (26.2 ft).
Extn cable	M-2115-0045	Extension cable 10 m long (32.8 ft long) 12 x 7/0.2 for OMI.
Extn cable	M-2115-0046	Extension cable 20 m long (65.6 ft long) 12 x 7/0.2 for OMI.
Mtg brkt	A-2033-0830	OMM/OMI mounting bracket complete with fixing screws, washers and nuts.
MI 12	A-2075-0142	MI 12 interface unit.
MI 12-B	A-2075-0141	MI 12 interface board.
Panel mtg	A-2033-0690	Panel mounting kit for MI 12 interface unit.
PSU3	A-2019-0018	PSU3 power supply unit 85-264 V input.
		EXTENSIONS and ADAPTOR
MPE1	A-2033-6571	MPE1 extension housing Ø62 x 100 mm long with holding screws and washers.
MPE2	A-2033-6595	MPE2 extension housing Ø62 x 150 mm long with holding screws and washers.
MPE3	A-2033-6667	MPE3 extension housing Ø62 x 200 mm long with holding screws and washers.
MA6	A-2063-7774	MA6 adaptor - allows LP2 probe to be used in place of MP10 probe.
LPE1	A-2063-7001	LPE1 extension bar Ø25 x 50 mm long.
LPE2	A-2063-7002	LPE2 extension bar Ø25 x 100 mm long.
LPE3	A-2063-7003	LPE3 extension bar Ø25 x 150 mm long.
		SOFTWARE
Software	—	Probe software for machine tools - **See Data sheet H-2000-2289.**

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

RENISHAW
apply innovation™

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

H-2000-5059-05