Installation and user's guide
H-2000-5085-02-I

RENISHAW
apply innovation™

MP7 - MP8 - MP9 probe systems

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MP7 - MP8 - MP9 probe systems

CE

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

MP 7 - 8 - 9 PROBE SYSTEMS

The probe touch-trigger mechanism and operating envelope are common to all types. However to suit different operational requirements, each type incorporates a unique probe switch-on/switch-off method.

MP7 Spin-on/spin-off.
MP8 Shank pressure switch-on/switch off.
MP9 Spin-on/timer-off.

MP7 - MP9 CENTRIFUGAL SWITCH

The centrifugal switch incorporated in MP7 and MP9 probes rattles when the probe body is shaken. This is quite normal and should not be the cause of any concern.

WARRANTY

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

CARE OF THE PROBE

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

CHANGES TO EQUIPMENT

Renishaw reserves the right to change specifications without notice.

PROBE IP RATING X8

CNC MACHINE

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

PATENT NOTICE

Features of MP7-8-9 probes and features of similar probes are the subjects of the following patents and or patent applications.

EP 0390342 JP 2,945,709 US 5,040,931
EP 0695926 US 5,669,151

SAFETY

ELECTRICAL
Only qualified persons should adjust switches or replace fuses.

Remove the mains supply from units before removing covers.

OPERATOR
MP8 probes should only be rotated by hand or standard spindle orientation, when mounted in the machine spindle.

Contents

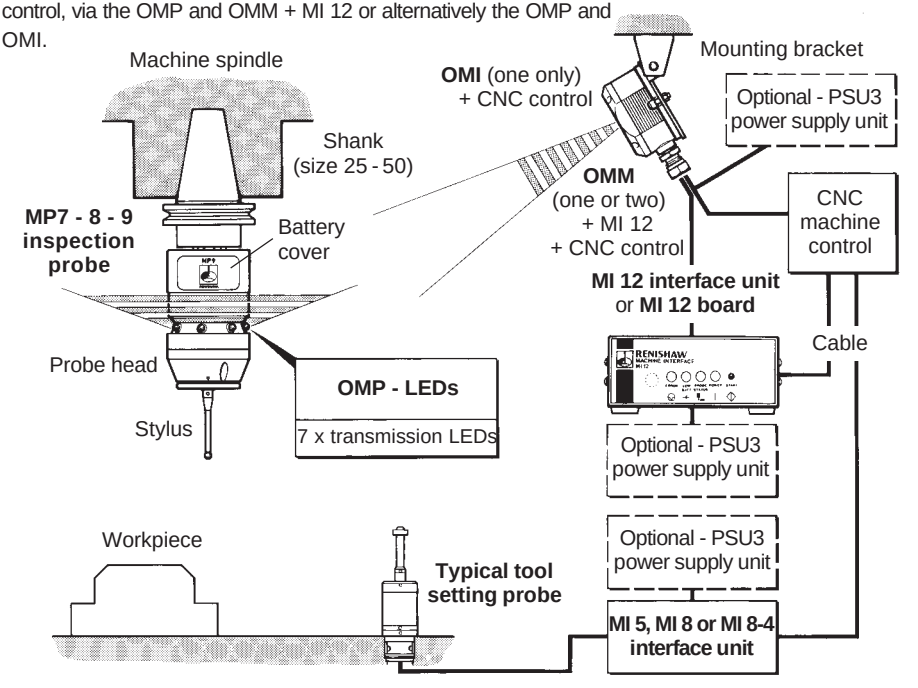
TYPICAL PROBE SYSTEMS

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's control, via the OMP and OMM + MI 12 or alternatively the OMP and OMI.

see pages 39 and 41

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



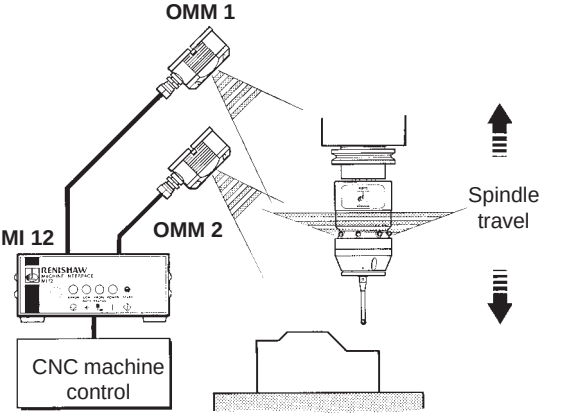
TWO OMMs and REMOTE INDICATOR

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.

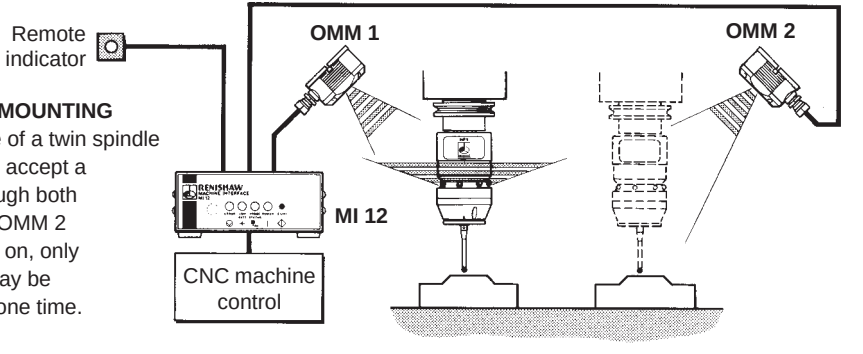
REMOTE INDICATOR

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.



SYSTEM PERFORMANCE

PROBE REPEATABILITY

Maximum 2 sigma (2σ) value

Repeatability of 1.0 µm (40 µin) 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 force	4.2 N/420 gf (14.83 ozf)

STYLUS OVERTRAVEL

See page 21

OPTICAL SIGNAL RANGE

Minimum 10 mm (0.39 in)
Maximum 3 metres (9.84 ft)

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 multi-coloured LED.

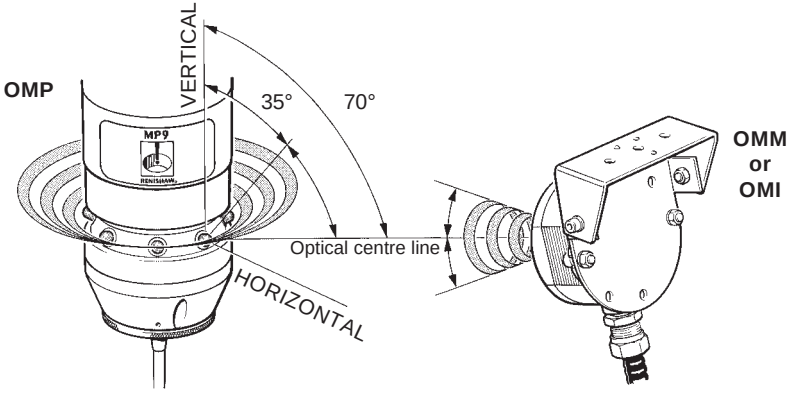
ENVIRONMENT

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)

BATTERY ™Duracell MN1604	TEMPERATURE
Storage **- Short term** **- Long term**	 –30 °C to 70 °C (–22 °F to 158 °F) 5 °C to 40 °C (41 °F to 104 °F)
Operating	10 °C to 40 °C (50 °F to 104 °F)
Operating life	See page 18
Shelf life	2.1/2 years at 20 °C (68 °F)

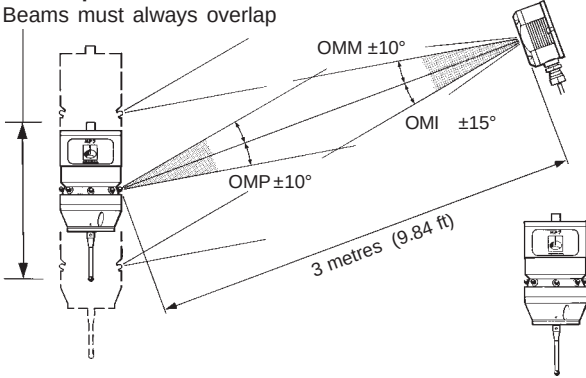
™Duracell Trademark of Duracell Batteries Ltd.

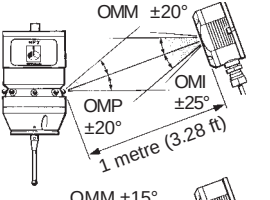
OPERATING ENVELOPE for MP7 - 8 - 9 PROBES with 35° or 70° OUTPUT

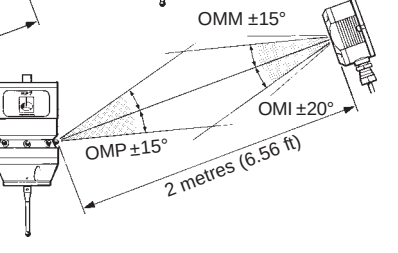


Spindle travel

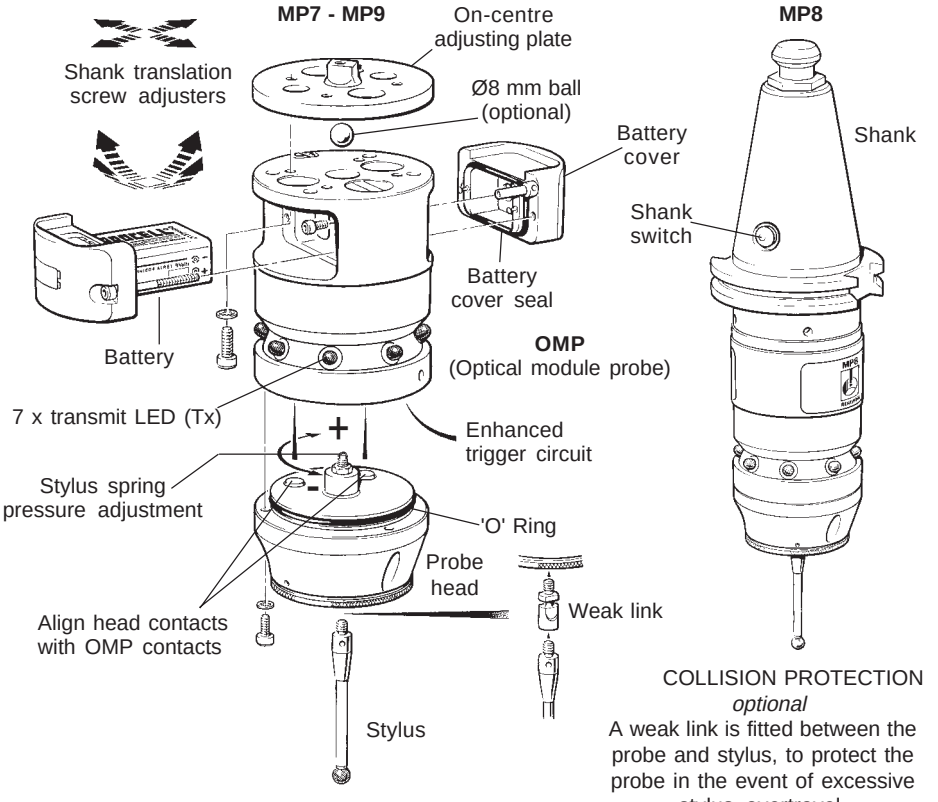
Beams must always overlap







PROBE FEATURES



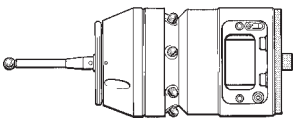
COLLISION PROTECTION

optional

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

MP7 - 9 with CENTRE BALL ADJUSTMENT

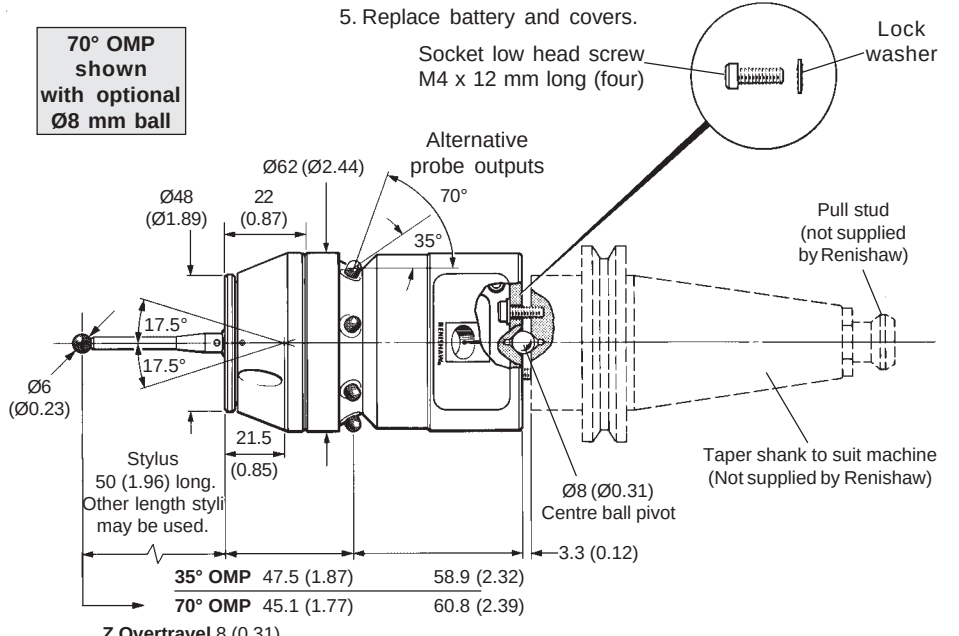
dimensions mm (in)



TO FIT SHANK

1. Remove battery covers and battery.
2. Remove adjusting plate.
3. Fit shank and centre ball to probe.
4. Set stylus on-centre position - see page 20.
5. Replace battery and covers.

70° OMP shown with optional Ø8 mm ball



Z Overtravel 8 (0.31)

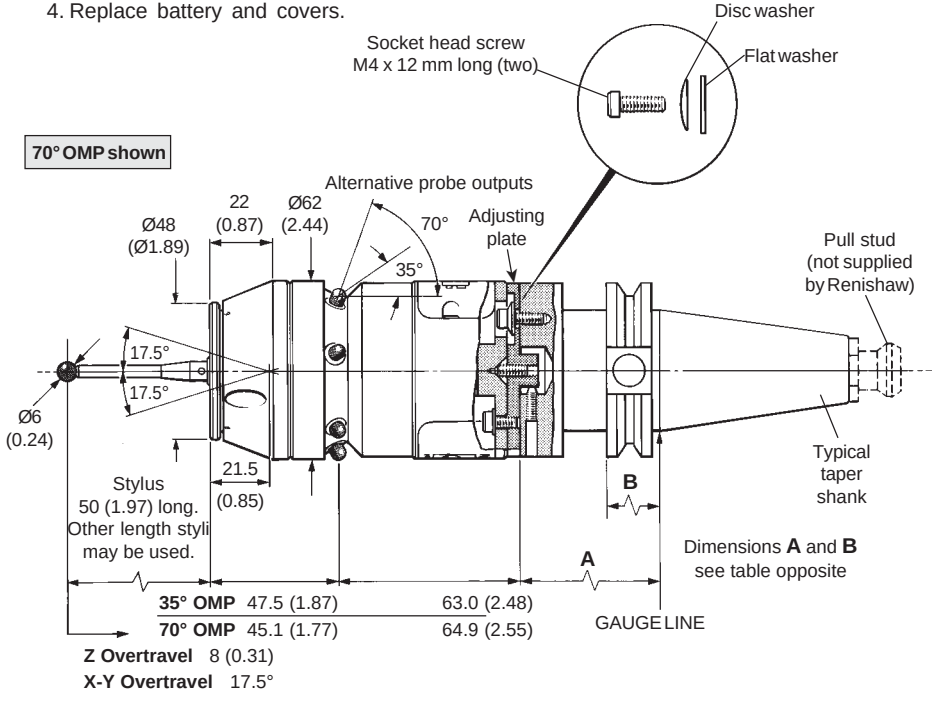
X-Y Overtravel 17.5°

MP7 - 9 with ADJUSTING PLATE

dimensions mm (in)

TO FIT SHANK

1. Remove battery covers and battery.
2. Fit shank to probe.
3. Set stylus on-centre position - see page 19.
4. Replace battery and covers.

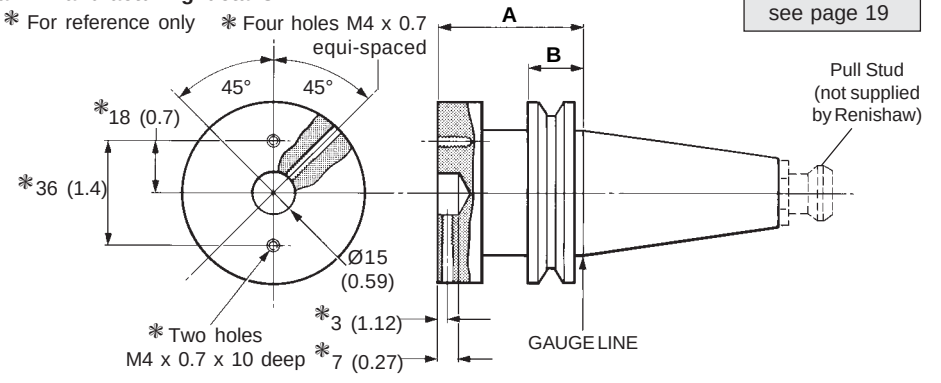


MP7 - 9 with ADJUSTING PLATE and TAPER SHANK

dimensions mm (in)

Shank mounting see page 19

Shank manufacturing details

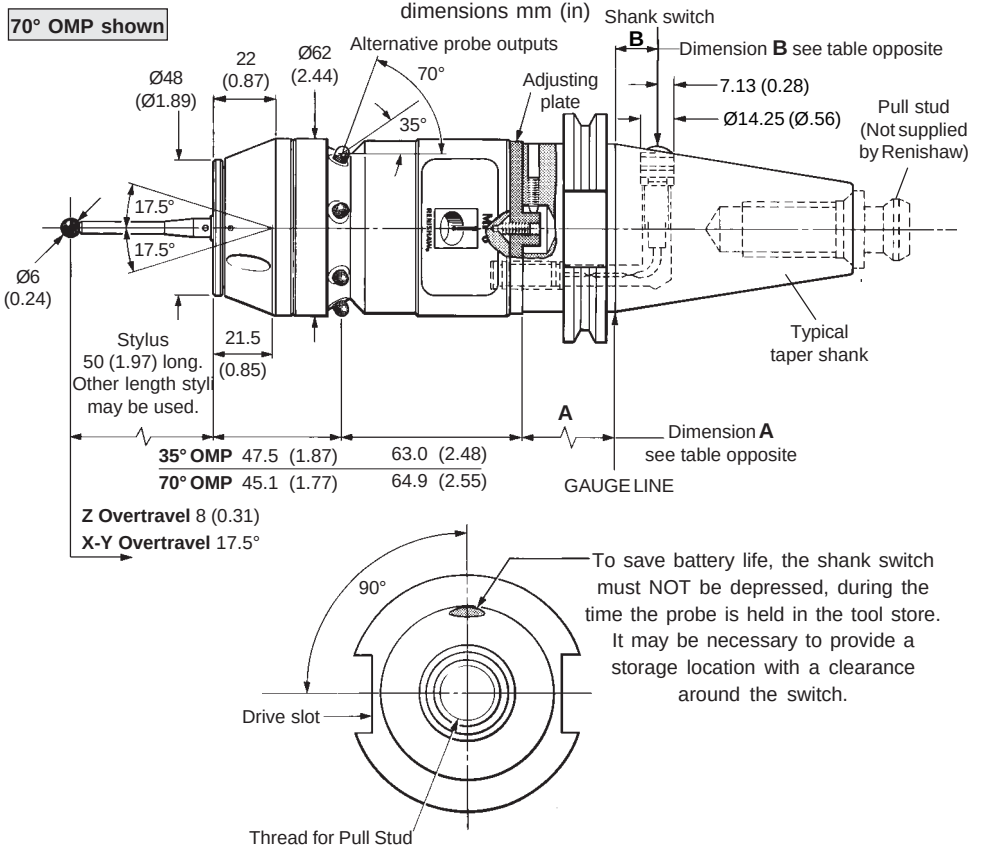


Shanks available from Renishaw - Please quote the Part No. when ordering equipment

Shank	Part No.	Taper	A	B
DIN 69871	M-2033-6637	40	50 (1.969)	19.1 - 19.0 (0.752 - 0.748)
	M-2033-6636	45	50 (1.969)	19.1 - 19.0 (0.752 - 0.748)
	M-2033-6635	50	50 (1.969)	19.1 - 19.0 (0.752 - 0.748)
ANSI B5.50 - 1985	M-2033-7031	40	50 (1.969)	19.1 - 19.0 (0.752 - 0.748)
(CAT)	M-2033-7032	45	50 (1.969)	19.1 - 19.0 (0.752 - 0.748)
	M-2033-7033	50	35 (1.377)	19.1 - 19.0 (0.752 - 0.748)
BT	M-2033-6445	40	40 (1.575)	27 (1.063)
	M-2033-6446	45	45 (1.772)	33 (1.299)
	M-2033-6447	50	50 (1.969)	38 (1.496)

MP8 with ADJUSTING PLATE and TAPER SHANK

dimensions mm (in)



MP8 PROBE/SHANK UNITS

dimensions mm (in)

MP8 probe/shanks available from Renishaw - Please quote the Part No. when ordering equipment

Part No. MP8 probe/shank with battery and tool kit.	Probe output	Description			
		Shank specification	Shank ISO taper size	Dimensions A	Dimensions B
A-2033-6812	35°	BT	40	35 (1.38)	14 (0.55)
A-2033-6704	35°	BT	50	50 (1.97)	24 (0.94)
A-2033-7104	35°	ANSI B5.50 - 1985 (CAT)	40	35 (1.38)	14 (0.55)
A-2033-0802 ▲	35°	ANSI B5.50 -1985 (CAT)	50	65 (2.56)	36.8 (1.45)
A-2033-6765 ▲	35°	DIN 69871	40	50.6 (1.99)	14 (0.55)
A-2033-6771 ▲	35°	DIN 69871	50	50.6 (1.99)	36.8 (1.45)
A-2033-7191 ✻	35°	ANSI (CAT) MODIFIED	40	35 (1.38)	14 (0.55)
A-2033-0799 ▲ ✻	35°	ANSI (CAT) MODIFIED	50	65 (2.56)	36.8 (1.45)
A-2033-6815	70°	BT	40	35 (1.38)	14 (0.55)
A-2033-7192	70°	BT	50	50 (1.97)	24 (0.94)
A-2033-0806	70°	ANSI B5.50 - 1985 (CAT)	40	35 (1.38)	14 (0.55)
A-2033-0808	70°	ANSI B5.50 - 1985 (CAT)	50	35 (1.38)	36.8 (1.45)
A-2033-6773 ▲	70°	DIN 69871	40	50.6 (1.99)	14 (0.55)
A-2033-6778 ▲	70°	DIN 69871	50	50.6 (1.99)	36.8 (1.45)
A-2033-0803 ✻	70°	ANSI (CAT) MODIFIED	40	35 (1.38)	14 (0.55)
A-2033-0805 ✻	70°	ANSI (CAT) MODIFIED	50	35 (1.38)	36.8 (1.45)

▲ These kits are more commonly used.

✻ These shank specifications are for certain Cincinatti Milacron machines. Generally to ANSI B5.50 - 1985 (CAT), but with a metric thread for the pull stud.

MP7 - 8 - 9 ENHANCED TRIGGER CIRCUIT

Only qualified persons should change settings

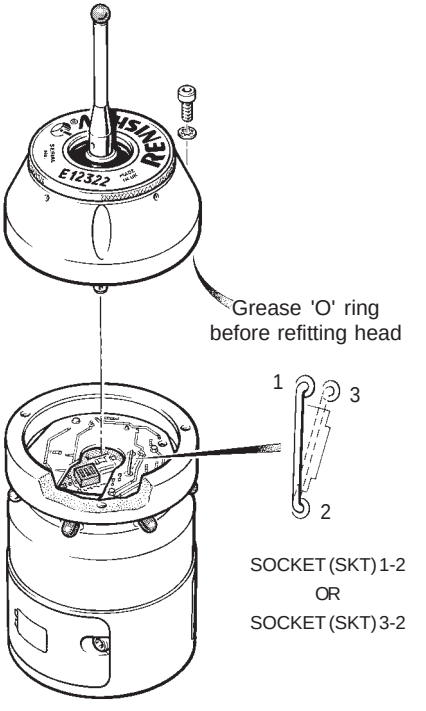
Probes subjected to high levels of vibration or shock loads, may release spurious readings. The enhanced trigger circuit improves the probes resistance to these effects.

To enable or disable the enhanced trigger circuit, remove the probe head to gain access to the wire link. Then manually transfer the link from SKT 1-2 (disabled), to SKT 3-2 (enabled) or vice versa.

When the enhanced trigger circuit is changed from enabled to disabled or vice versa, the probe output delay is changed, therefore it is essential the probe be recalibrated prior to its first use, using the software routines shown on page 23.

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

DO NOT TOUCH ELECTRONIC COMPONENTS WHEN CHANGING SETTINGS.



MP7 and MP9	Factory set	**Disabled**	SKT 1-2
MP8	Factory set	**Enabled**	SKT 3-2

MP7 - 8 - 9 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.

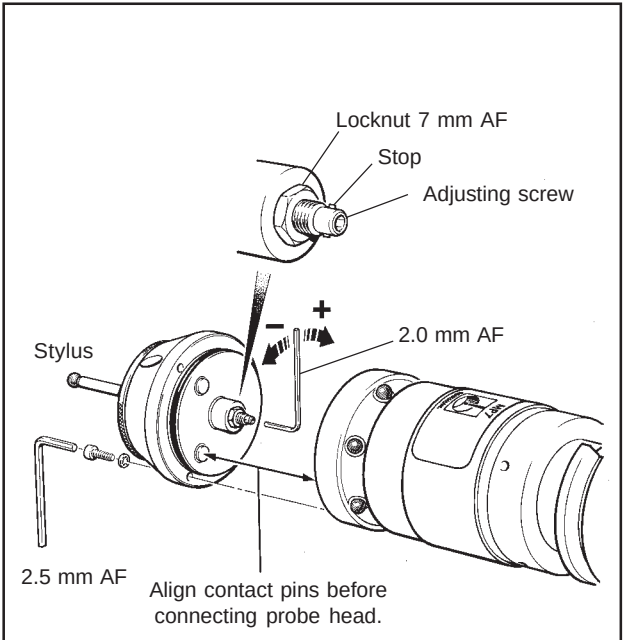
Stylus pressure is set by Renishaw. The user should only adjust spring pressure in special circumstances e.g. excessive machine vibration or insufficient pressure to support the stylus weight.

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.

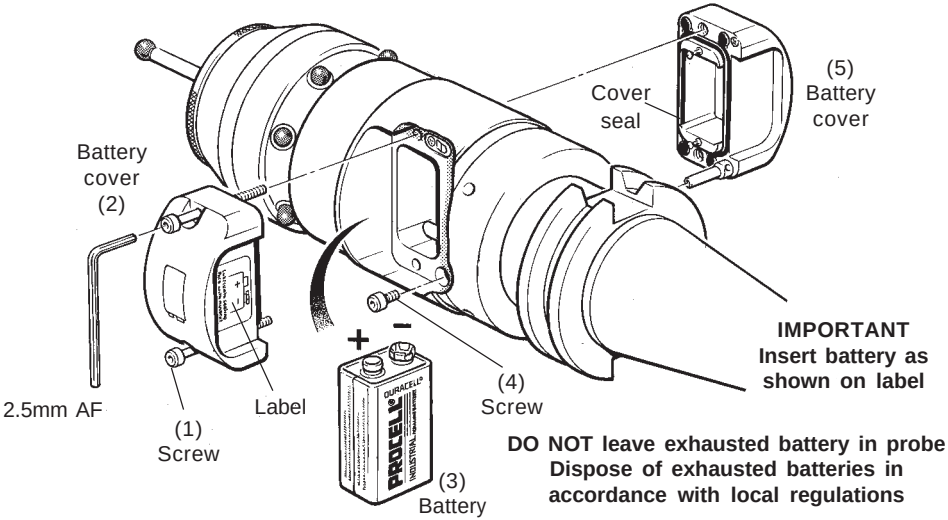
Finally tighten the locknut to 1 Nm (0.74 lbf.ft) and replace the probe head.

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 DIFFER FROM THE TEST CERTIFICATE RESULTS.



MP7 - 8 - 9 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 page 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).

MP7 - 8 - 9 BATTERY LIFE EXPECTANCY
Alkaline battery
Duracell type MN 1604 or equivalent

STAND-BY LIFE		5% USAGE - 72min/day				CONTINUOUS LIFE	
		MP7 - MP8		MP9		MP7 - MP8 - MP9	
Minimum	**Typical**	**Minimum**	**Typical**	**Minimum**	**Typical**	**Minimum**	**Typical**
458 days	764 days	42 days	70 days	33 days	50 days	53 hrs	92 hrs

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

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 40 and 42.

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.

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

MP7 - 8 - 9 STYLUS ON-CENTRE ADJUSTMENT USING ADJUSTING PLATE

Stylus alignment with the spindle's 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.
3. The stylus must be parallel to the spindle axis to prevent stylus stem contact against the side of deep holes - see page 20.

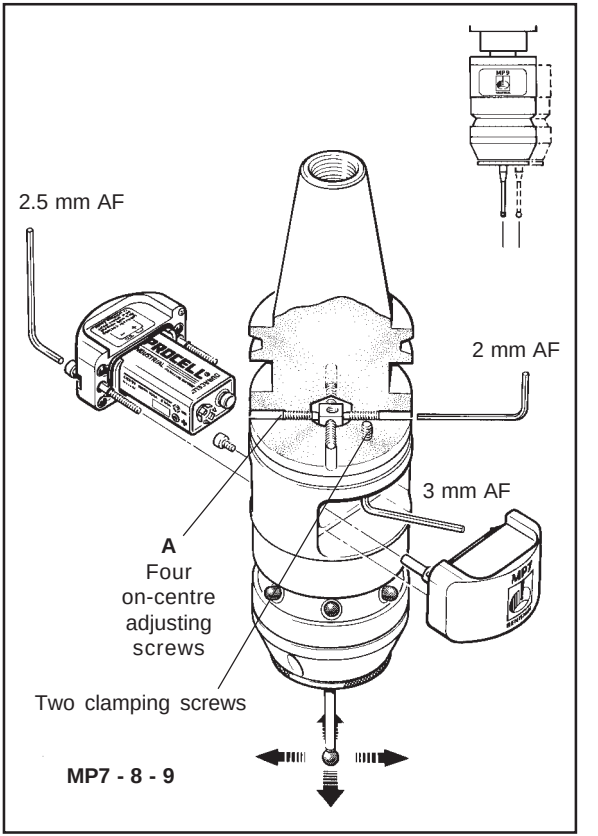
How to check stylus position

Mount the probe in the machine spindle and use one of the following procedures.

1. Rotate stylus close to a reference surface, check if the gap is constant.
2. Rotate stylus against low force dial test indicator, which does not unseat the probe.
3. Use method advised by machine tool supplier.

Adjustment

1. If adjustment is required, remove the battery covers and battery.
2. Slacken the two probe/shank clamping screws half of one turn, so that the disc washers maintain a slight clamping grip.
3. There are four adjusting screws **A**. Each will move the probe relative to the shank, in the X or Y direction as pressure is applied. Tighten individually. Back off after each movement.
4. When stylus target position is obtained, tighten all screws - see page 33.
5. Replace battery and battery covers.



MP7 - MP9 STYLUS ON-CENTRE ADJUSTMENT USING CENTRE BALL - OPTIONAL

Stylus alignment - see page 19
The centre ball is used for applications where the stylus stem must be parallel with the spindle centre line.

The probe body pivots on a centre ball, which allows the stylus stem to be set parallel to the side of a bored hole, to avoid stem contact.

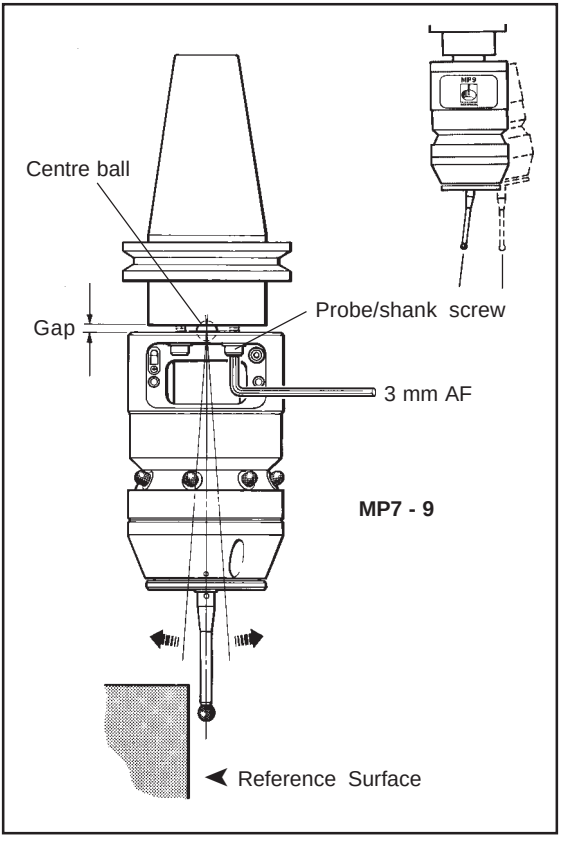
How to check stylus position
See page 19.

Adjustment
1. If adjustment is required, remove the battery covers and battery.
2. Slacken and adjust the four probe/shank screws to realign the probe head.
4. When the stylus target position is obtained, tighten all screws - see page 33.
5. Replace the battery and battery covers.

ALL MP7 and MP9 PROBES

IF A PROBE/SHANK UNIT IS ACCIDENTALLY DROPPED, IT SHOULD BE CHECKED FOR ON-CENTRE POSITION.

DO NOT HIT OR TAP THE PROBE TO ACHIEVE ON-CENTRE ADJUSTMENT



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.

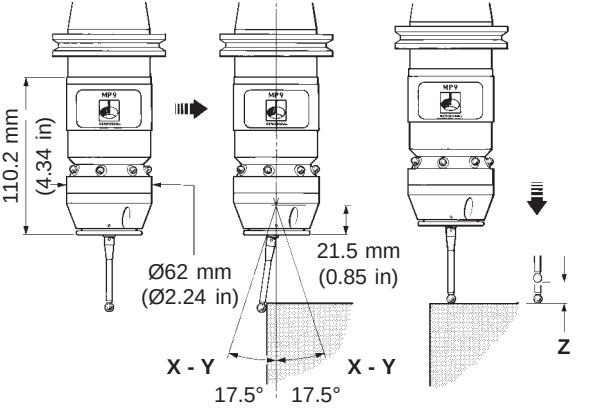
High probing speeds are desirable, however a probing velocity must be chosen which allows the machine to stop within the limits of stylus overtravel. Follow feed rate guidelines given by supplier.

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 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)

PROBE MOVES

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. The probe is then 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. Activating 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 co-ordinate 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.

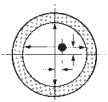
Good software will allow the following functions:

- Update work co-ordinate 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.

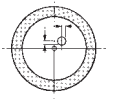
SOFTWARE for MACHINING CENTRES
Simple to use canned cycles for basic features

CALIBRATION

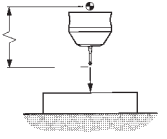
Probe XY offset calibration



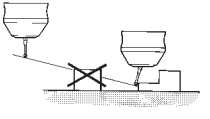
Stylus ball radius calibration



Probe length calibration



PROBE COLLISION PROTECTION

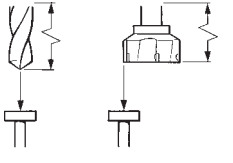


TOOL SETTING PROBE

Length setting (rotating and non rotating)

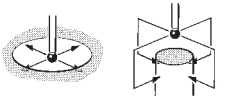
Diameter setting (rotating)

Broken tool

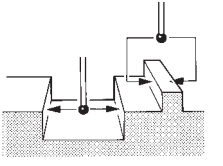


INSPECTION

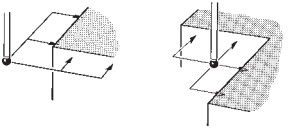
Bore and boss measure



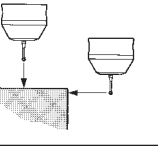
Web and pocket measure



Internal and external corner find



XYZ single surface position



Inspection print-out

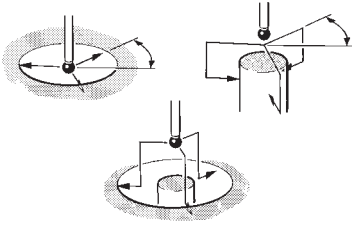
COMPONENT No. 1

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

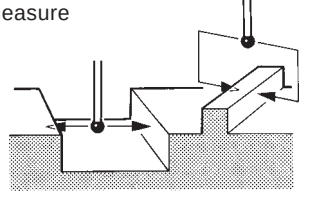
SOFTWARE for MACHINING CENTRES
Simple to use canned cycles for additional features

INSPECTION

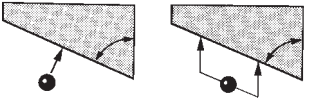
Bore and boss (three point)



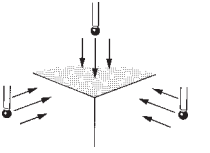
Angled web and pocket measure



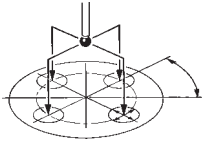
Angled surface measure



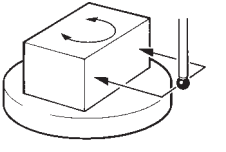
Stock allowance



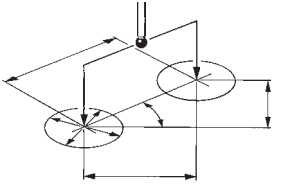
Bore and boss on PCD



4th axis measure



Feature to feature measure



MP7 - 8 - 9 MODES of OPERATION

Modes of operation
Probes have 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.

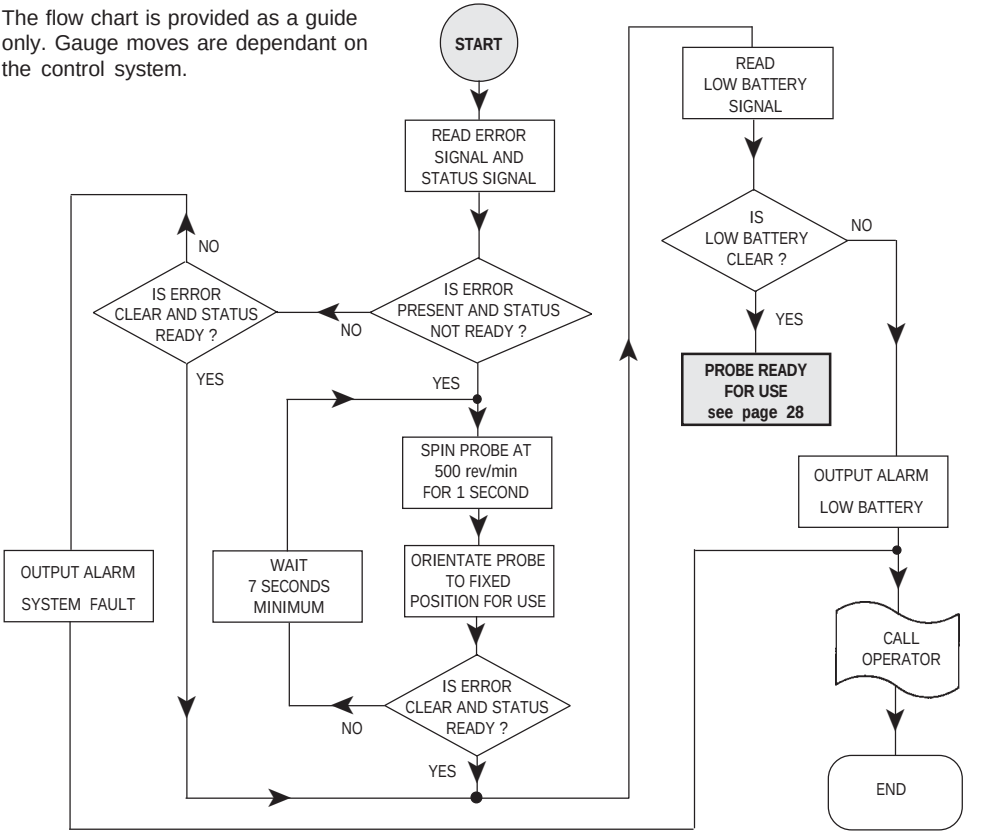
Probe power on/off
Probe power switch on/off, only occurs when the probe is located in the machine's spindle.

MP7, MP8 and MP9 time delays
Following probe switch-on, a minimum 7 seconds must elapse before switch-off. A further minimum 7 seconds must elapse before the probe can be switched on again.

SWITCH-ON	SWITCH-OFF
MP7 and MP9 Spin the probe for a minimum one second, and a maximum 4 seconds at 500 rev/min ±10%. A centrifugal switch, switches the probe on.	**MP7** Spin the probe for a minimum one second, and a maximum 4 seconds at 500 rev/min ±10% to switch the probe off. **MP9** A timer allows the probe to remain on for 3 minutes (± 1 min 10 sec). The timer will be reset for a further 3 minutes probe available, each time the stylus is triggered during its operating cycle. Following a clear 3 minutes after switch-on, or 3 minutes after the last probe trigger, the system 'times out' and switches the probe off.
MP8 A pressure switch incorporated in the shank, automatically switches the probe on, whenever the shank is placed in the machine spindle.	**MP8** The shank switch is released and switches the probe off, when the probe is removed from the machine spindle. The shank switch must not be held depressed during storage in the tool changer.

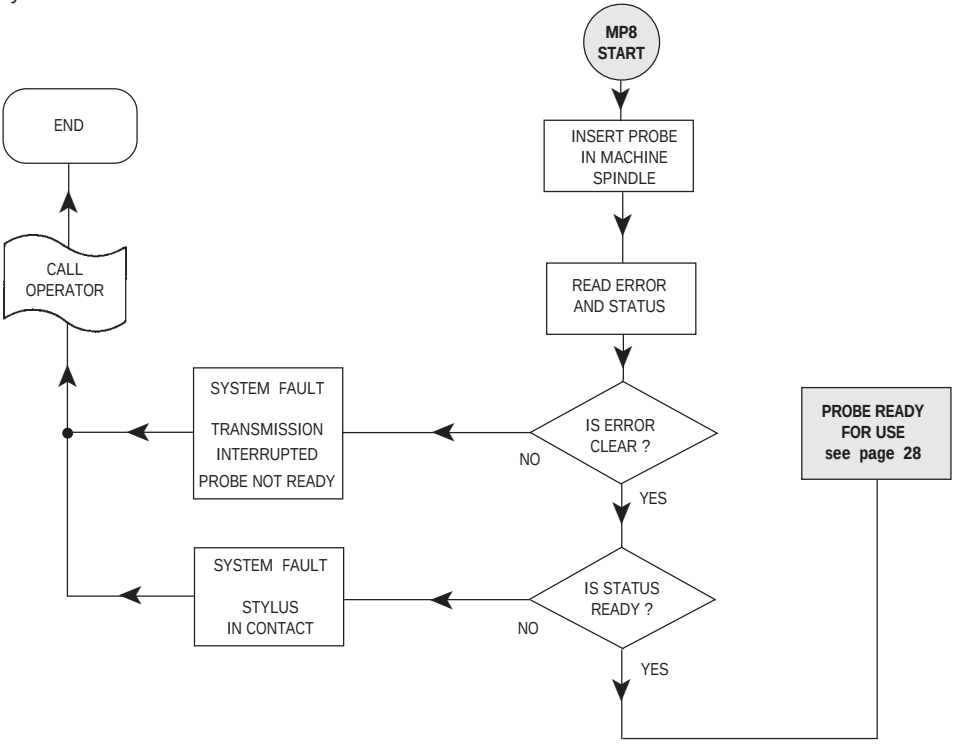
MP7 - 9 SPIN ON

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



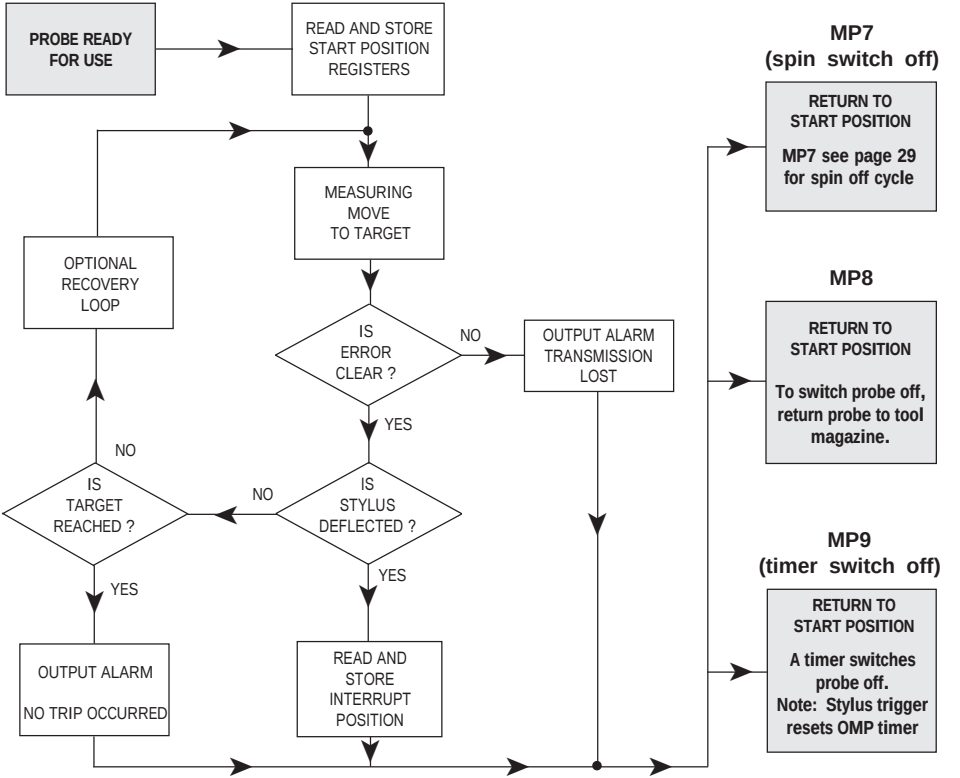
MP8 SHANK SWITCH ON

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



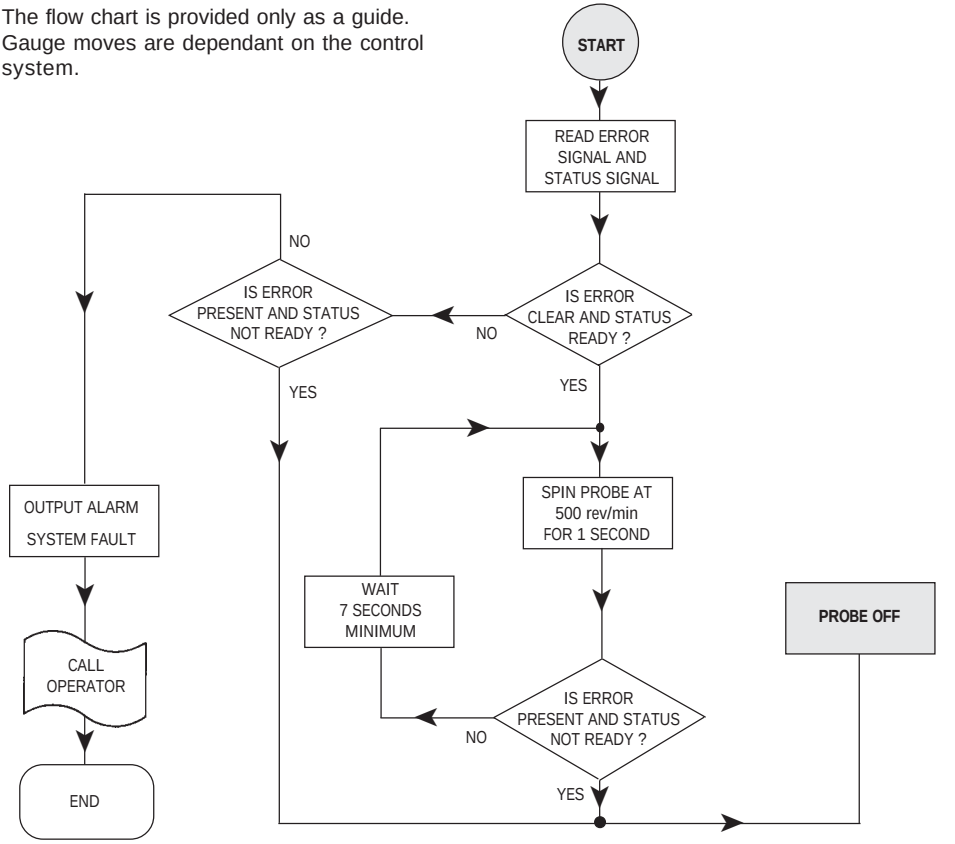
GAUGING MOVES FOR PROBE

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



MP7 SPIN OFF

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



SERVICE and MAINTENANCE

SAFETY
SWITCH POWER OFF WHEN WORKING INSIDE ELECTRICAL COMPONENTS

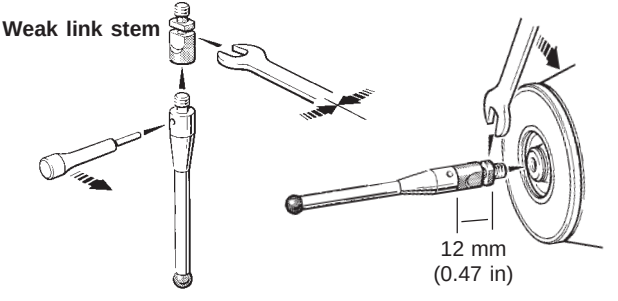
THE PROBE IS A PRECISION TOOL HANDLE WITH CARE
ENSURE THE PROBE IS FIRMLY SECURED IN ITS MOUNTING

Although Renishaw probes require little maintenance, the performance of the probe 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.

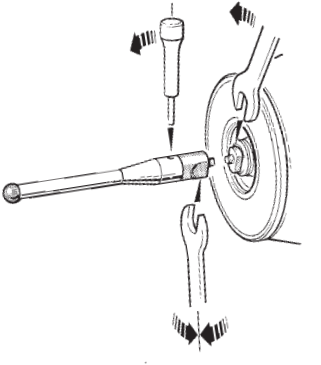
WEAK LINK FOR STYLI WITH STEEL SHAFT - Optional

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 33



To remove a broken stem



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

DIAPHRAGM INSPECTION

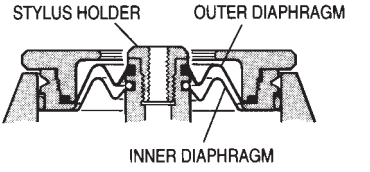
PROBE DIAPHRAGMS

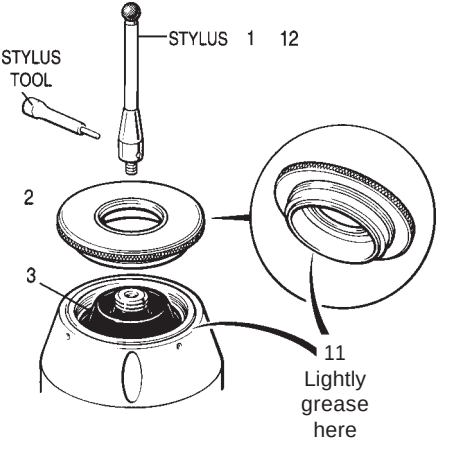
The probe mechanism is protected from coolant and debris by two diaphragms, these provide adequate protection under normal working conditions.

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

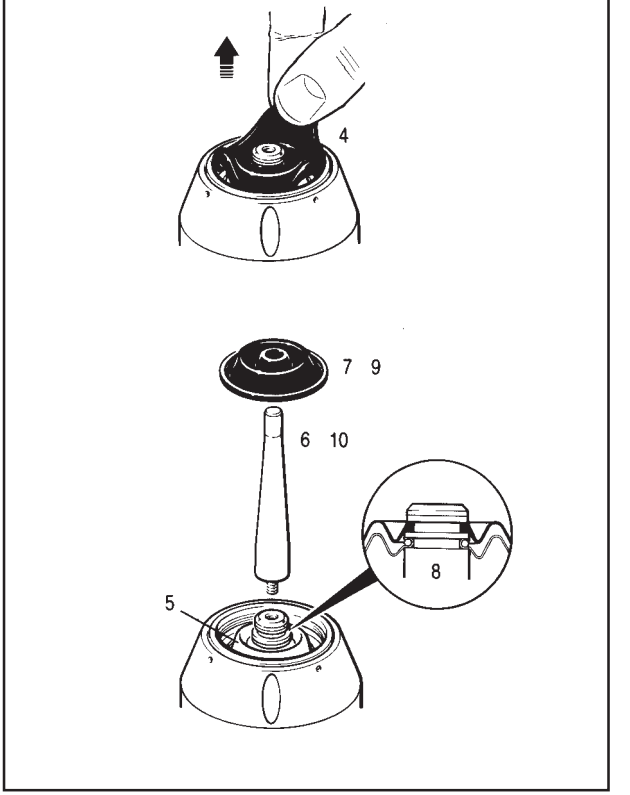
5. Inspect inner diaphragm for damage.

If damaged return the probe to your supplier for repair.

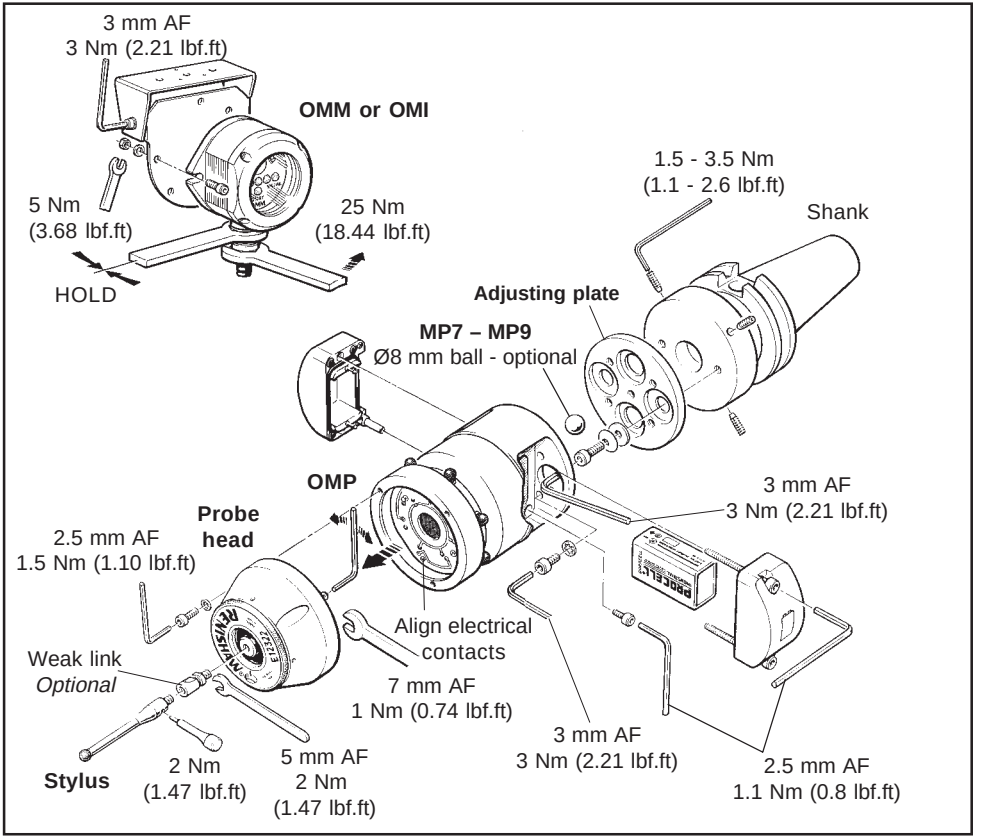
DO NOT REMOVE INNER DIAPHRAGM

OUTER DIAPHRAGM REPLACEMENT

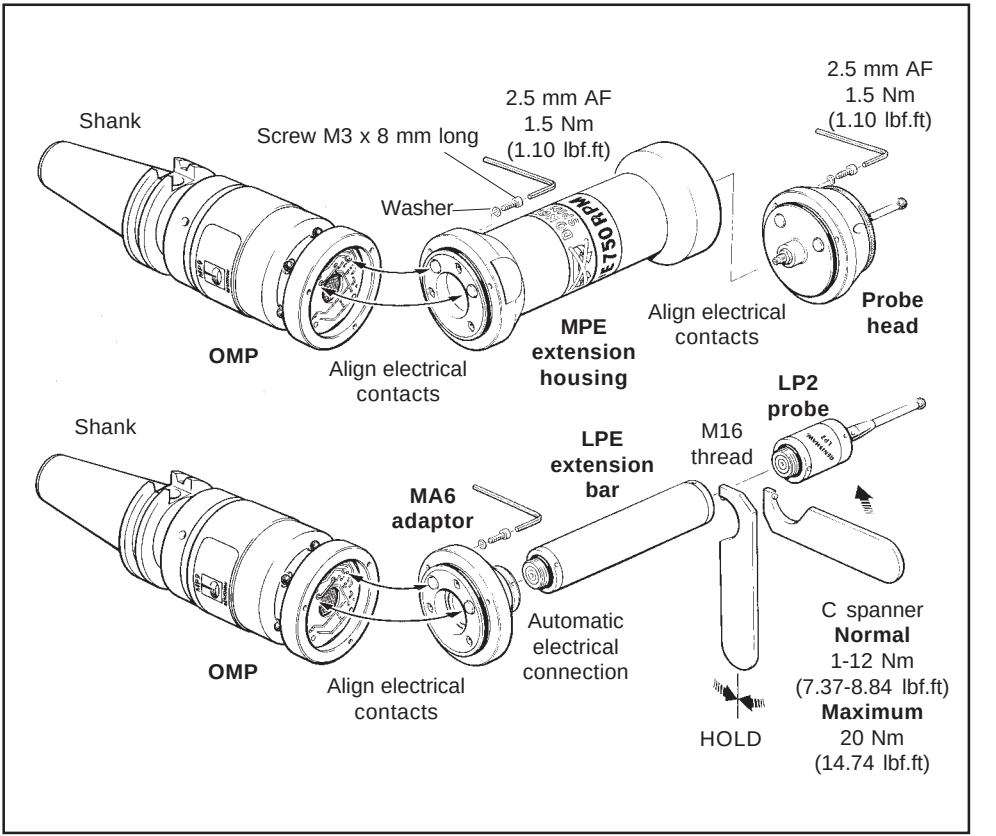
6. Screw tool fully into stylus holder.
7. Fit new diaphragm.
8. The diaphragm must locate centrally in the stylus holder groove.
9. Press diaphragm to expel trapped air.
10. Remove tool.
11. Lightly smear medium grease on front cover lower surface. Then refit cover and tighten.
12. Refit stylus



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 page 8.
No OMI start signal.	See page 41.
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 toolsetting 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 occurring.	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 the 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 3 min (±1 min 10 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 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 is 24 Vdc.
MI 12 LOW BATTERY LED REMAINS ILLUMINATED	
Battery Installed incorrectly.	Check battery installation.
Battery dead.	Replace battery.

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

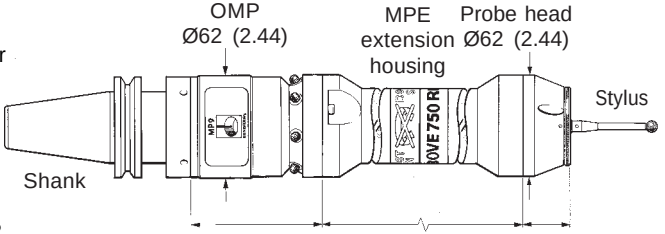
PROBE IS TRANSMITTING SPURIOUS READINGS	
Damaged cables.	Check and replace cable if damage is found.
Electrical or optical interference.	Move transmission cables away from other cables carrying high currents.
System malfunctioning or inducing intermittent xenon beams.	Shield from intense light sources e.g. errors.
	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 correctly regulated. power supply.	Ensure power supply is
Excessive machine vibration.	Eliminate vibration.
Loose mountings or styli. loose connections.	Check and tighten
PROBE FAILS TO RESEAT CORRECTLY	
Probe trigger occurred on reseat.	Move stylus clear of workpiece.
Inner and/or outer probe diaphragm is damaged. inner diaphragm	Inspect/replace outer diaphragm. Return to supplier if is damaged.

APPENDIX 1
ADAPTOR and EXTENSIONS

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

EXTENSION HOUSING

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

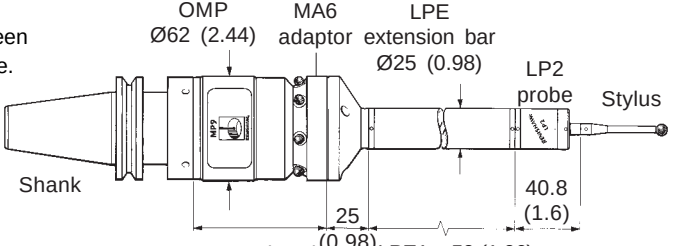


35° OMP 87.9 (3.46) MPE1 100 (3.94) 30
70° OMP 87.4 (3.44) MPE2 150 (5.90) (1.18)
MPE3 200 (7.87)

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
MP7, MP8 or MP9 probe head, which is substituted with an
MA6 + LP2.
Further reach is obtained by adding an LPE extension between the MA6 adaptor and LP2 probe.

MP7-8-9 probe head replaced with
MA6 adaptor + LPE extension + LP2 probe



35° OMP 87.9 (3.46) LPE1 50 (1.96)
70° OMP 87.4 (3.44) LPE2 100 (3.94)
LPE3 150 (5.90)

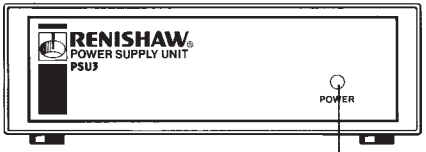
dimensions mm (in)

APPENDIX 2
PSU3 POWER SUPPLY UNIT

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

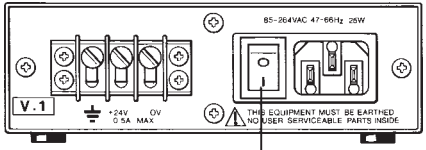
The PSU3 provides a +24 V supply for Renishaw interface units when a power supply is not available from the CNC machine control.

Front view



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

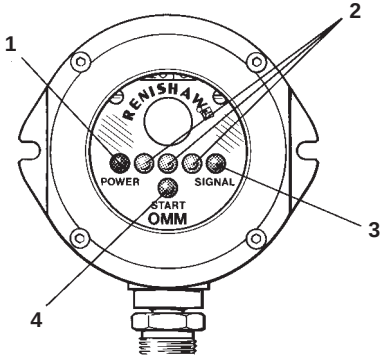
Rear view



Mains switch
On/Off

APPENDIX 3
OMM (OPTICAL MODULE MACHINE)

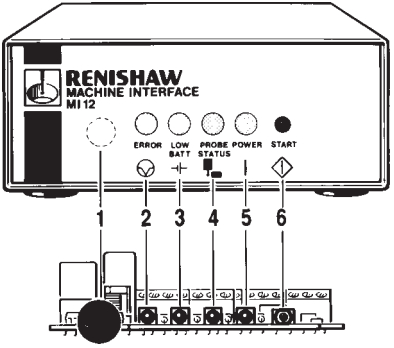
The OMM is fully described in User's guide H-2000-5044



KEEP WINDOW CLEAN
To fully maintain effective signal transmission

1. **Red LED**
   Lit when power is on.
2. **LEDs x 3**
   Transmit infra-red 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.

5. 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

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

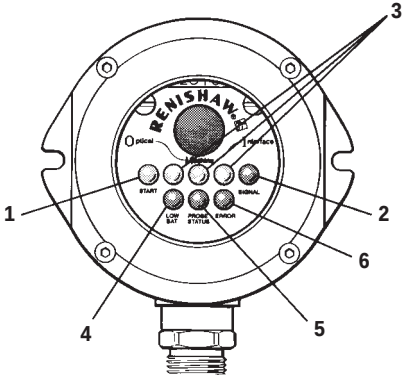
   Red - Signal received from the probe is *either* too weak *or* not there at all (i.e. no signal).

   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.



KEEP WINDOW CLEAN

To fully maintain effective signal transmission

MAGNETIC LABEL

To assist the machine operator, a summary of OMI LED activity is provided on a magnetic label, which may be attached to the machine tool.

3. LED (clear x 3)

These LEDs transmit infra-red control signals to the probe.

4. 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.

5. LED (red, green) – PROBE STATUS.

This bi–colour 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.

6. 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.

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

Type	Part No.	Description
MP7 system	A-2033-6410	MP7 35° probe, battery, stylus Ø6 mm ball x 50 mm long, OMM, mounting bracket, MI 12 interface and tool kit.
MP7 system	A-2033-6411	MP7 70° probe, battery, stylus Ø6 mm ball x 50 mm long, OMM, mounting bracket, MI 12 interface and tool kit.
MP7 system	A-2115-0020	MP7 35° probe, battery, stylus Ø6 mm ball x 50 mm long, OMI, mounting bracket and tool kit.
MP7 system	A-2115-0021	MP7 70° probe, battery, stylus Ø6 mm ball x 50 mm long, OMI, mounting bracket and tool kit.
MP7 probe	A-2033-0700	MP7 35° probe, adjusting plate, battery, Ø8 mm centre ball & tool kit.
MP7 probe	A-2033-0701	MP7 70° probe, adjusting plate, battery, Ø8 mm centre ball & tool kit.
MP8 probe	—	See page 14.
MP9 system	A-2034-6001	MP9 35° probe, battery, stylus Ø6 mm ball x 50 mm long, OMM, mounting bracket, MI 12 interface and tool kit.
MP9 system	A-2034-6002	MP9 70° probe, battery, stylus Ø6mm ball x 50 mm long, OMM, mounting bracket, MI 12 interface and tool kit.
MP9 system	A-2115-0022	MP9 35° probe, battery, stylus Ø6 mm ball x 50 mm long, OMI, mounting bracket and tool kit.
MP9 system	A-2115-0023	MP9 70° probe, battery, stylus Ø6 mm ball x 50 mm long, OMI, mounting bracket and tool kit.
MP9 probe	A-2034-0035	MP9 35° probe, adjusting plate, battery, Ø8 mm centre ball & tool kit.
MP9 probe	A-2034-0036	MP9 70° probe, adjusting plate, battery, Ø8 mm centre ball & tool kit.
		SOFTWARE
Software	—	Probe software for machine tools - See Data Sheet H-2000-2289.

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

Type	Part no.	Description
		ACCESSORIES
Stylus	A-5000-3709	PS3-1C ceramic stylus Ø6 mm ball x 50 mm long.
		Styli are fully listed in Renishaw styli guide H-1000-3200.
Weak 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-TLO9-0003	Spanner for stylus weak link stem.
Battery	P-BT03-0001	9 V alkaline battery.
TK	A-2053-7531	Probe tool kit for MP7-8- 9 comprising : Ø1.98 mm stylus tool,
		Hexagon keys 1.5 mm, 2.0 mm, 2.5 mm, 3.0 mm and 4.0 mm AF.
OMM	A-2033-0576	OMM complete with cable Ø5.1 mm x 25 m (Ø0.2 in x 82 ft).
O-M-I	A-2115-0001	O-M-I complete with cable 8 m long (26.2 ft).
Mtg brkt	A-2033-0830	OMM/O-M-I mounting bracket 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.
MPE2	A-2033-6595	MPE2 extension housing Ø62 x 150 mm long with holding screws.
MPE3	A-2033-6667	MPE3 extension housing Ø62 x 200 mm long with holding screws.
MA6	A-2063-7774	MA6 Adaptor, allows LP2 probe to be used in place of MP7-8-9 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.

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