

MP3 probe with inductive or hard-wired signal transmission system



Compliance information for this product is available by scanning the QR code or visiting www.renishaw.com/mtpdoc



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Before you begin

Warranty

Unless you and Renishaw have agreed and signed a separate written agreement, the equipment and/or software are sold subject to the Renishaw Standard Terms and Conditions supplied with such equipment and/or software, or available on request from your local Renishaw office.

Renishaw warrants its equipment and software for a limited period (as set out in the Standard Terms and Conditions), provided that they are installed and used exactly as defined in associated Renishaw documentation. You should consult these Standard Terms and Conditions to find out the full details of your warranty.

Equipment and/or software purchased by you from a third-party supplier is subject to separate terms and conditions supplied with such equipment and/or software. You should contact your third-party supplier for details.

CNC machines

CNC machine tools must always be operated by fully trained personnel in accordance with the manufacturer's instructions.

Care of the probe

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

Patents

None applicable.

Intended use

The MP3 is a spindle probe that enables automated workpiece inspection and job set-up on multi-tasking machines, machining centres and gantry machining centres.

Safety

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

Information to the machine supplier/ installer

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product literature, and to ensure that adequate guards and safety interlocks are provided.

If the probe fails, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine.

Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant UK, EU and FCC regulatory requirements. It is the responsibility of the equipment installer to ensure that the following guidelines are adhered to, in order for the product to function in accordance with these regulations:

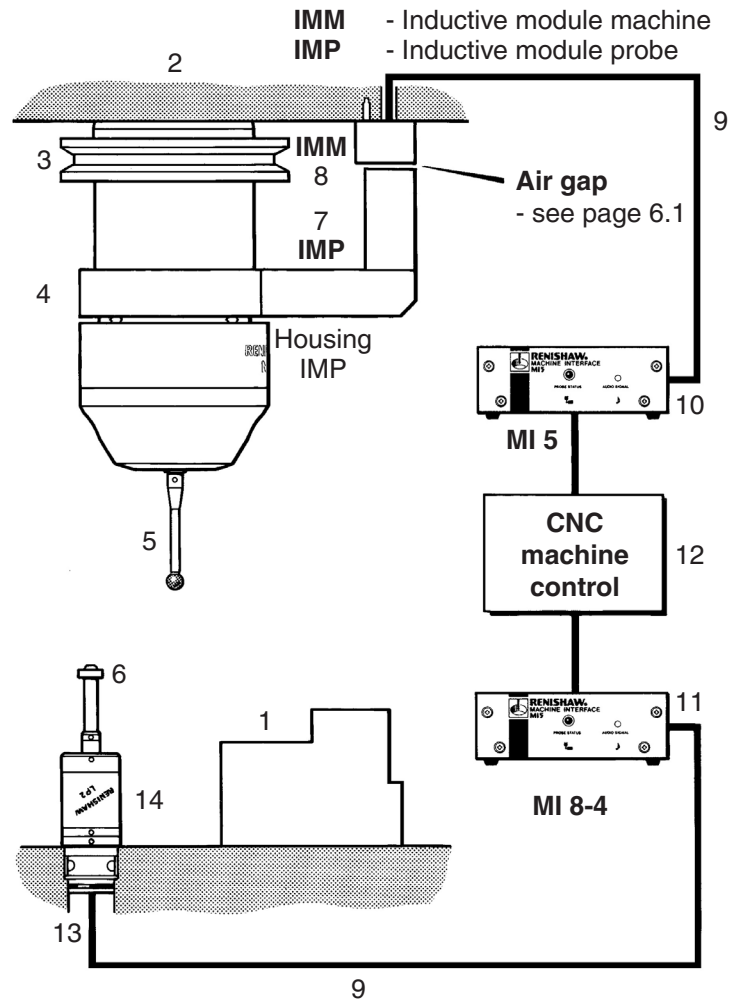
- Any interface MUST be installed in a position away from any potential sources of electrical noise, (for example power transformers, servo drives);
- All 0 V/ground connections should be connected to the machine "star point" (the "star point" is a single point return for all equipment ground and screen cables). This is very important and failure to adhere to this can cause a potential difference between grounds;
- All screens must be connected as outlined in the user instructions;
- Cables must not be routed alongside high current sources (for example, motor power supply cables), or be near high-speed data lines;
- Cable lengths should always be kept to a minimum.

Equipment operation

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

MP3 probe basics

Typical probe system - Inductive transmission



Machining centre job set-up and inspection

Inductive signal transmission

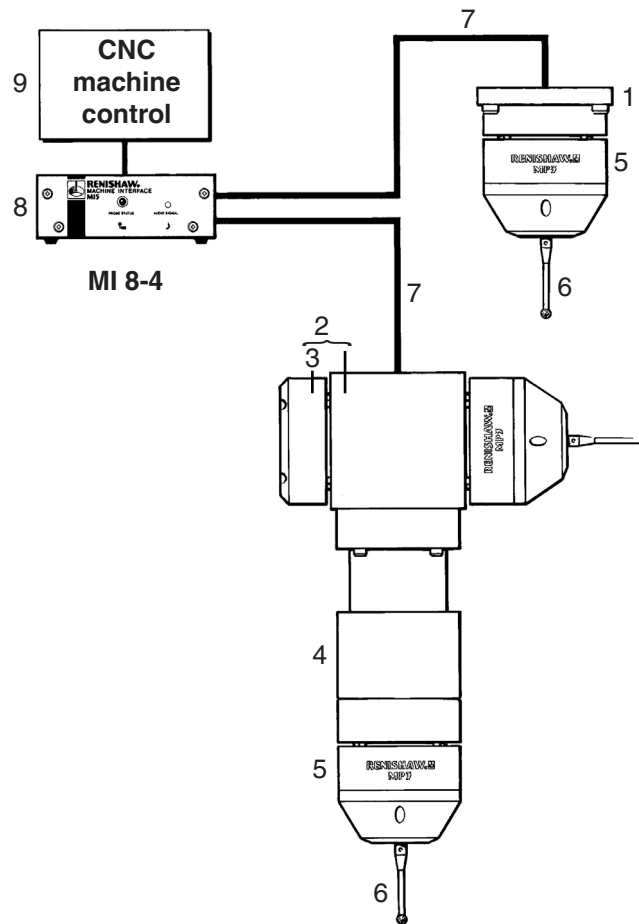
1. Workpiece
2. Machine spindle
3. Shank
4. MP3 probe
5. Stylus
7. Housing /inductive module probe (IMP)
8. Inductive module machine (IMM)
9. Cable
10. MI 5 interface unit
12. CNC machine control

Tool setting

Hard-wired signal transmission

6. Square tip stylus
9. Cable
11. MI 8-4 interface
13. Socket for LP2
14. LP2 probe

Typical probe system - Hard-wired transmission



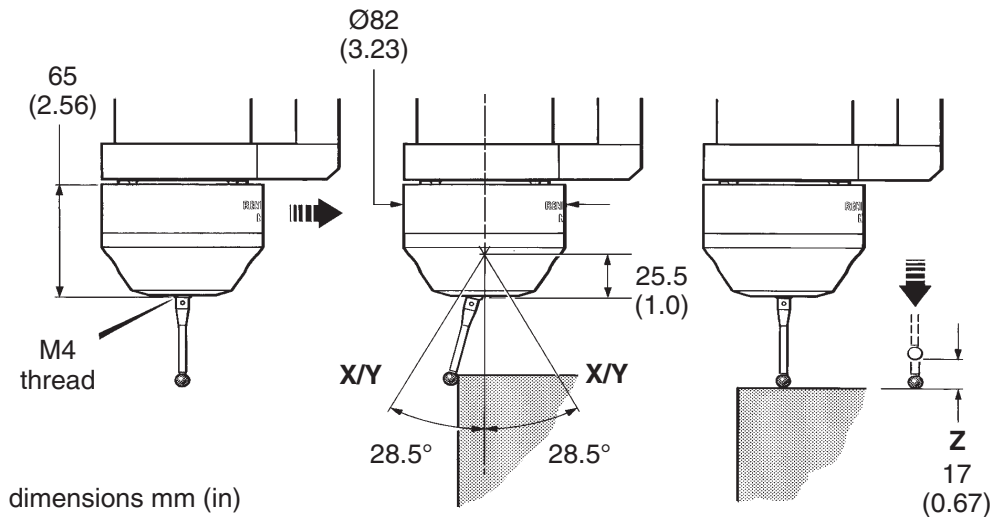
Machining centre job set-up and inspection

Hard-wired signal transmission

1. 1-way mounting block
2. 3-way mounting block
3. Cover
4. MEH3 extension housing
5. MP3 probe
6. Stylus
7. Cable
8. Interface unit MI 8-4
9. CNC machine control

Specification

Repeatability Max 2 sigma (2σ) value	A rigid probe mounting is essential for good repeatability. Repeatability of 1.0 μm (40 μin) is valid for test velocity of 480 mm/min (1.57 ft/min) at the stylus tip using a stylus 50 mm (1.97 in) long.	
Stylus trigger force	Set at factory using a stylus 50 mm (1.97 in) long. X and Y trigger forces vary around the stylus seating.	
	X -Y direction	0.75 N to 1.5 N 75 gf to 150 gf (2.6 ozf to 5.29 ozf)
	Z direction	4.9 N 490 gf (17.28 ozf)



Stylus overtravel limits			
Stylus length	X	Y	Z
50 mm (1.96 in)	36 mm (1.4 in)	36 mm (1.4 in)	17 mm (0.67 in)
100 mm (3.93 in)	60 mm (2.6 in)	60 mm (2.6 in)	17 mm (0.67 in)

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System installation

Stylus spring pressure adjustment - gauging force

Spring pressure within the probe causes the stylus to sit in a unique position, and return to this position following each stylus deflection.

Spring 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.

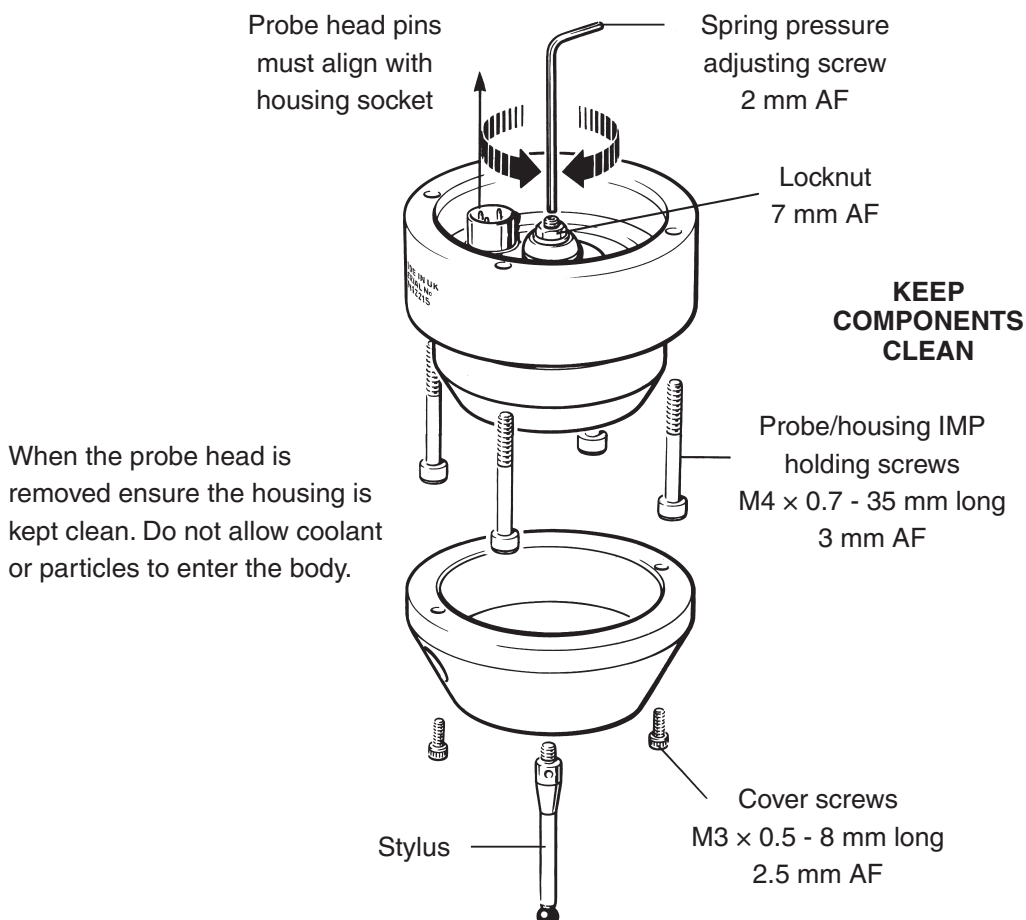
The probe head detaches to provide access to the spring pressure adjusting screw.

First release the locknut, then turn the adjusting screw either anti-clockwise to reduce pressure for greater sensitivity or clockwise to increase pressure.

CAUTION: Overtightening will eventually unseat an internal seal. To check if sealing is secure, press the stylus inwards. On release the probe outer diaphragm should return to its original shape, any crumpling indicates that the internal seal is no longer effective.

Turn the adjusting screw anti-clockwise to reseal the internal seal. Oil leakage around the adjusting screw will also indicate over tightening. Finally tighten the locknut to 1 Nm (0.74 lbf.ft).

Stylus spring pressure adjustment and use of styli, other than calibration stylus type, may cause repeatability to differ from the test certificate results.



Stylus on-centre adjustment

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

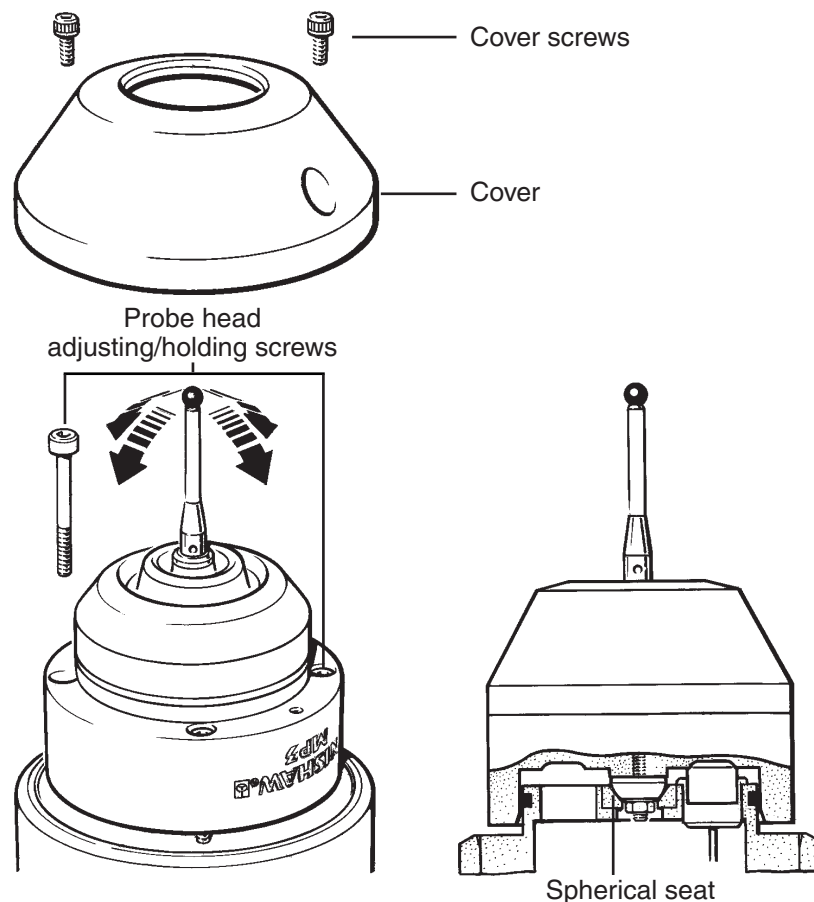
1. Alignment must be as exact as possible, when probe vector software is used.
2. The probe must be parallel to the spindle axis to prevent stylus stem contact when gauging deep holes.
3. When the machine control software cannot compensate for an offset stylus.

How to check the stylus position

Stylus tip and stem position are established using a low force (less than 0.2 N / 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.

Stylus alignment

First remove the two probe front cover screws, and remove the front cover. This provides access to four probe head holding screws. To adjust stylus alignment, slacken the probe head holding screws to allow the probe head to pivot on its spherical seat. Adjust and tighten these four screws to lock the probe head in its new position. Then check the new position for alignment. When the stylus is correctly aligned, check the tightness of the holding screws, and replace the front cover.



1. If at any time the unit is accidentally dropped, it should be checked for on-centre position.
2. Do not hit or tap the probe to achieve on-centre adjustment.

Probe moves

Probe trigger

A probe trigger signal is generated when the probe stylus is driven against a surface. The machine control records the 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 and machine measuring capability. Follow the feed rate guidelines given by supplier.

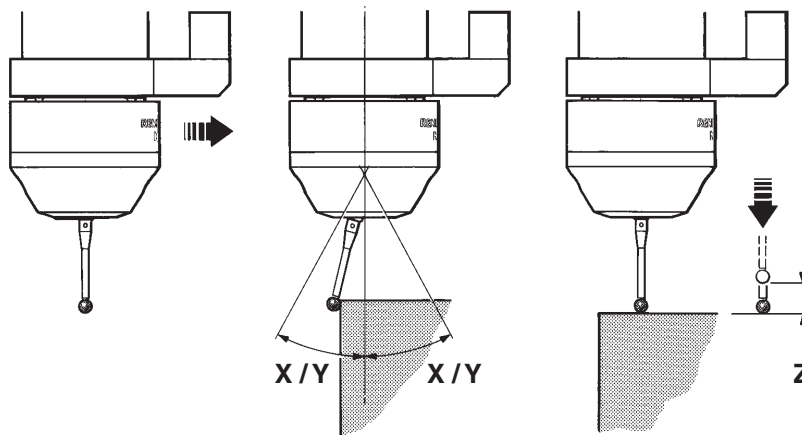
To ensure a trigger signal is given, drive the probe against the workpiece to a target beyond the expected surface, but within the limits of stylus overtravel.

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

Single and double touch

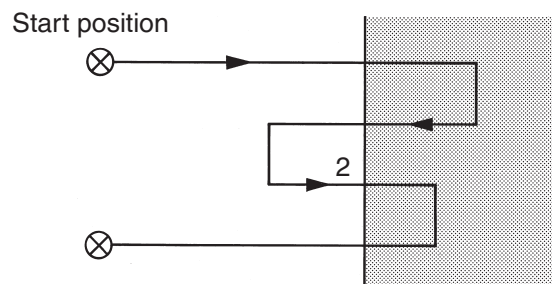
With some types of controllers, it is an advantage to use a two touch method as poor repeatability can result at higher feed rates.

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.



X/Y overtravel limits - see **page 2-3**, "Specification," for more information.

With a double touch sequence 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.



Probe moves

System delays

System delays are repeatable to less than 2 μ s, and are constant in each direction measurement is taken.

Delays are automatically compensated, provided a calibration move is made in the same direction and velocity as each measurement move.

Calibrating a system

In the following circumstances, calibrate the probe system at a constant measurement speed and in the measurement direction to automatically compensate for errors:

1. Before the system is used.
2. When a new stylus is used.
3. If the stylus is bent.
4. To allow for machine thermal growth.
5. Poor shank relocation repeatability in the machine spindle.

NOTE: Probe cycles and features are machine software dependant. Software for probing routines is available from Renishaw.

Software requirements

Software for turning and machining centres

Good software will allow the following functions:

- Simple to use calibration routines
- Update a tool offset.
- Generate an alarm if a broken tool is found or set a flag for corrective action.
- 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.

Verify your software

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

NOTE: Machining centre applications

When using probe styli which are not on spindle centre, spindle orientation repeatability is important to avoid probe measurement errors.

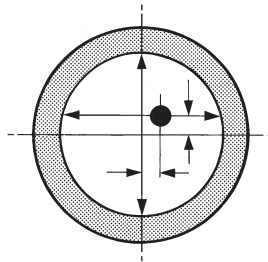
2. Does your software compensate for probe triggering characteristics in all measuring directions?
3. Does the software automatically adjust the program co-ordinate system to the relevant set-up feature on the component, for job set-up purposes?

Software for machining centres

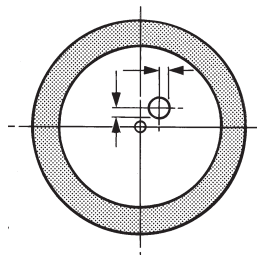
Simple to use canned cycles for basic features.

Calibration

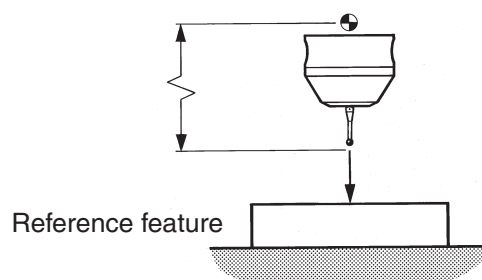
Probe XY offset calibration



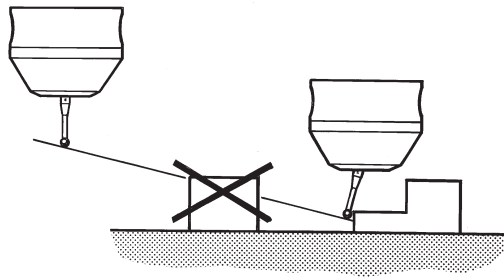
Stylus ball radius calibration



Probe length calibration

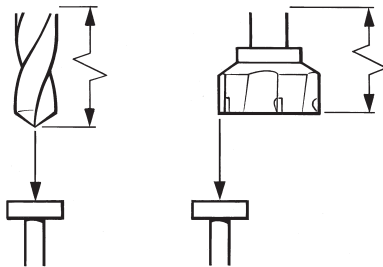


Probe collision protection



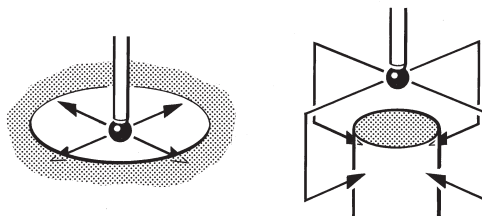
Tool setting probe

Length setting (rotating and non rotating). Diameter setting (rotating). Broken tool detection.

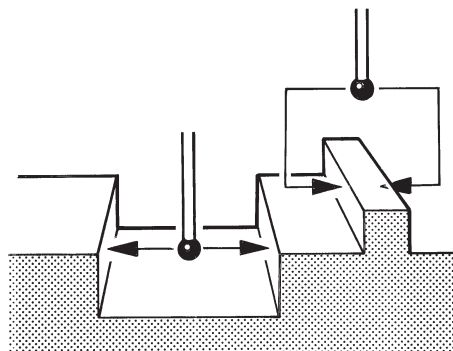


Inspection

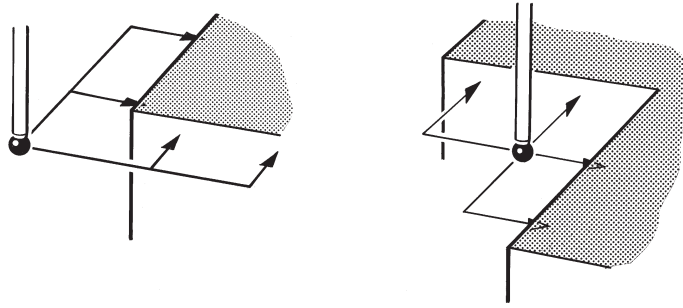
Bore and boss measure



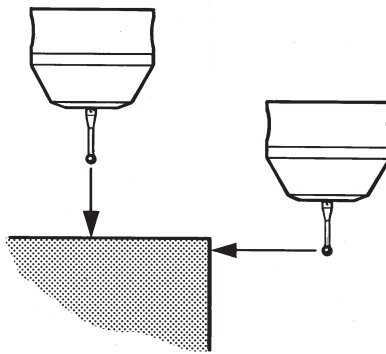
Web and pocket measure



Internal and external corner find



XYZ single surface position



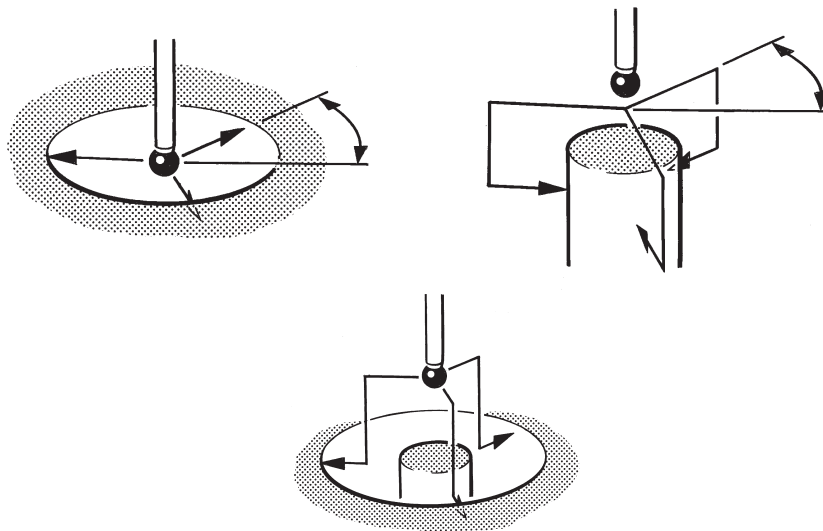
Inspection print-out

COMPONENT No. 1				
OFFSET NO.	NOMINAL DIMENSION	TOLERANCE	DEVIATION FROM NOMINAL	COMMENTS
99	1.5000	.1000	.0105	
97	200.000	.1000	.2504	OUT OF TOL

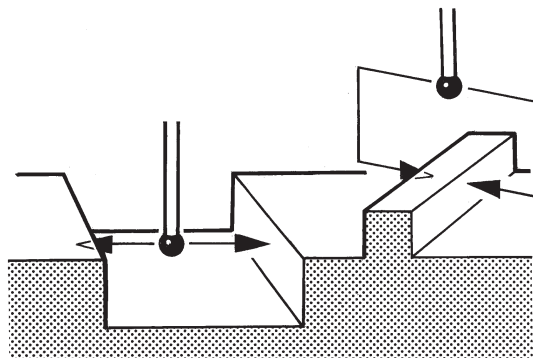
Software for machine centres

Inspection

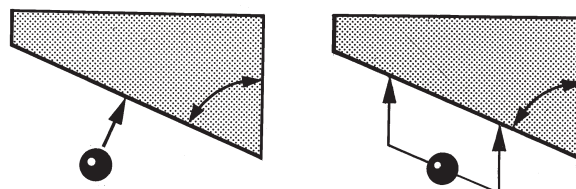
Bore and boss (three point)



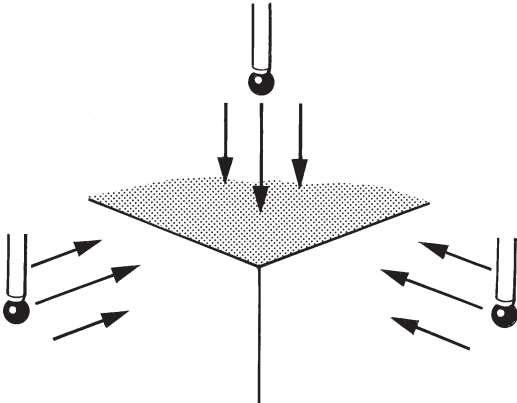
Web and pocket angled measure



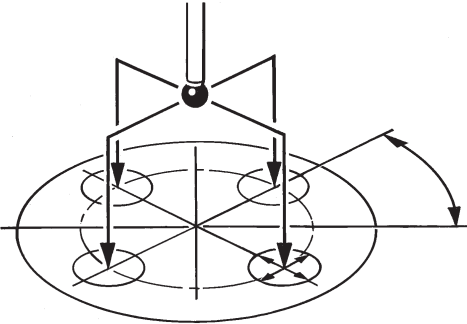
Angled surface measure



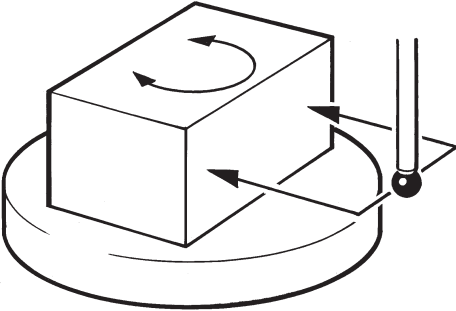
Stock allowance



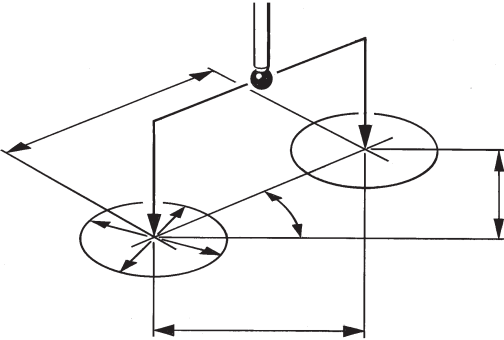
Bore and boss on PCD



4th axis measure



Feature to feature measure



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Maintenance

The probe is a precision tool so handle with care. Ensure the probe is firmly secured in its mounting.
Safety: Switch power off when working with electrical components.

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.

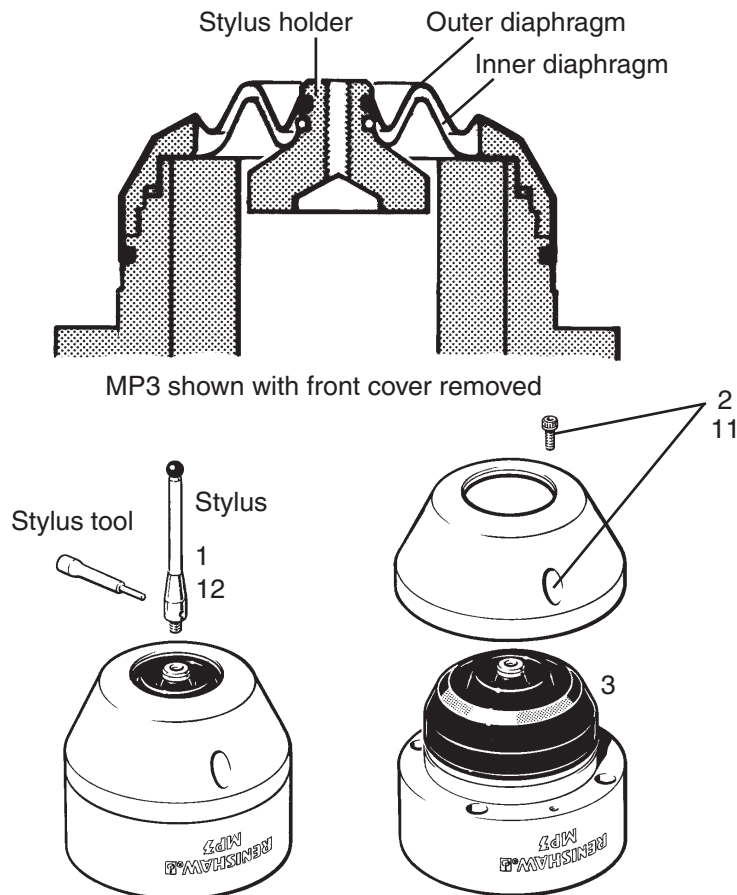
Therefore keep all components clean and free from grease and oil. Periodically check cables for signs of damage, corrosion or loose connections.

Outer diaphragm inspection

The probe mechanism is protected by two diaphragms, which 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 the outer diaphragm with metal objects.

Diaphragm inspection

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

Inner diaphragm inspection

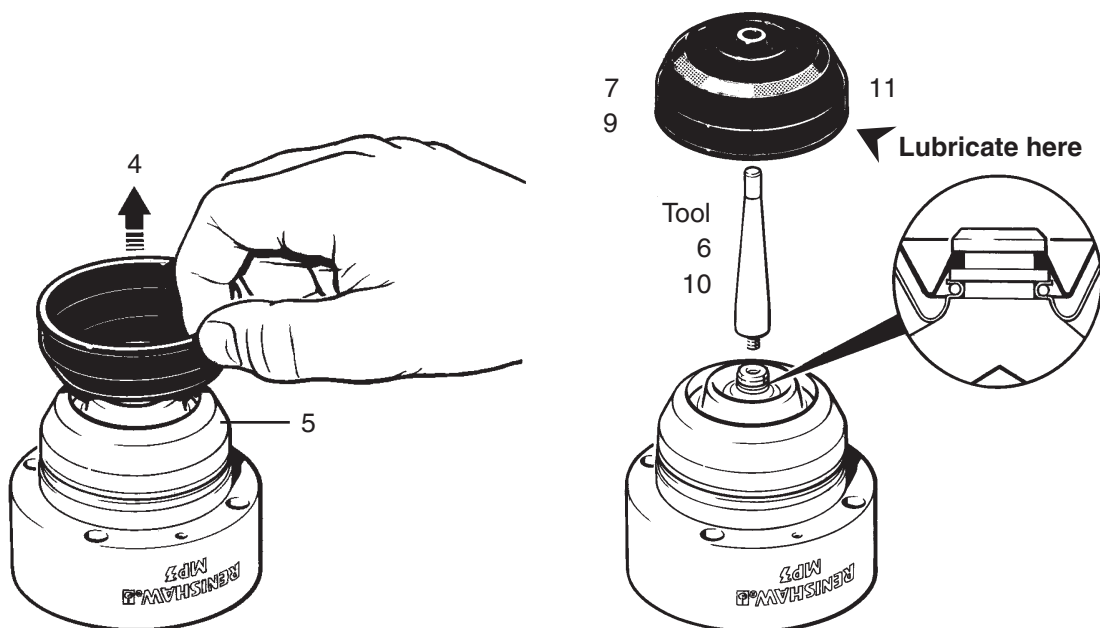
5. Inspect the inner diaphragm for damage.

If damaged return the probe to your supplier for repair.

WARNING: Do not remove the inner diaphragm

Outer diaphragm replacement

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



Fault finding

Symptom	Cause	Action
Complete failure	Transmission modules not correctly aligned.	Align correctly.
	Transmission modules damaged.	Return to supplier for repair. To check IMM, place metal disc against IMM. The audible indicator should bleep when disc is removed. If it does not bleep, replace IMM.
	Swarf blocking inductive transmission air gap.	Clean out.
	Loose mounting.	Check all bolted or screwed connections for tightness.
	Interface LED does not light up.	Check fuses.
	Cable screen broken.	Replace cable.
	Incorrect voltage.	Check supply.
	Probe failure.	No continuity through probe circuit.
	Probe spring pressure too low.	Tighten stylus spring pressure.
	Probe mounting damaged.	Repair or replace.
If these checks do not eliminate the fault, consult your probe supplier.		
Poor repeatability	Transmission modules not correctly aligned.	Align correctly
	Loose mounting	Check all bolted and screwed connections for tightness.
	Loose stylus	Tighten
	Poor electrical connections	Check connectors
	Excessive machine vibration	Tighten spring pressure
Spurious reading	Cable screen broken	Replace cable
	Poorly regulated supply voltage	Regulate correctly
	Excessive machine vibration	Eliminate vibration or adjust stylus spring pressure

Symptom	Cause	Action
Poor re-arming (The probe is armed when the stylus mounting is seated, the electrical circuit is complete and the interface LED is lit.)	Spring pressure is too low	Adjust spring pressure
	Inner diaphragm pierced or damaged	Return to supplier for repair
If the probe or interface continues to malfunction, return it to your supplier for repair.		

Appendices

Appendix 1

Inductive signal transmission modules - machining centre

Inductive transmission systems are fully described in data sheet ITS H-2000-2140.

IMP installation is fully described in IMP installation guide H-2000-4037.

IMM installation is fully described in IMM installation guide H-2000-4039.

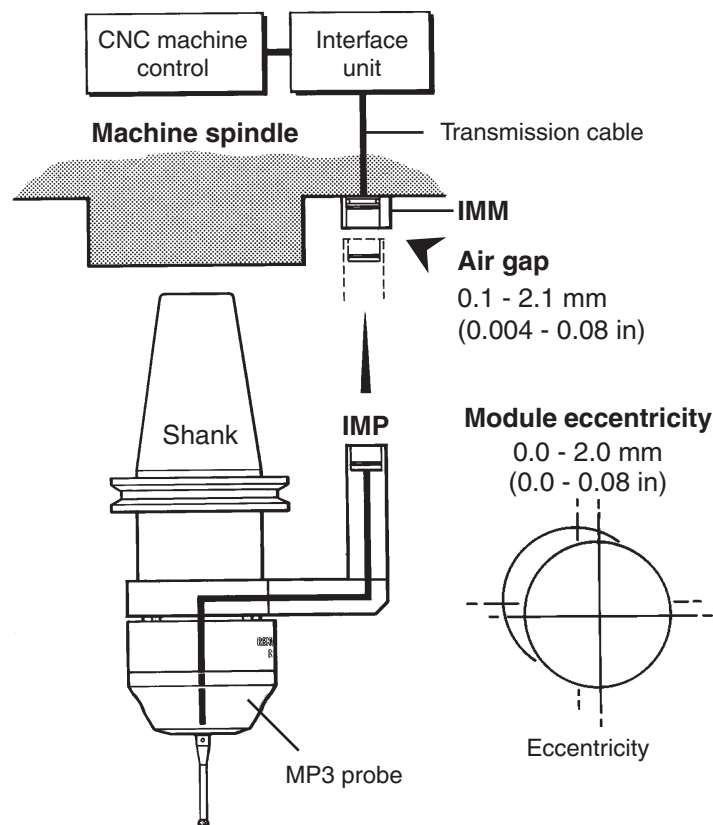
Signal transmission modules

Inductive module probe (IMP)

Inductive module machine (IMM)

Inductive signal transmission modules pass power and signals across an air gap between the IMP and IMM, allowing the probe unit to be easily transferred between the machine spindle and machine tool store, as any other tool in the system.

Modules are always installed in pairs and must locate within specified separation (air gap) and eccentricity limits.



Appendix 2

Adaptors and extensions

Adaptors and extensions are fully described in data sheet AEH H-2000-2120.

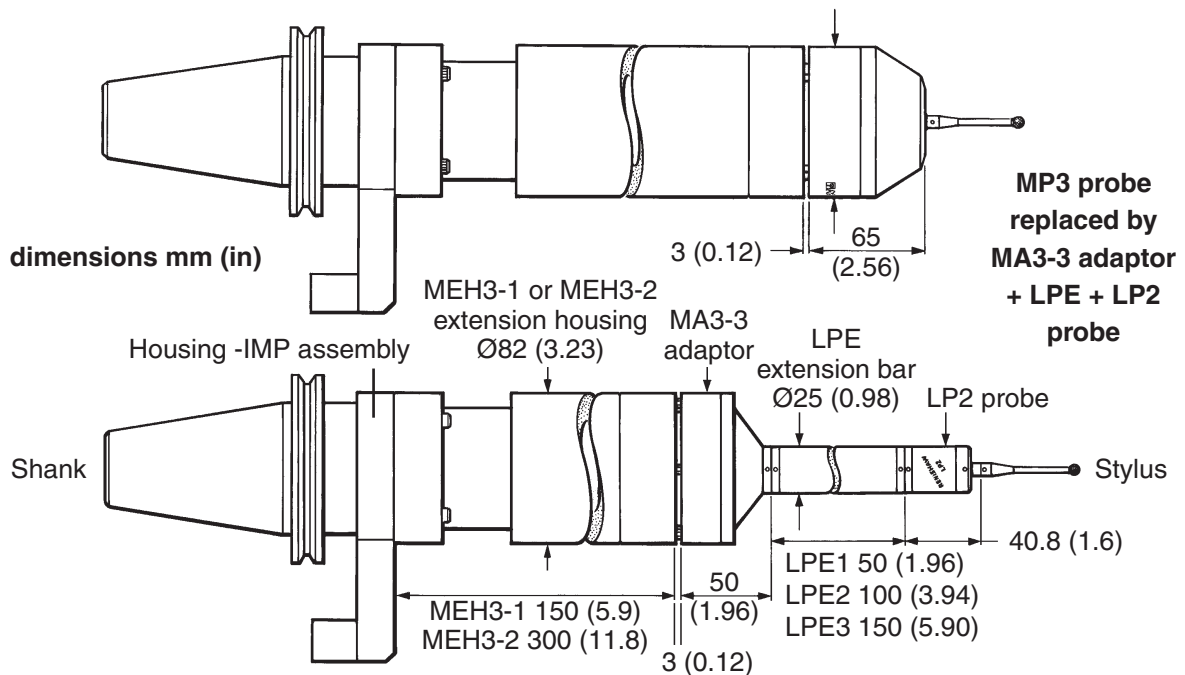
Housing-IMPs are fully described in data sheet ITS H-2000-2140.

Adaptors

Features with restricted access can be probed using an LP2 probe. The MA3-3 adaptor allows the MP3 probe to be substituted with an LP2 probe. The MA3-3 connects directly to the housing/IMP or MEH3 extension.

Extensions

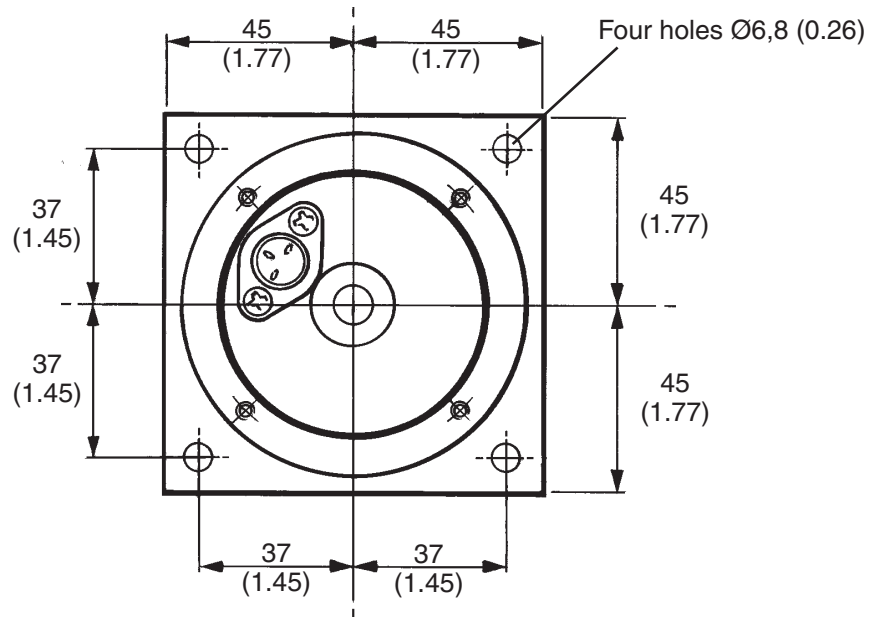
Extensions allow deeper access into workpiece features. MEH extensions are used for machining centre applications. LPE extensions with an M16 thread are suitable for machining centre applications using the LP2 probe.



Appendix 3

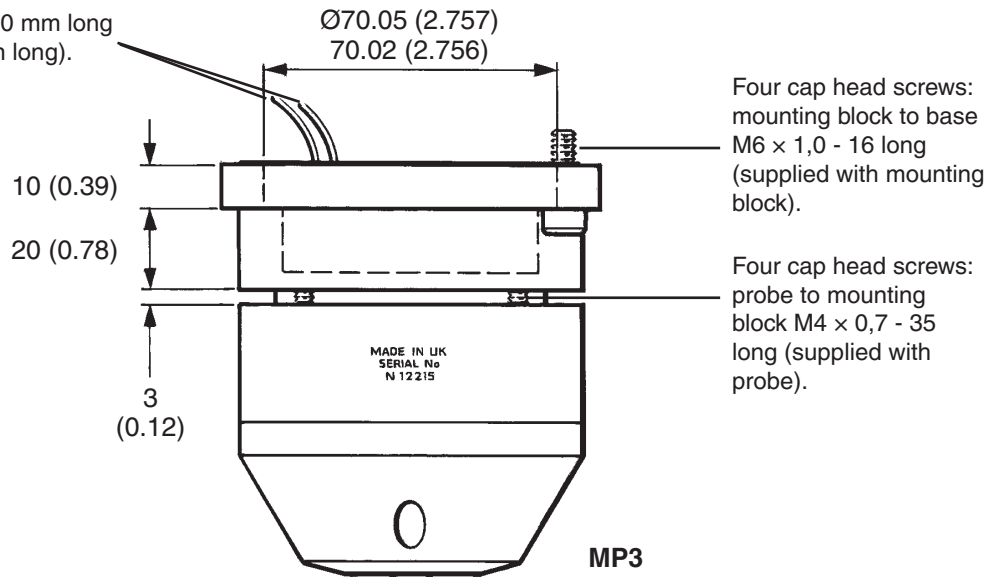
1-way mounting block for MP3 probe (or LP2 probe with adaptor)

NOTE: Mounting blocks are typically used on probing systems for vertical turning lathes or other installations requiring hard-wired signal transmission.



Wires

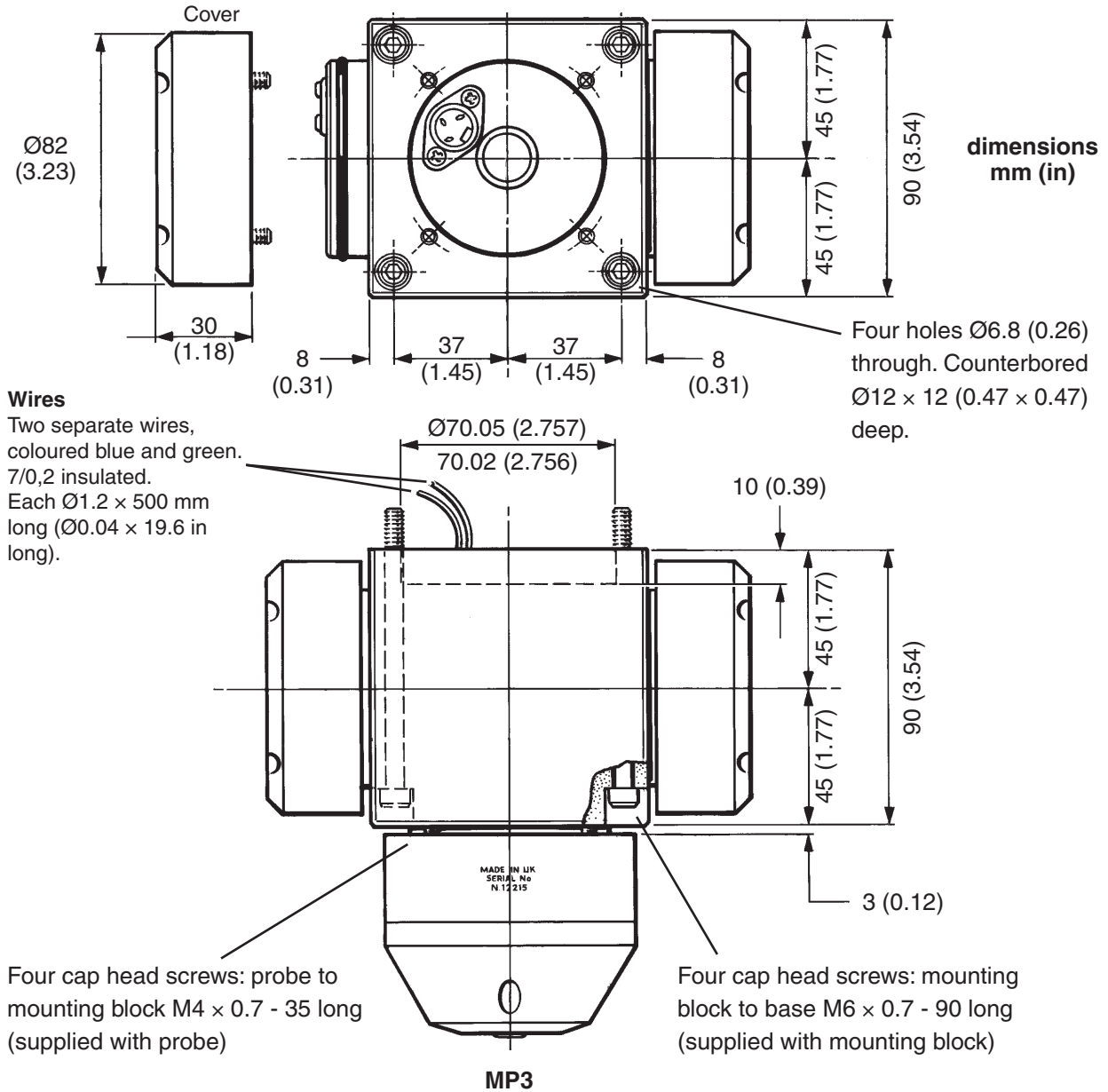
Two separate wires,
coloured blue and green.
7/0,2 insulated.
Each $\text{Ø}1.2 \times 500$ mm long
($\text{Ø}0.04 \times 19.6$ in long).



Appendix 4

3 way mounting block for MP3 probe/s (or LP2 probe with adaptor)

The mounting will accept one to three probes. A probe or cover must be fitted in each mounting position to complete the electrical circuit.



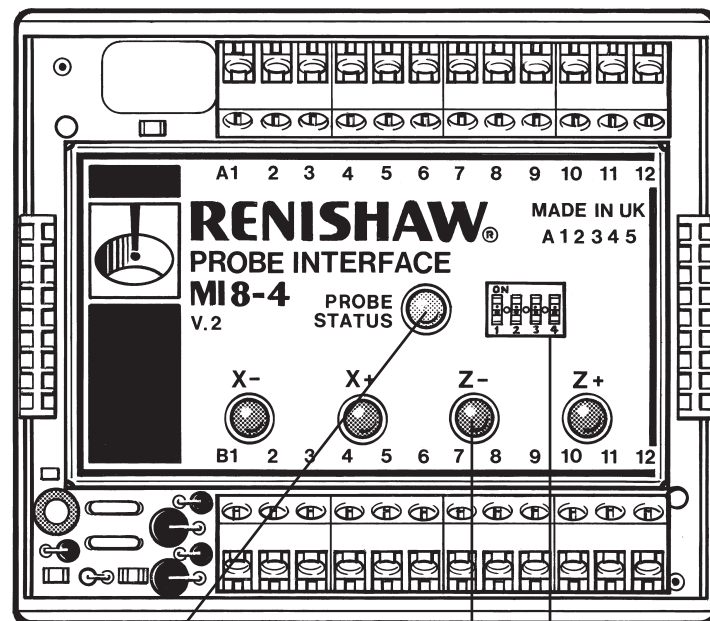
Appendix 5

MI 8-4 interface unit

The MI 8-4 is fully described in user guide H-2000-5008.

The MI 8-4 is used with hard-wired signal transmission systems. It connects to the machine control input, or it connects into the 4-wire Fanuc 'automatic length measurement' input (XAE, ZAE).

Front view



Bi-colour probe status LED

Green when the probe is at rest or the interface is inhibited. Red when the probe stylus is deflected. LED off indicates power is off.

Switch SW1

Output high or output low

Diagnostic LEDs

Indicate direction of machine movement

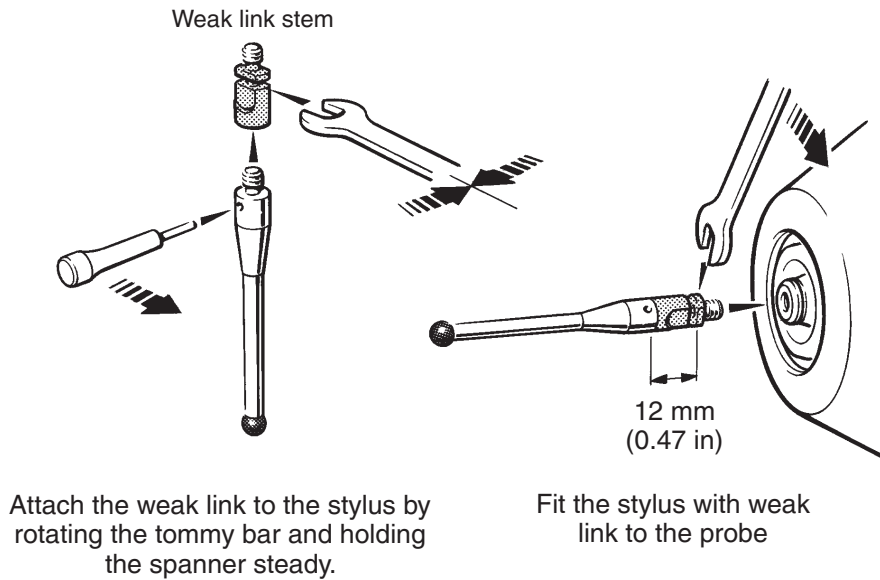
Appendix 6

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.

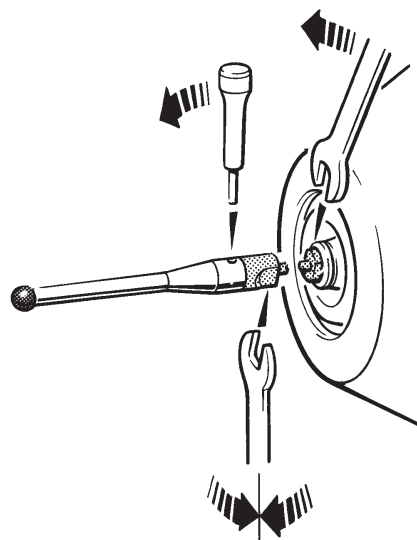
Fitting the stylus with a weak link onto a typical probe

Take care to avoid stressing the weak link during assembly. See screw torque value on **page 6-7**.



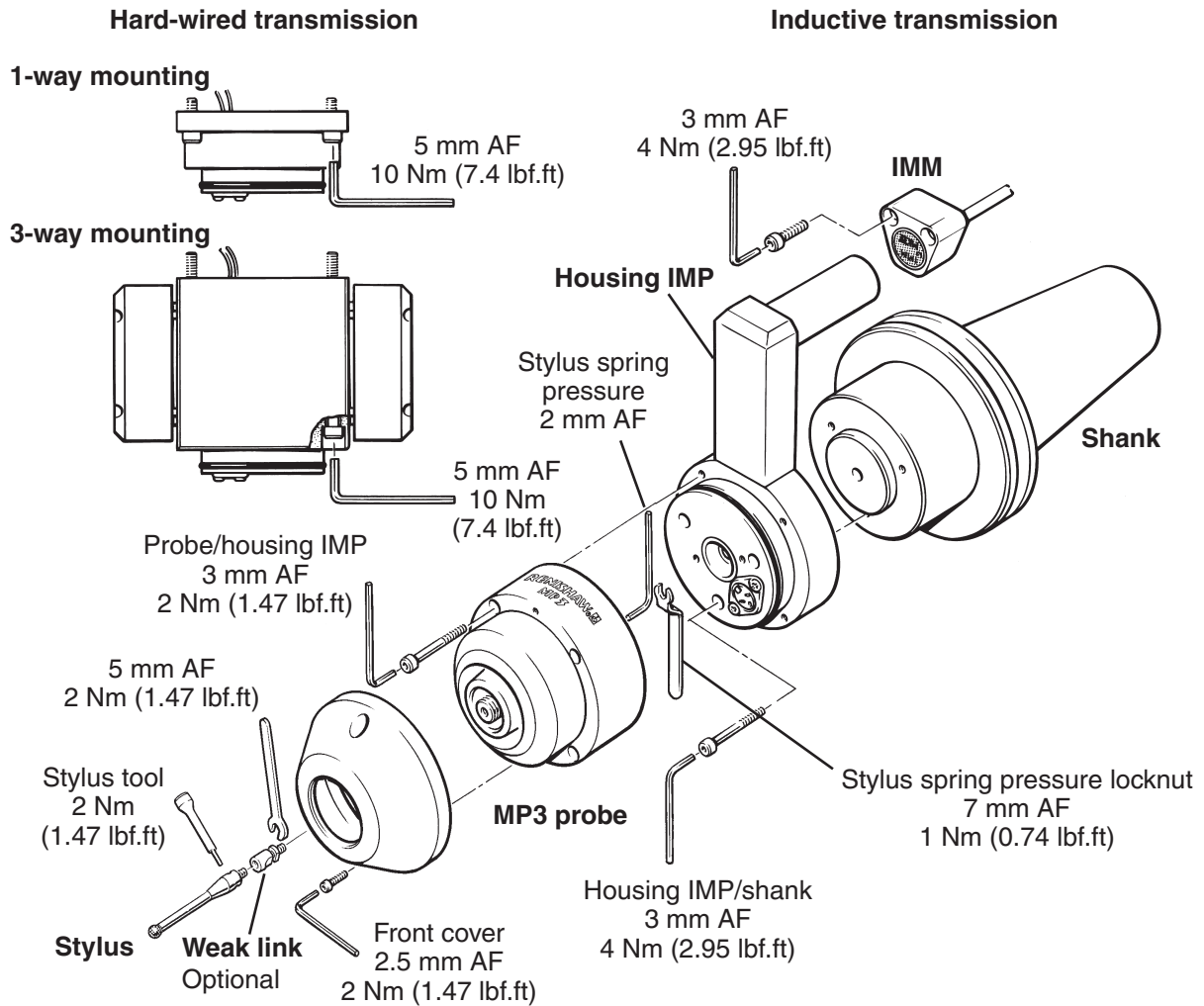
NOTE: The weak link is not used with ceramic shaft styli.

To remove broken stem



To remove the broken portion of stem from the stylus, use the spanner and tommy bar.
The broken portion of stem attached to the probe is removed with the spanner.

Screw torque values - Nm (lbf.ft)



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Parts list

Type	Part number	Description
MP3	A-2053-5358	MP3 probe complete with holding screws and TK1 tool kit.
Styli	-	For complete listing see Renishaw styli guide H-1000-3200.
Stylus	A-5000-3709	Ceramic stylus 50 mm long with Ø6 mm ball.
Stylus	A-5000-3712	Ceramic stylus 100 mm long with Ø6 mm ball.
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-TL09-0003	Spanner for stylus weak link stem.
TK1 kit	A-2053-7531	TK1 - probe had tool kit comprising: stylus tool, 1.5 mm, 2.0 mm, 2.5 mm, 3.0 mm and 4.0 mm hexagon keys.
DK3 kit	A-2053-8156	DK3 - MP3 outer diaphragm replacement kit.
Shank	-	Renishaw supply probe ready shanks - details available on application.
Mt block	A-2053-7285	1-way mounting block.
Mt block	A-2053-8275	3-way mounting block complete with two covers.
MEH3-1	A-2053-7286	MEH3-1 extension housing Ø82 × 150 mm long with holding screws.
MEH3-2	A-2053-7287	MEH3-2 extension housing Ø82 × 300 mm long with holding screws.
LPE1	A-2063-7001	LPE1 extension bar Ø25 × 50 mm long.
LPE2	A-2063-7002	LPE2 extension bar Ø25 × 100 mm long.
LPE3	A-2063-7003	LPE3 extension bar Ø25 × 150 mm long.

www.renishaw.com/mp3



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