

RENISHAW 

**MP3 probe with
optical transmission system**

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Installation and User's Guide

**MP3 probe with
360° optical transmission system**

**MP3 probe with
wide angle optical transmission system**



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.

**GB
SAFETY****Information for the user**

Beware of unexpected movement. The user should remain outside of the full working envelope of probe head/extension/probe combinations.

Handle and dispose of batteries according to the manufacturer's recommendations. Use only the recommended batteries. Do not allow the battery terminals to contact other metallic objects.

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

Remove power before performing any maintenance operations.

Refer to the machine supplier's operating instructions.

Information for the machine supplier

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 documentation, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to stop machine movement.

D

SICHERHEITSAUWEISUNGEN**Informationen für den Benutzer**

Auf unerwartete Bewegungen achten. Der Anwender soll sich immer außerhalb des Meßtasterkopf-Arm-Meßtaster-Bereichs aufhalten.

Batterien immer gemäß den Anleitungen des Herstellers handhaben und diese vorschriftsmäßig entsorgen. Nur die empfohlenen Batterien verwenden. Die Batterieklemmen nicht in Kontakt mit metallischen Gegenständen bringen.

Bei der Bedienung von Werkzeugmaschinen oder Koordinatenmeßanlagen ist Augenschutz empfohlen.

Bevor Wartungsarbeiten begonnen werden, muß erst die Stromversorgung getrennt werden.

Beziehen Sie sich auf die Wartungsanleitungen des Lieferanten.

Informationen für den Maschinenlieferanten

Es obliegt dem Maschinenlieferanten, den Anwender über alle Gefahren, die sich aus dem Betrieb der Ausrüstung, einschließlich der, die in der Renishaw Produktdokumentation erwähnt sind, zu unterrichten und zu versichern, daß ausreichende Sicherheitsvorrichtungen und Verriegelungen eingebaut sind.

Unter gewissen Umständen könnte das Meßtaster-signal fälschlicherweise melden, daß der Meßtaster nicht ausgelenkt ist. Verlassen Sie sich nicht allein auf Sondersignale, um sich über Maschinenbewegungen zu informieren.

DK

SIKKERHED**Oplysninger til brugeren**

Pas på uventede bevægelser. Brugeren bør holde sig uden for hele sondehovedets/forlængerens/sondens arbejdsområde.

Håndtér og bortskaf batterier i henhold til producentens anbefalinger. Anvend kun de anbefalede batterier. Lad ikke batteriterminalerne komme i kontakt med andre genstande af metal.

I alle tilfælde, hvor der anvendes værktøjs- og koordinatmålemaskiner, anbefales det at bære øjenbeskyttelse.

Afbryd strømforsyningen, før der foretages vedligeholdelse.

Se maskinleverandørens brugervejledning.

Oplysninger til maskinleverandøren

Det er maskinleverandørens ansvar at sikre, at brugeren er bekendt med eventuelle risici i forbindelse med driften, herunder de risici, som er nævnt i Renishaws produktdokumentation, og at sikre, at der er tilstrækkelig afskærmning og sikkerhedsblokeringer.

Under visse omstændigheder kan sondesignalet ved en fejl angive, at sonden står stille. Stol ikke på, at sondesignaler stopper maskinens bevægelse.

E SEGURIDAD

Información para el usuario

Tener cuidado con los movimientos inesperados. El usuario debe quedarse fuera del grupo operativo completo compuesto por la cabeza de sonda/ extensión/sonda o cualquier combinación de las mismas.

Las baterías deben ser manejadas y tiradas según las recomendaciones del fabricante. Usar sólo las baterías recomendadas. No permitir que los terminales de las mismas entren en contacto con otros objetos metálicos.

Se recomienda usar protección para los ojos en todas las aplicaciones que implican el uso de máquinas herramientas y máquinas de medición de coordenadas.

Quitar la corriente antes de emprender cualquier operación de mantenimiento.

Remitirse a las instrucciones de manejo del proveedor de la máquina.

Información para el proveedor de la máquina

Corresponde al proveedor de la máquina asegurar que el usuario esté consciente de cualquier peligro que implica el manejo de la máquina, incluyendo los que se mencionan en la documentación sobre los productos Renishaw y le corresponde también asegurarse de proporcionar dispositivos de protección y dispositivos de bloqueo de seguridad adecuados.

Bajo determinadas circunstancias la señal de la sonda puede indicar erróneamente que la sonda está asentada. No fiarse de las señales de la sonda para parar el movimiento de la máquina.

F SECURITE

Informations à l'attention de l'utilisateur

Attention aux mouvements brusques. L'utilisateur doit toujours rester en dehors de la zone de sécurité des installations multiples Tête de Palpeur/Rallonge/ Palpeur.

Suivre les conseils du fabricant pour manipuler et jeter les batteries. Utiliser uniquement les batterie recommandées. Veiller à ce que les bornes de la batterie n'entrent pas en contact avec d'autres objets métalliques.

Le port de lunettes de protection est recommandé pour toute application sur machine-outil et MMC.

Mettre la machine hors tension avant d'entreprendre toute opération de maintenance.

Consulter le mode d'emploi du fournisseur de la machine.

Informations à l'attention du fournisseur de la machine

Il incombe au fournisseur de la machine d'assurer que l'utilisateur prenne connaissance des dangers d'exploitation, y compris ceux décrits dans la documentation du produit Renishaw, et d'assurer que des protections et verrouillages de sûreté adéquats soient prévus.

Dans certains cas, il est possible que le signal du palpeur indique à tort l'état que le palpeur est au repos. Ne pas se fier aux signaux du palpeur qui ne garantissent pas toujours l'arrêt de la machine.

FIN
TURVALLISUUTTA

Κäyttäjälle tarkoitettuja tietoja

Varo äkillistä liikettä. Käyttäjän tulee pysytellä täysin anturin pään/jatkeen/anturin yhdistelmiä suojaavan toimivan kotelon ulkopuolella.

Käytä paristoja ja hävitä ne valmistajan ohjeiden mukaisesti. Käytä ainoastaan suositeltuja paristoja. Älä anna paristonapojen koskettaa muita metalliesineitä.

Kaikkia työstökoneita ja koordinoituja mittauskoneita (CMM) käytettäessä suositamme silmäsuojuksia.

Kytke pois sähköverkosta ennen huoltotoimenpiteitä.

Katso koneen toimittajalle tarkoitettuja käyttöohjeita.

Tietoja koneen toimittajalle

Koneen toimittaja on velvollinen selittämään käyttäjälle mahdolliset käyttöön liittyvät vaarat, mukaan lukien Renishaw'n tuoteselosteessa mainitut vaarat. Toimittajan tulee myös varmistaa, että toimitus sisältää riittävän määrän suoja ja lukkoja.

Tietäessä olosuhteissa anturimerkki saattaa osoittaa virheellisesti, että kyseessä on anturiin liittyvä ongelma. Älä luota anturimerkkeihin koneen liikkeen pysäyttämiseksi.

GR
ΑΣΦΑΛΕΙΑ

Πληροφορίες για τους χρήστες

Προσοχή - κίνδυνος απροσδόκητων κινήσεων. Οι χρήστες πρέπει να παραμένουν εκτός του χώρου που επηρεάζεται από όλους τους συνδυασμούς λειτουργίας της κεφαλής του ανιχνευτή, της προέκτασης και του ανιχνευτή.

Ο χειρισμός και η απόρριψη των μπαταριών να γίνεται σύμφωνα με τις συστάσεις του κατασκευαστή. Να χρησιμοποιούνται μόνο οι συνιστώμενες μπαταρίες. Δεν πρέπει οι ακποδέκτες να έρχονται σε επαφή με άλλα μεταλλικά αντικείμενα.

Σε όλες τις εφαρμογές που συνεπάγονται τη χρήση εργαλείων μηχανημάτων και εξαρτημάτων CMM, συνιστάται η χρήση συσκευής προστασίας των ματιών.

Αποσυνδέστε το μηχανήμα από το ηλεκτρικό ρεύμα προτού επιχειρήσετε τυχόν εργασίες συντήρησης.

Βλέπετε τις οδηγίες λειτουργίας του προμηθευτή του μηχανήματος.

Πληροφορίες για τους προμηθευτές των μηχανημάτων

Αποτελεί ευθύνη του προμηθευτή του μηχανήματος να εξασφαλίσει ότι ο χρήστης είναι ενήμερος τυχόν κινδύνων που συνεπάγεται η λειτουργία, συμπεριλαμβανομένων και όσων αναφέρονται στο διαφωτιστικό υλικό του προϊόντος της Renishaw. Είναι επίσης ευθύνη του να εξασφαλίσει ότι υπάρχουν τα απαιτούμενα προστατευτικά καλύμματα καλύμματα και συνδέσεις ασφάλειας.

Υπό ορισμένες συνθήκες μπορεί το σήμα ανιχνευτή να δώσει εσφαλμένη ένδειξη θέσης του ανιχνευτή. Μη βασίζεστε στα σήματα ανιχνευτή για θέση της κίνησης του μηχανήματος εκτός λειτουργίας.

I SICUREZZA

Informazioni per l'utente

Fare attenzione ai movimenti inaspettati.

Si raccomanda all'utente di tenersi al di fuori dell'involucro operativo della testina della sonda, prolungh e altre varianti della sonda.

Trattare e smaltire le pile in conformità alle istruzioni del fabbricante. Usare solo pile del tipo consigliato. Evitare il contatto tra i terminali delle pile e oggetti metallici.

Si raccomanda di indossare occhiali di protezione in applicazioni che comportano macchine utensili e macchine per misurare a coordinate.

Prima di effettuare qualsiasi intervento di manutenzione, isolare dall'alimentazione di rete.

Consultare le istruzioni d'uso del fabbricante della macchina.

Informazioni per il fabbricante della macchina

Il fornitore della macchina ha la responsabilità di avvertire l'utente dei pericoli inerenti al funzionamento della stessa, compresi quelli riportati nelle istruzioni della Renishaw, e di mettere a disposizione i ripari di sicurezza e gli interruttori di esclusione.

E' possibile, in certe situazioni, che la sonda emetta erroneamente un segnale che la sonda è in posizione. Evitare di fare affidamento sugli impulsi trasmessi dalla sonda per arrestare la macchina.

NL VEILIGHEID

Informatie voor de Gebruiker

Oppassen voor onverwachte beweging. De gebruiker dient buiten het werkende signaalveld van de Sondekop/Extensie/Sonde combinaties te blijven.

De batterijen volgens de aanwijzingen van de fabrikant hanteren en wegdoen. Gebruik uitsluitend de aanbevolen batterijen. Zorg ervoor dat de poolklemmen niet in contact komen met andere metaalhoudende voorwerpen.

Het dragen van oogbescherming wordt tijdens gebruik van Machinewerktuigen en CMM's aanbevolen.

Voordat u enig onderhoud verricht dient u de stroom uit te schakelen.

De bedieningsinstructies van de machineleverancier raadplegen.

Informatie voor de Machineleverancier

De leverancier van de machine is ervoorverantwoordelijk dat de gebruiker op de hoogte wordt gesteld van de risico's die verbonden zijn aan bediening, waaronder de risico's die vermeld worden in de produktendocumentatie van Renishaw. De leverancier dient er tevens voor te zorgen dat de gebruiker is voorzien van voldoende beveiligingen en veiligheidsgridelinrichtingen.

Onder bepaalde omstandigheden kan het sondesignaal een onjuiste sondetoestand aangeven. Vertrouw niet op de sondesignalen voor het stoppen van de machinebeweging.

P SEGURANÇA

Informações para o Utilizador

Tomar cuidado com movimento inesperado. O utilizador deve permanecer fora do perímetro da área de trabalho das combinações Cabeça da Sonda/Extensão/Sonda.

Manusear e descartar baterias de acordo com as recomendações do fabricante. Utilizar apenas as baterias recomendadas. Não permitir que os terminais da bateria entrem em contacto com outros objectos metálicos.

Em todas as aplicações que envolvam a utilização de Máquinas-Ferramenta e CMMs, recomenda-se usar protecção para os olhos.

Desligar a alimentação antes de efectuar qualquer operação de manutenção.

Consultar as instruções de funcionamento do fornecedor da máquina.

Informações para o Fornecedor da Máquina

É responsabilidade do fornecedor da máquina assegurar que o utilizador é consciencializado de quaisquer perigos envolvidos na operação, incluindo os mencionados na documentação do produto Renishaw e assegurar que são fornecidos resguardos e interbloqueios de segurança adequados.

Em certas circunstâncias, o sinal da sonda pode indicar falsamente uma condição de sonda assentada. Não confiar em sinais da sonda para parar o movimento da máquina.

SW SÅKERHET

Information för användaren

Se upp för plötsliga rörelser. Användaren bör befinna sig utanför arbetsområdet för sondhuvudet/förlängningen/sond-kombinationerna.

Hantera och avyttra batterier i enlighet med tillverkarens rekommendationer. Använd endast de batterier som rekommenderas. Låt ej batteriuttagen komma i kontakt med andra metallföremål.

Ögonskydd rekommenderas för alla tillämpningar som involverar bruket av maskinverktyg och CMM.

Koppla bort strömmen innan underhåll utförs.

Se maskintillverkarens bruksanvisning.

Information för maskinleverantören

Maskinleverantören ansvarar för att användaren informeras om de risker som drift innebär, inklusive de som nämns i Renishaws produktokumentation, samt att tillräckligt goda skydd och säkerhetsföreglingar tillhandahålls.

Under vissa omständigheter kan sondens signal falskt ange att en sond är monterad. Lita ej på sondersignaler för att stoppa maskinens rörelse.

Installation and Users Guide

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.

CNC MACHINE

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

PATENT NOTICE

The following patents and/or patent applications relate to Renishaw probe systems.

JP 1,847,335
US 4542467
US 4636960
WO 99/41856

SAFETY



SPINDLE ROTATION

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

ELECTRICAL

Only qualified persons should adjust switches or replace fuses.
Remove the mains supply from units before removing covers.

SYSTEMS

OPTICAL MODULE PROBE (OMP)

The 360° and wide angle OMP's described in this handbook are upgraded versions of earlier systems.

If your OMP does not feature probe status LED's, then you should **not** use this guide.

MI 12 and MI 4 INTERFACE

Both 360° and wide angle OMP's may be used with :
an O-M-I,
or OMM + MI 12 interface unit,
or OMM + MI 4 interface unit.
(The MI 4 is out of production)

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360° OPTICAL PROBE SYSTEM

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 O-M-I.

The PSU3 powers the interface when a +24V DC power supply is not available from the CNC machine.

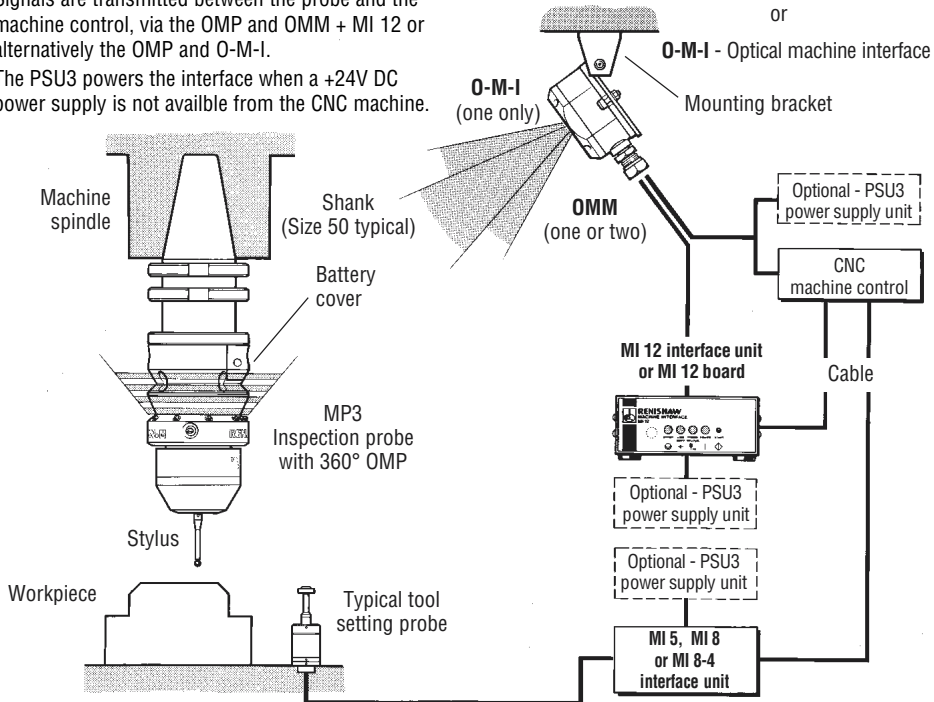
SEE PAGES 1-36, 1-37 & 1-38

OMM - Optical module machine

OMP - Optical module probe

or

O-M-I - Optical machine interface



OMM TANDEM MOUNTING

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

REMOTE INDICATOR

A beep is emitted from the MI 12 each time the stylus is deflected or returns to rest.

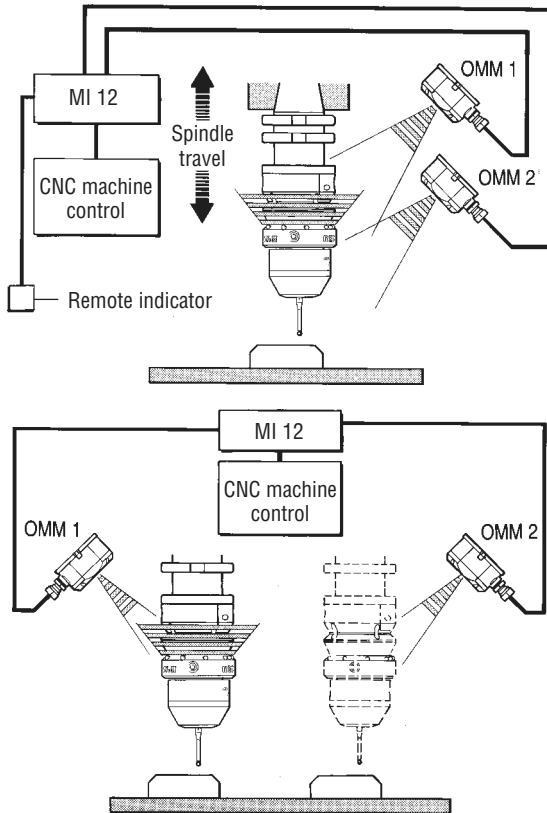
Alternatively a remote lamp or bleeper may be placed in a position where it is easily seen or heard by the operator.

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.

Note

Only one O-M-I can be used per machine.



360° OPTICAL PROBE SYSTEM - OPERATING ENVELOPE - see page 1-20

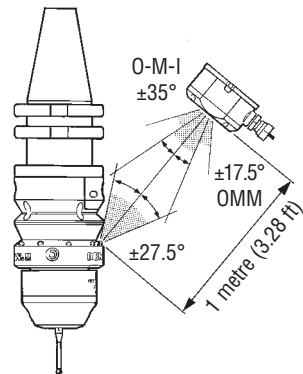
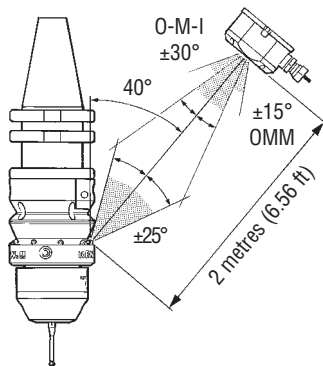
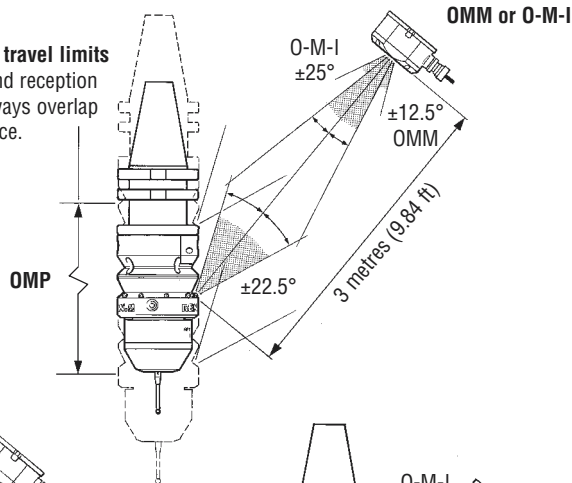
Machine spindle travel limits

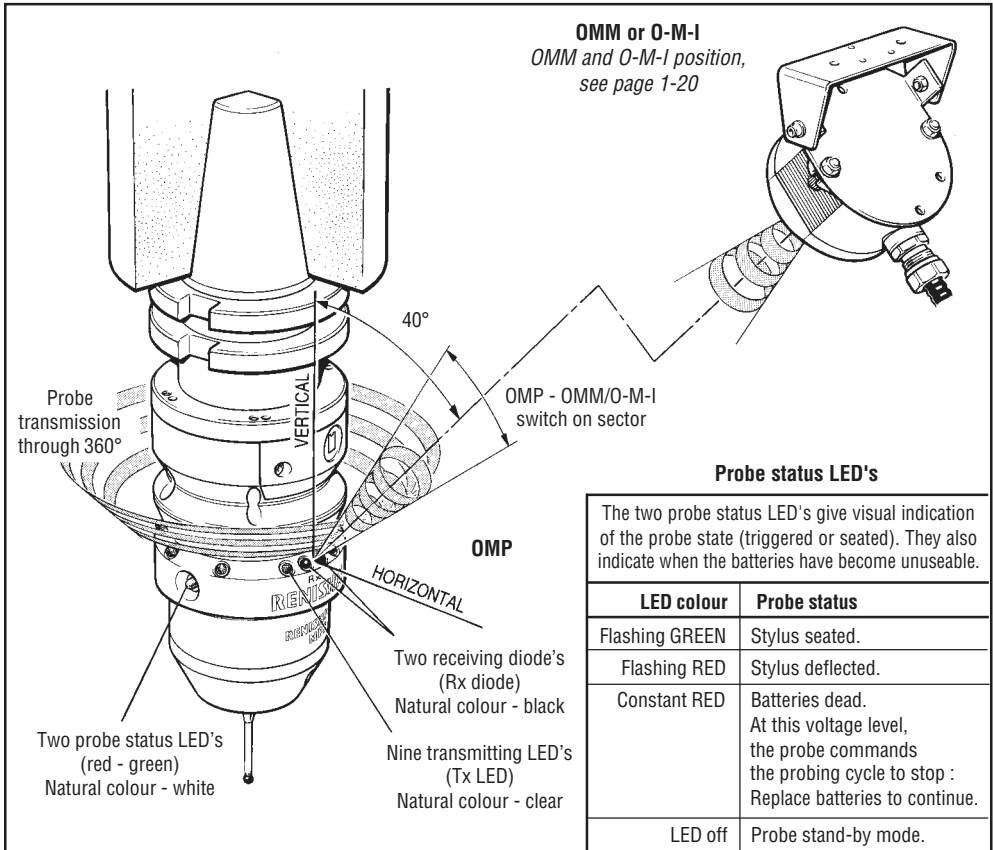
Transmission and reception beams must always overlap at source.

NOTE :

Earlier 360° OMP's had either 30° or 50° output. Both these units have now been replaced by the OMP with 40° output.

Improved LED technology allows the 40° output version to cover the combined operating envelopes of the 30° and 50° versions.





To gain access to the OMP switches, first remove the MP3 probe head - see page 1-18

TAKE CARE - KEEP ALL COMPONENTS CLEAN

DO NOT allow coolant or chips to enter probe head/OMP.

DO NOT touch electronic components when changing switch settings.

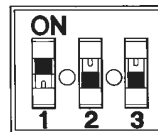
DO NOT use tip of pencil for switch adjustment.

SWITCH SW1

Debounce - Time out - Mode see pages 1-22 & 1-23

Factory settings are shown. i.e. Optical on - Time out.

- | | | |
|---|---------------------------------|--|
| 1 DEBOUNCE
5 seconds
(Factory set) | 2 TIME OUT
33 seconds | 3 MODE
Optical on
Optical off |
|---|---------------------------------|--|



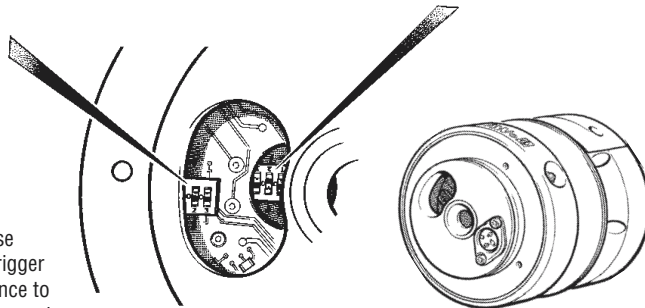
- | | | |
|--------------------------------|---|--|
| 1 DEBOUNCE
9 seconds | 2 TIME OUT
134 seconds
(Factory set) | 3 MODE
Optical on
Time out
(Factory set) |
|--------------------------------|---|--|

SWITCH SW2 Enhanced trigger circuit

1	2	3
Trigger circuit enable	Not used	Not used

1	2	3
Trigger circuit disable	Not used	Not used

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. SW2 enables the enhanced trigger circuit to be initiated. This results in a system delay of a nominal 6 milli-seconds.



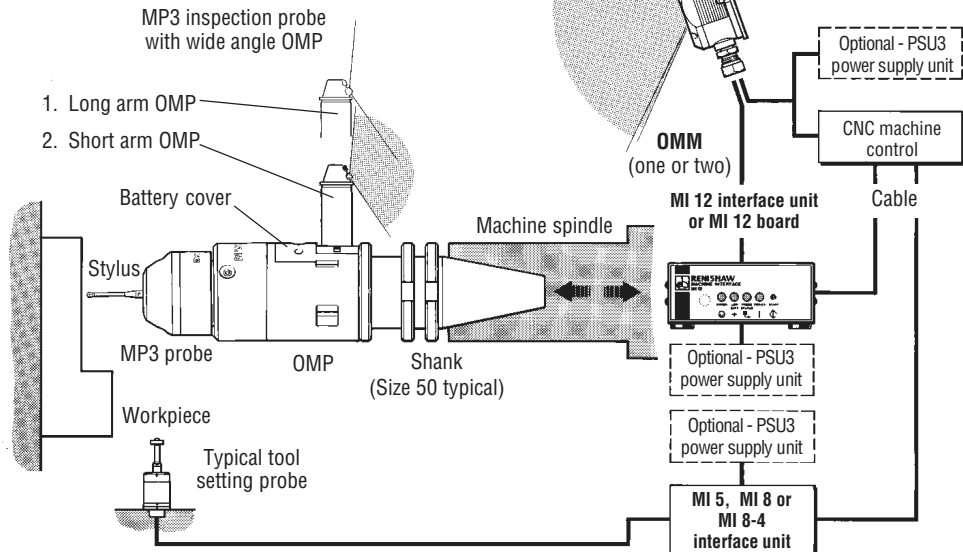
OMP

WIDE ANGLE OPTICAL PROBE SYSTEM

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 O-M-I.

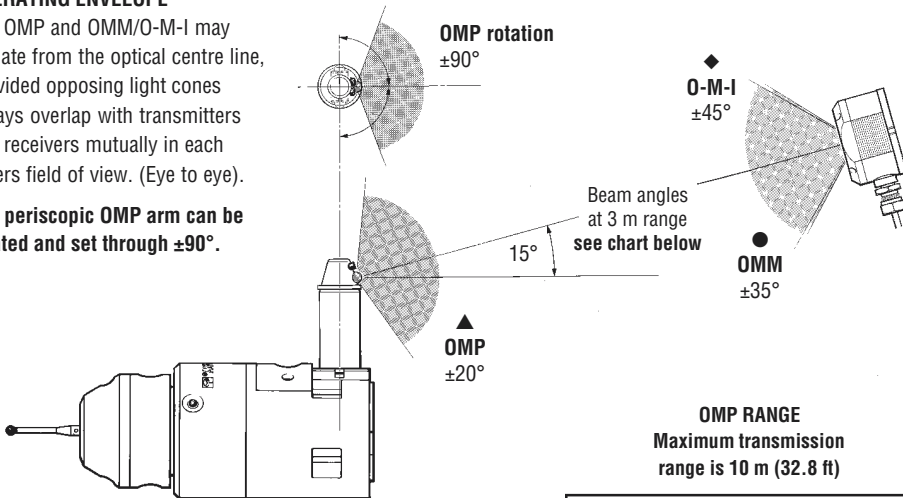
The PSU3 powers the interface when a +24V DC power supply is not available from the CNC machine.



OPERATING ENVELOPE

The OMP and OMM/O-M-I may deviate from the optical centre line, provided opposing light cones always overlap with transmitters and receivers mutually in each others field of view. (Eye to eye).

The periscopic OMP arm can be rotated and set through $\pm 90^\circ$.



There is a choice of two arm lengths.

The long arm OMP extended from 150 to 206 mm (5.9 to 8.11 in).

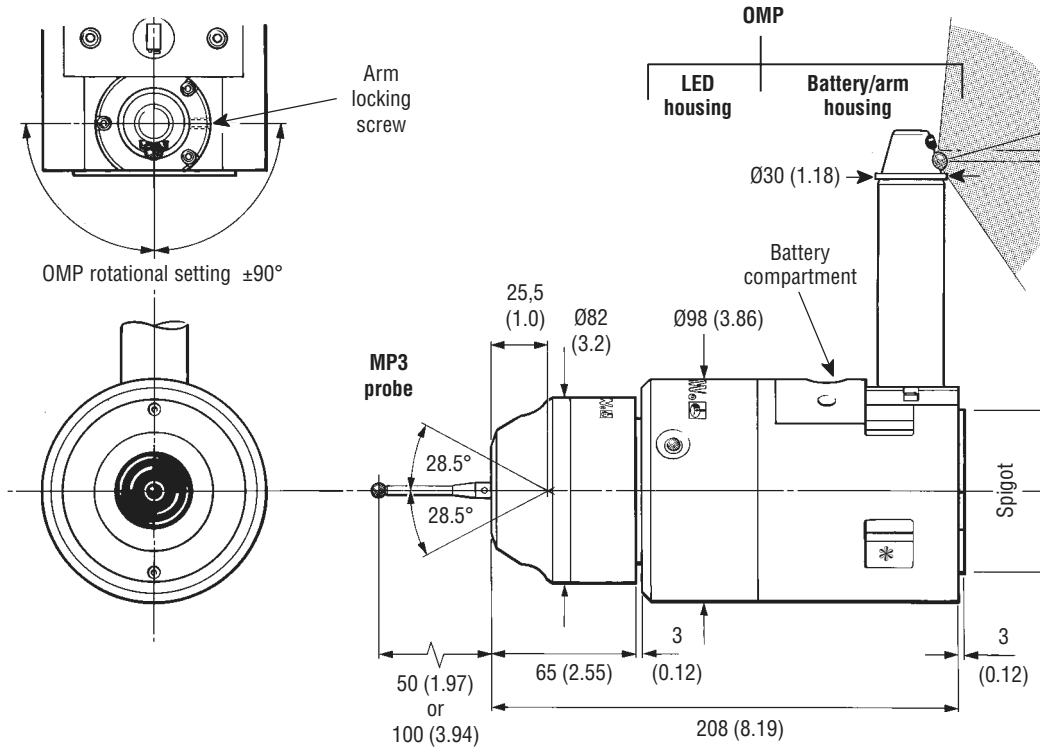
The short arm extended from 65 to 121 mm (2.56 to 4.76 in).

The OMP arm setting allows the OMM or O-M-I to be located in the most convenient position - see page 1-20, OMM and O-M-I position.

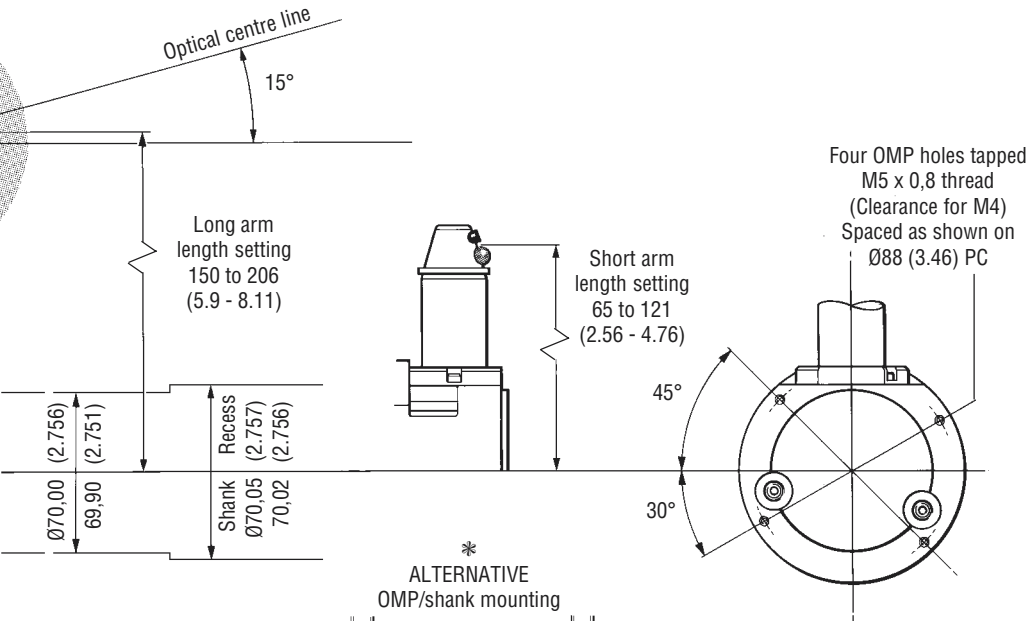
OMP RANGE
Maximum transmission range is 10 m (32.8 ft)

	Range			
	1 m (3.28 ft)	2 m (6.56 ft)	3 m (9.84 ft)	4 m (13.12 ft)
▲ OMP Beam angle	$\pm 70^\circ$	$\pm 40^\circ$	$\pm 20^\circ$	$\pm 20^\circ$
◆ O-M-I Beam angle	$\pm 47^\circ$	$\pm 47^\circ$	$\pm 45^\circ$	$\pm 40^\circ$
● OMM Beam angle	$\pm 45^\circ$	$\pm 40^\circ$	$\pm 35^\circ$	$\pm 30^\circ$

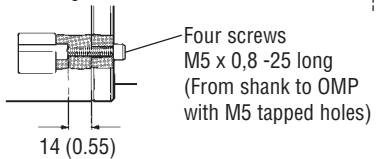
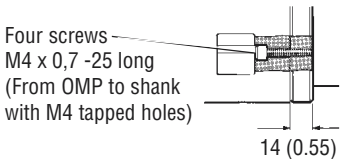
WIDE ANGLE OPTICAL PROBE - dimensions mm (in)



Ensure OMP is correctly orientated relative to the shank drive dog slot



*
ALTERNATIVE
OMP/shank mounting



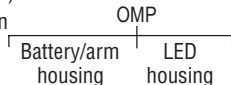
WIDE ANGLE OPTICAL PROBE FEATURES and ASSEMBLY - see Screw Torque Values page 1-35

Adjustable arm setting

The adjustable arm position must be set, before the probe is used. Slackening the locking screw, gives the adjustable periscopic arm freedom to rotate, to extend or retract. (Internal O ring seals may cause some resistance to movement).

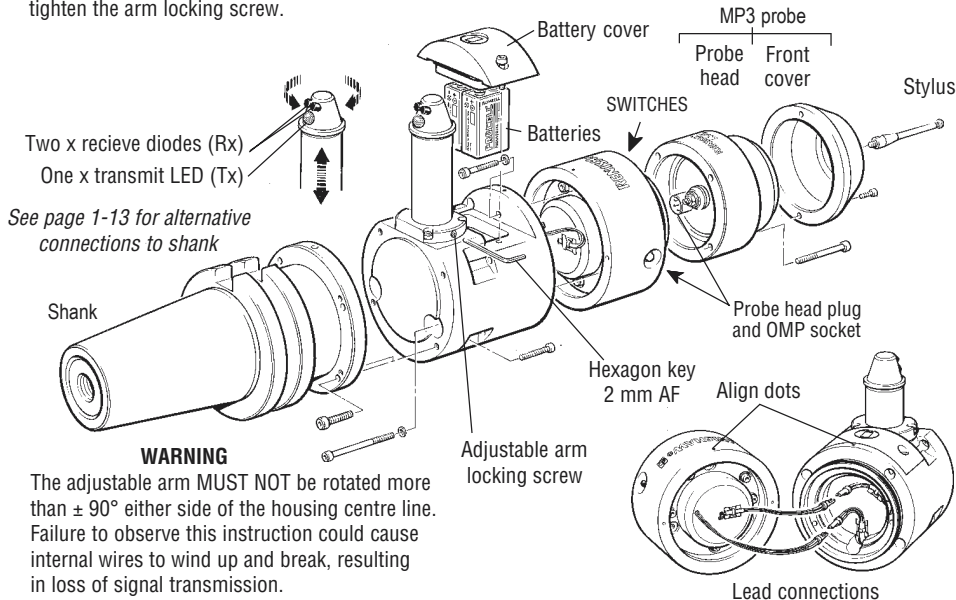
To obtain OMM/O-M-I optimum position for signal strength - see page 1-20.

After OMP setting is established tighten the arm locking screw.



Assembly

1. Attach the LED housing to the battery housing - connect leads and align dots on each housing.
2. Fit the MP3 probe onto the OMP - align probe head plug with OMP socket - see page 1-18.
3. Attach shank to OMP - see page 1-13.



To gain access to the OMP switches, first remove the MP3 probe head - see page 1-18

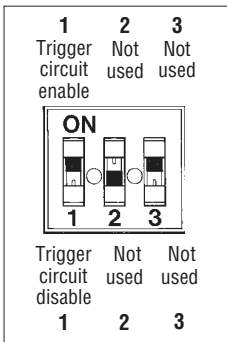
TAKE CARE - KEEP ALL COMPONENTS CLEAN

DO NOT allow coolant or chips to enter probe head/OMP.

DO NOT touch electronic components when changing switch settings.

DO NOT use tip of pencil for switch adjustment.

SWITCH SW2 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. SW2 enables the enhanced trigger circuit to be initiated. This results in a system delay of a nominal 6 milli-seconds.

SWITCH SW1

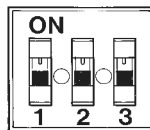
Debounce - Time out - Mode see pages 1-22 & 1-23

Factory settings are shown. i.e. Optical on - Time out.

1 DEBOUNCE
5 seconds
(Factory set)

2 TIME OUT
33 seconds

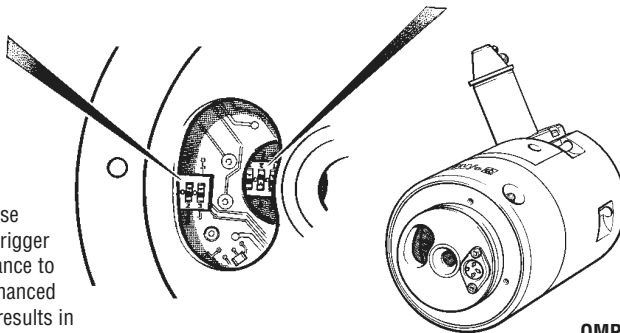
3 MODE
Optical on
Optical off



1 DEBOUNCE
9 seconds

2 TIME OUT
134 seconds
(Factory set)

3 MODE
Optical on
Time out
(Factory set)



OMP

BATTERY POWER

Power for the probe is supplied by two Type PP3 9 V batteries.

Low battery indication

The MI 12 or O-M-I low battery LED lights up when battery voltage is low. The low battery LED will only illuminate during the probe operating mode. This will warn the user that the end of useable battery life is approaching. The machine control may also be programmed to flag up a low battery alarm.

Typical battery reserve life.

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

Dead battery indication

The probe status LED indicates when the batteries have come to the end of their useful life.

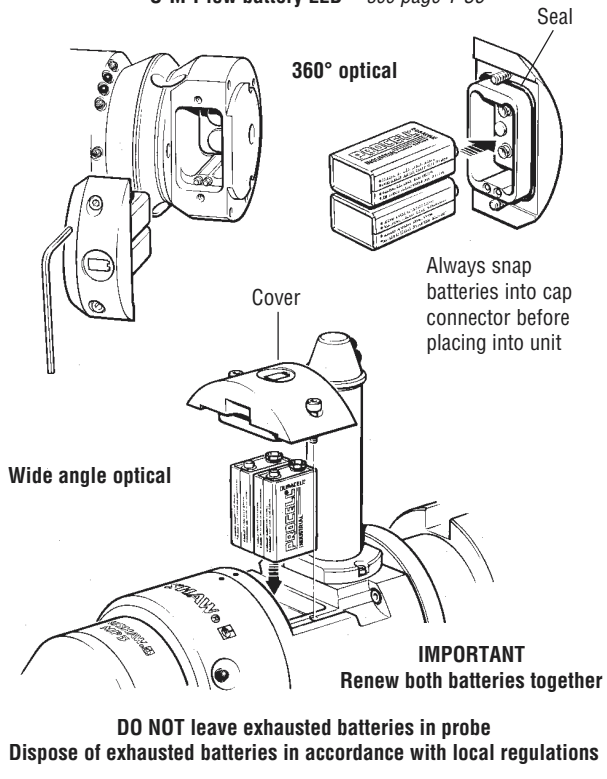
When the battery voltage drops below a threshold where performance cannot be guaranteed, the probe status LED will change to continuous red.

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

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

MI 12 low battery LED - see page 1-37

O-M-I low battery LED - see page 1-39



BATTERY LIFE EXPECTANCY
Two x PP3 9 V alkaline battery
 Duracell type MN1604 or equivalent

SYSTEM	STAND-BY LIFE		5% USAGE - 72 min/day				CONTINUOUS LIFE			
			OPTICAL ON OPTICAL OFF		OPTICAL ON TIMER OFF		OPTICAL ON OPTICAL OFF		OPTICAL ON TIMER OFF	
	Minimum	Typical	Minimum	Typical	Minimum	Typical	Minimum	Typical	Minimum	Typical
360° optical	657 days	687 days	90 days	102 days	70 days	73 days	120 hrs	135 hrs	86 hrs	96 hrs
Wide angle optical	657 days	687 days	105 days	117 days	72 days	75 days	145 hrs	165 hrs	90 hrs	100 hrs

To replace batteries

- Remove cover -
Do not damage cover seal.
- Remove exhausted batteries.
- Insert new batteries - observing correct polarity.
- If the cover seal is dry, lightly smear the surface with mineral oil or grease.
- Replace cover and tighten screws
- *see pages 1-34 and 1-35.*

BATTERY Duracell MN1604	TEMPERATURE
Shelf Life	2.5 years at 20° C (68° F)
Storage - Short term - Long term	-30° to 70° C (-22° to 158° F) 5° to 40° C (41° to 104° F)
Operating	10° to 40° C (50° to 104° F)
Note : Unit will operate down to 0° C (32° F), but may not retain full range accuracy.	

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.

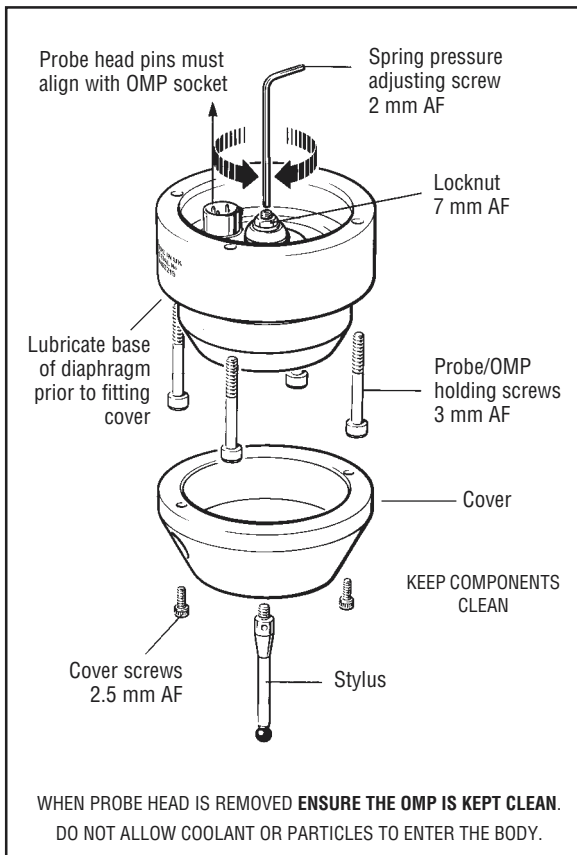
The probe head detaches to provide access to the spring pressure adjusting screw. First release the locknut, then turn the adjusting screw anti-clockwise to reduce pressure or clockwise to increase pressure.

Caution - Overtightening will eventually unseat an internal seal. To check if sealing is secure, press the stylus in, 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 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 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.

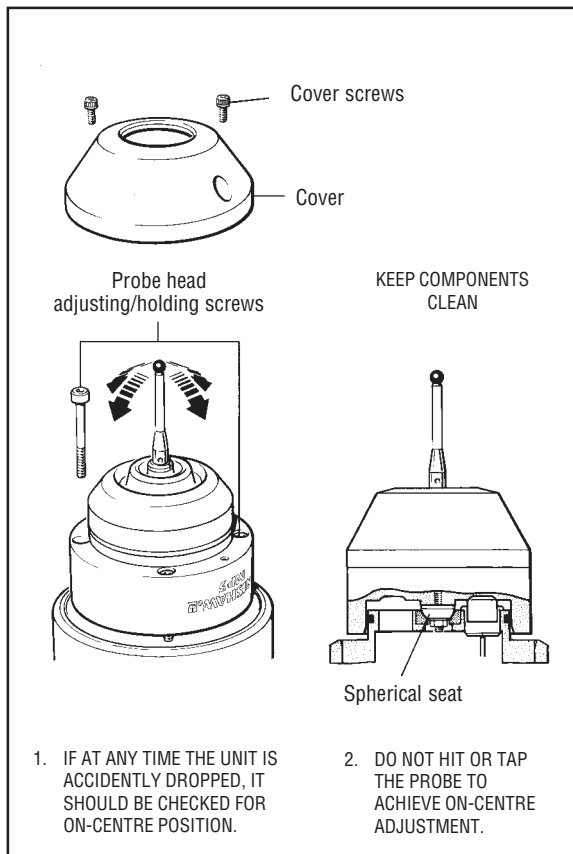
Alternatively rotate the stylus ball against a flat surface. Alignment is good when the stylus ball maintains a consistent distance from the flat surface.

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 tightness of holding screws, and replace the front cover.



SYSTEM PERFORMANCE

360° OPTICAL and WIDE ANGLE OPTICAL SYSTEMS

PROBE REPEATABILITY

Maximum 2 sigma (2σ) value

Repeatability of 1,0 μm (40 μ in) is valid for test velocity of 480 mm/min (1.57 ft/min) at stylus tip, using stylus 50mm (1.97 in) long.

STYLUS TRIGGER FORCE

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

X - Y direction - lowest force

7,5 N

75 gf

2.6 ozf

X - Y direction - highest force

1,5 N

150 gf

5.2 ozf

Z direction

4,90 N

490 gf

17.3 ozf

PROBE/OMP IP RATING

MP3 - 360° optical IP68.

MP3 - Wide angle optical IP68.

OMM and O-M-I OPTIMUM POSITION

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

- see *MI 12 handbook*.

O-M-I signal strength is displayed on an O-M-I multi-coloured LED

- see *page 1-38 or O-M-I handbook*.

OPTICAL SIGNAL RANGE

Minimum 10 mm (0.39 in)

Maximum

360° optical system	3 m (9.84 ft)
Wide angle optical system	10 m (32.8 ft)

OPERATING ENVELOPE

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

Coolant residue accumulating on the OMP LED's and OMM/O-M-I window, will have a detrimental effect on transmission performance. Wipe clean as often as is necessary to maintain unrestricted transmission.

WARNING

If two systems are operating in close proximity to each other, take care to ensure that signals transmitted from the OMP on one machine, are not received by the OMM/O-M-I on the other machine, and vice versa.

SYSTEM PERFORMANCE

ENVIRONMENT

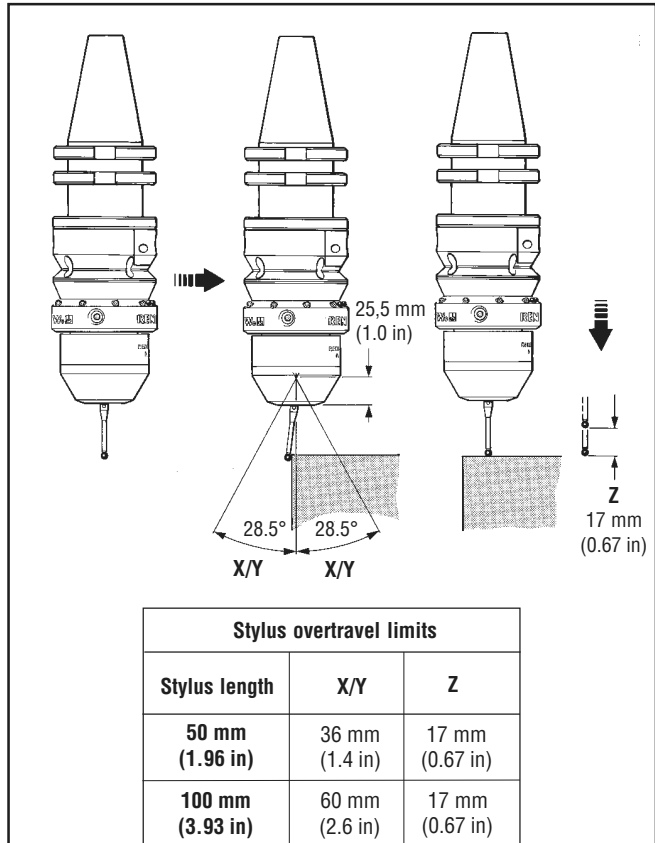
Temperature range for optimum system performance.

PROBE / OMP
O-M-I
OMM + MI 12 INTERFACE
PSU3

Storage
 -10° to 70° C
 (14° to 158° F)

Operating
 5° to 50° C
 (41° to 122° F)

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



OPERATING MODES

The probe has two basic operating modes, which are user selectable.

1. Optical on - Optical off

2. Optical on - Time out (off)

Definition of terms

The terms and descriptions given below, define the different phases of system operation.

The probe can only be used, if batteries with useable life are correctly fitted in the OMP.

Stand-by

When the OMP transmitter is off, and only the receiver is active - waiting for a start signal.

Start signal

A burst of infra red from the OMM or O-M-I, modulated at 7,8125 kHz, will switch on the OMP transmitter.

Operational

When the OMP is transmitting probe status information, and the receiver is active.

Time out

The period during which the OMP will remain operational before switching to stand-by, when in Optical on - Time out mode.

The time out is user selectable to 33 or 134 seconds - *factory set to 134 seconds \pm 2 seconds.*

Debounce time

See OMP switches - *pages 1-9 and 1-15.*

The debounce time, is the minimum time that must elapse after sending a start signal, before the OMP is ready to act upon another start signal.

If a start signal is sent within the debounce period the OMP will ignore it. The debounce period after the OMP has been switched on, is user selectable to 5 or 9 seconds - *factory set to 5 seconds.*

The debounce period after the OMP has been switched off, or timed out, is less than 10 ms. i.e. It can be switched back on again, after 10 ms has elapsed.

OPERATING MODES

SWITCH ON

OMP switch on options

The probe should be located in the machine spindle, and have a direct line of sight between its Rx diodes, and the OMM/O-M-I.

Switch on options are user selectable by MI 12 or O-M-I switch settings - see MI 12 or O-M-I handbook.

OMP switch on is initiated by one of the following methods:

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 systems are set to the Optical on - Optical off option.

SWITCH OFF

OMP switch off options

There are two switch off options.

Switch off options are user selectable by OMP switch settings - *see pages 1-9 and 1-15*.

1. Optical on - Time out - *factory set*

A timer automatically returns the OMP 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 changing the internal OMP switch - *see pages 1-9 and 1-15*.

The timer is also reset for a further 33 or 134 seconds each time the probe triggers during the operating mode.

Note : A start signal received during probe on time also resets the timer (not during debounce period of 5 or 9 seconds).

2. Optical on - Optical off

In this mode a second start signal will return the OMP to the stand-by mode. Optical switch off is commanded by a software M code.

The probe will remain off until the next switch on command. Switch off can only occur after the switch on debounce period has elapsed (5 or 9 seconds).

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.

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 PROBING

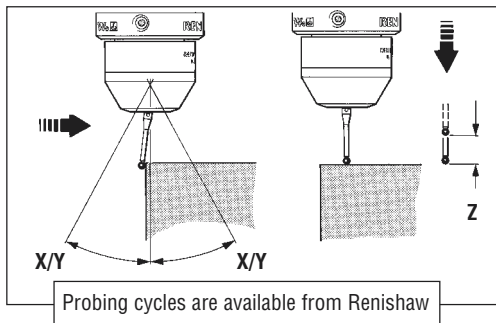
If the probe operating sequence is based on a single touch, then the probe is returned to its start point following a measuring move.

On some types of controller, it is desirable to use a two touch method as poor accuracy and repeatability can result at higher feed rates.

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 MEASURING SPEED

The probe system transmission delay time is small and constant and does not normally limit the probing speed, because it is cancelled out during calibration of the probe on the machine tool.



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 measuring capability of the machine.

CALIBRATING A SYSTEM

Calibration should be done in the following circumstances :

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 relocation repeatability of the probe holder.

It is important that calibration cycles are run at the measuring cycle feed rate to cancel out system errors.

Make measurements in every measuring direction to provide complete calibration data for the measuring cycles.

PROBE INTERFACE SIGNALS

1. Error signal delay

A delay of 48 ms maximum for the OMM + MI 12 or 41 ms maximum for the O-M-I, will elapse between an error occurring and the output indicating error.

2. Probe signal delay

There is a nominal delay of 140 μ s with a repeatability of 2 μ s for each interface, from the time the probe actually operates to the MI 12/O-M-I interface indicating a probe change of state.

Enabling the enhanced trigger circuit will add a further nominal 7 milliseconds.

SOFTWARE REQUIREMENTS

Probe cycles and features are machine software dependant. Good software will allow the following functions :

- Simple to use cycles.
- Update a tool offset.
- If an out of tolerance is found, either generate an alarm stop, 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.
4. Does your software provide protected moves in the cycles to monitor for a collision.

INSPECTION CYCLE FEATURES

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.

SOFTWARE for MACHINING CENTRES

Simple to use canned cycles for basic features

CALIBRATION

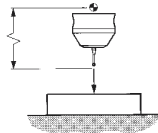
Probe XY offset calibration



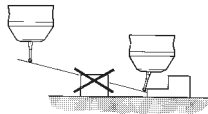
Stylus ball radius calibration



Probe length calibration



PROBE COLLISION PROTECTION



TOOL SETTING PROBE

Length setting
(rotating and non rotating)



Diameter setting
(rotating)

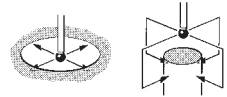


Broken tool detection

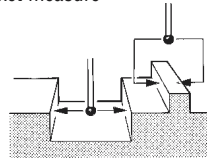


INSPECTION

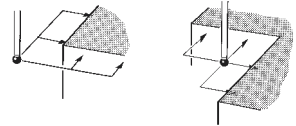
Bore and boss measure



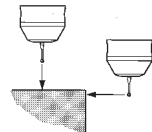
Web and pocket measure



Internal and external corner find



XYZ single surface position



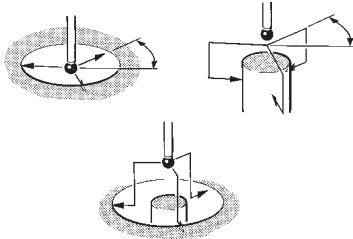
Inspection print-out

COMPONENT No. 1				
OFFSET NO.	NOMINAL DIMENSION	TOLERANCE	DEVIATION FROM NOMINAL	COMMENTS
99	1.5000	.1000	.0105	
97	200.0000	.1000	.2054	OUT OF TOL

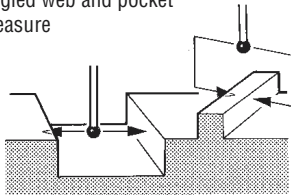
SOFTWARE for MACHINING CENTRES
Simple to use canned cycles for additional features

INSPECTION

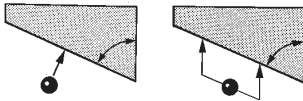
Bore and boss (three point)



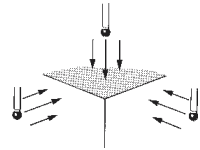
Angled web and pocket measure



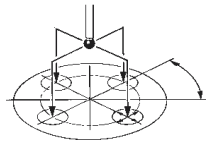
Angled surface measure



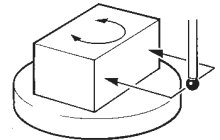
Stock allowance



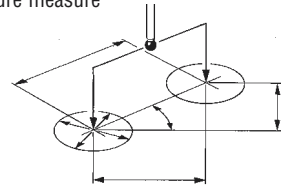
Bore and boss on PCD



4th axis measure



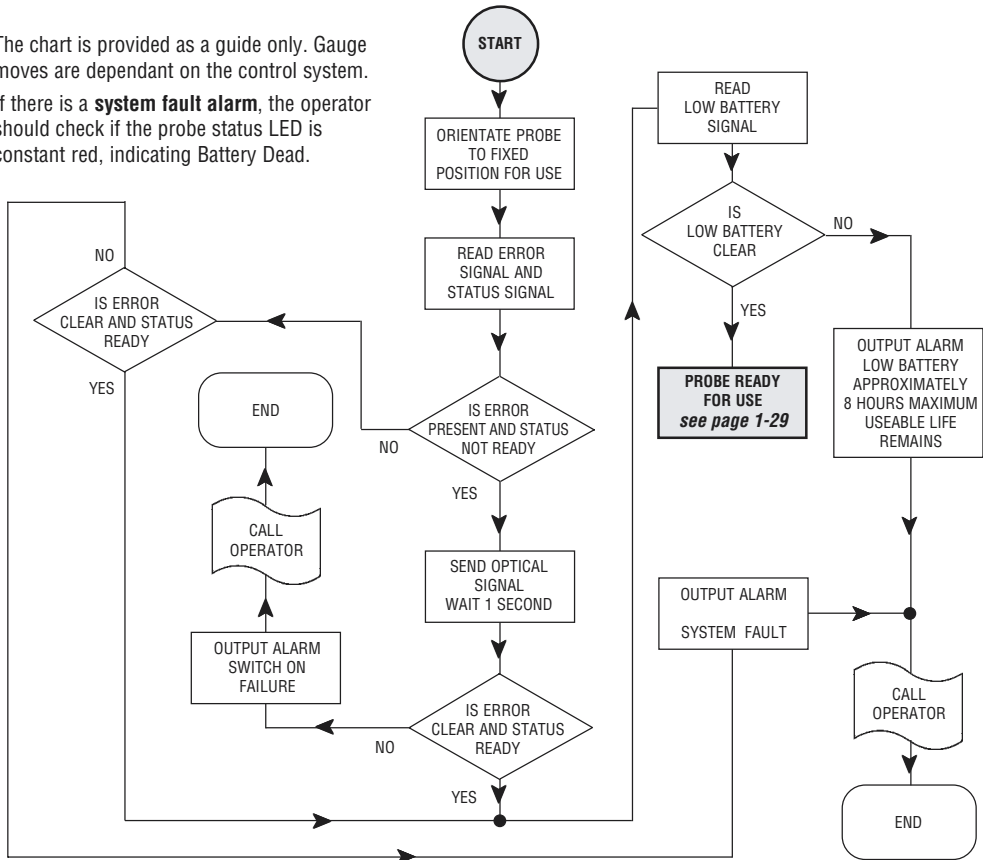
Feature to feature measure



FLOW CHART - OPTICAL ON

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

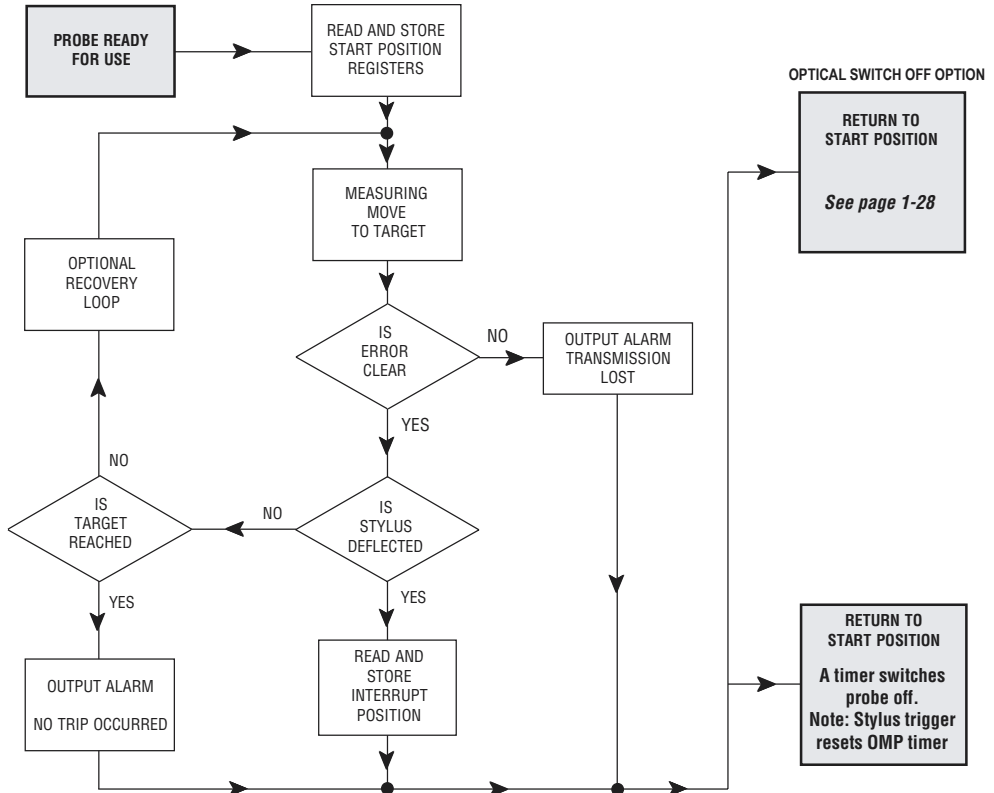
If there is a **system fault alarm**, the operator should check if the probe status LED is constant red, indicating Battery Dead.



FLOW CHART - GAUGING MOVES FOR PROBE

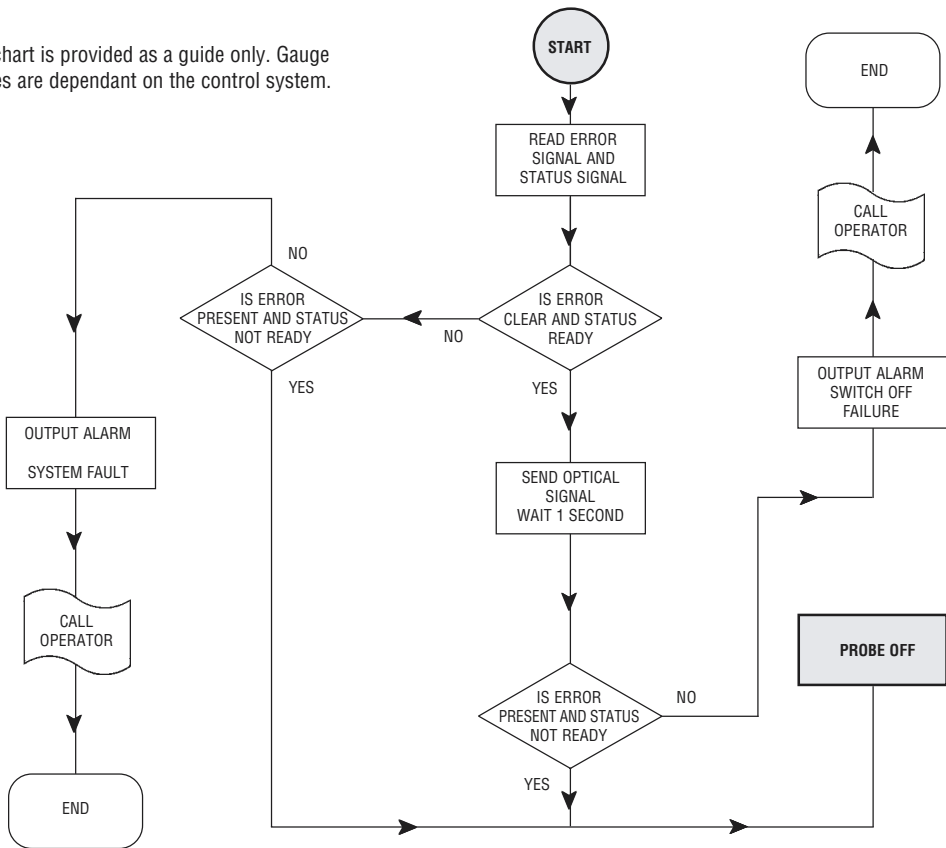
The chart is provided as a guide only. Gauge moves are dependant on the control system.

The system switch off is either optical off or time out.



FLOW CHART - OPTICAL OFF

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



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

<p>COMPLETE FAILURE (No change in output)</p> <p>OMP - OMM/O-M-I not aligned correctly /out of range</p> <p>Beam obstructed</p> <p>Incorrect voltage supply to interface</p> <p>Probe LED fails to light up after switch on</p> <p>MI 12 power LED fails to light up</p> <p>MI 12 low battery LED is lit</p> <p>Probe status LED constant red</p> <p>IF THESE CHECKS DO NOT ELIMINATE THE FAULT, RETURN PROBE TO YOUR SUPPLIER</p>	<p>SPURIOUS READING</p> <p>Cable damaged</p> <p>Electrical or optical interference.</p> <p>System may not function or intermittent errors occur.</p> <p>Poorly regulated power supply</p> <p>Excess machine vibration</p> <p>Loose mounting or stylus</p> <p>Replace cable</p> <p>Route transmission cable clear of other cables carrying high currents</p> <p>Shield from intense light sources e.g. Xenon beacons</p> <p>Electrically isolate OMM from machine to prevent earth loop</p> <p>Check if arc welders, stroboscopes or other high intensity light source is in close proximity.</p> <p>Regulate correctly</p> <p>Eliminate vibration or increase stylus spring pressure. Enable enhanced trigger circuit</p> <p>Tighten</p>
<p>POOR REPEATABILITY</p> <p>Loose mounting</p> <p>Loose stylus</p> <p>Excessive machine vibration</p> <p>Check all screwed connections</p> <p>Tighten stylus</p> <p>Eliminate vibration</p>	<p>POOR RESEAT</p> <p>Probe spring pressure too low</p> <p>Probe trigger on reseat</p> <p>Diaphragms pierced or damaged</p> <p>Adjust probe spring pressure</p> <p>Move stylus clear of workpiece</p> <p>Inspect outer diaphragm. If inner diaphragm is damaged return to your supplier for repair</p> <p>IF THE PROBE CONTINUES TO MALFUNCTION, RETURN PROBE TO YOUR SUPPLIER</p>

MAINTENANCE

THE PROBE IS A PRECISION TOOL HANDLE WITH CARE

ENSURE THE PROBE IS FIRMLY SECURED IN ITS MOUNTING

SAFETY - SWITCH POWER OFF WHEN WORKING INSIDE 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.

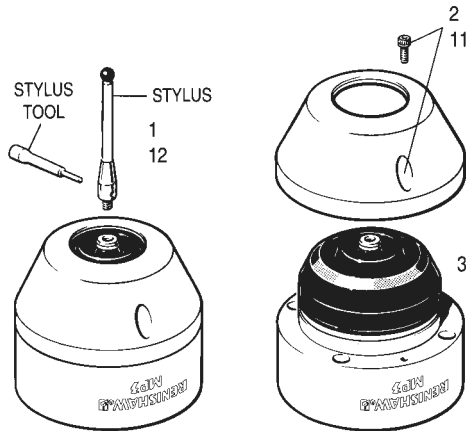
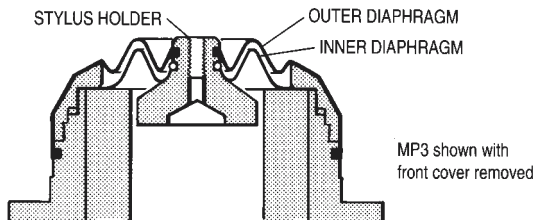
OUTER DIAPHRAGM INSPECTION.

The probe mechanism is protected by two diaphragms, 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



DIAPHRAGM INSPECTION

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

INNER DIAPHRAGM INSPECTION

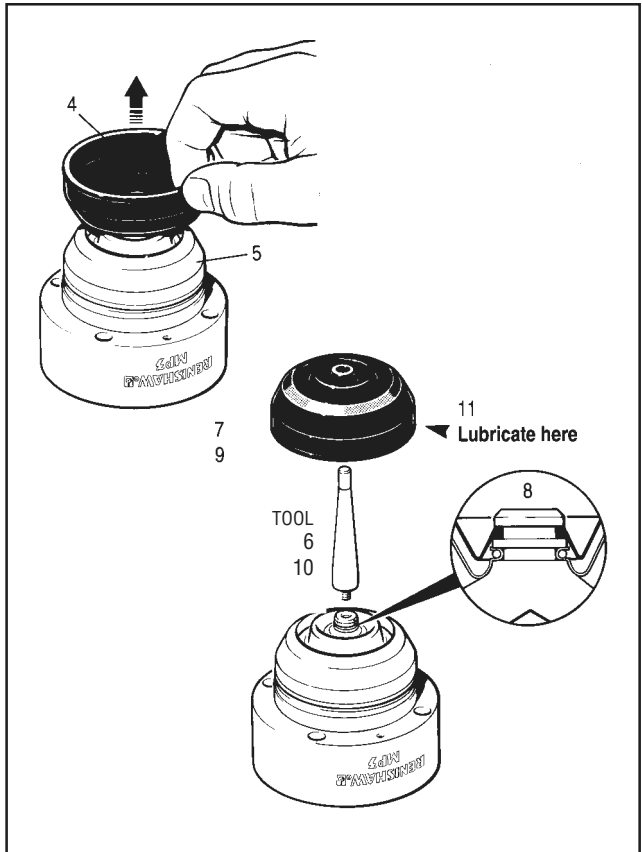
5. Inspect inner diaphragm for damage.

If damaged return the probe to your supplier for repair.

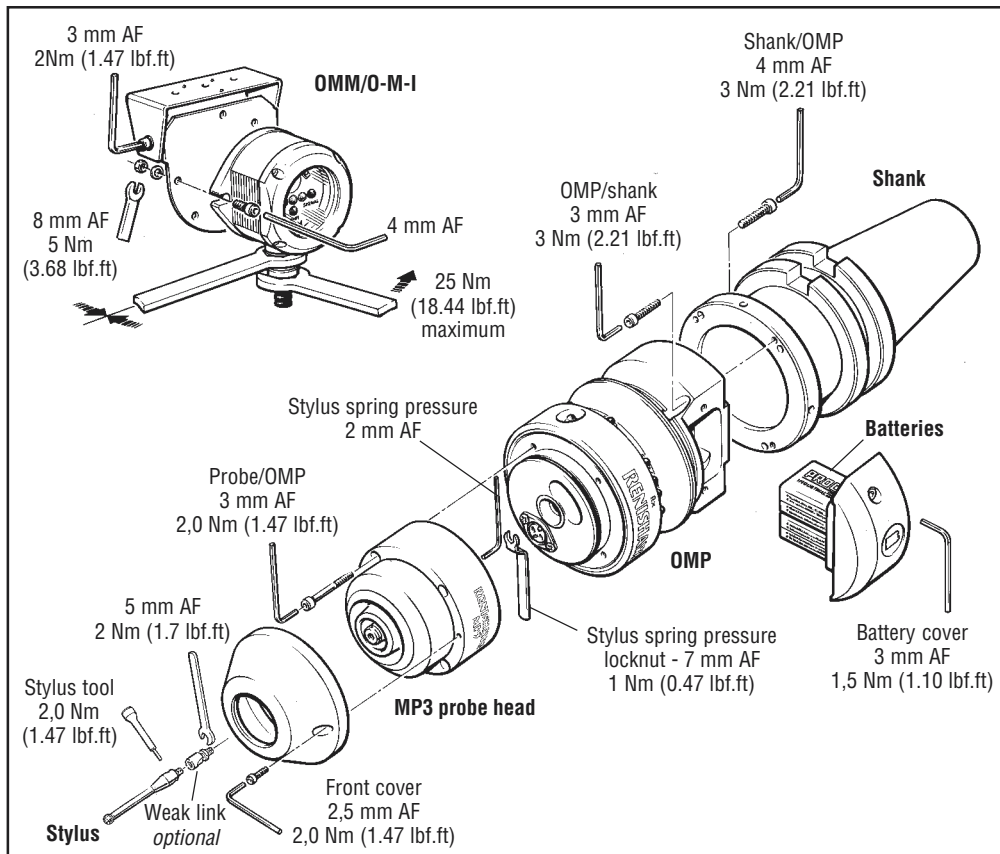
DO NOT REMOVE INNER DIAPHRAGM

OUTER DIAPHRAGM REPLACEMENT

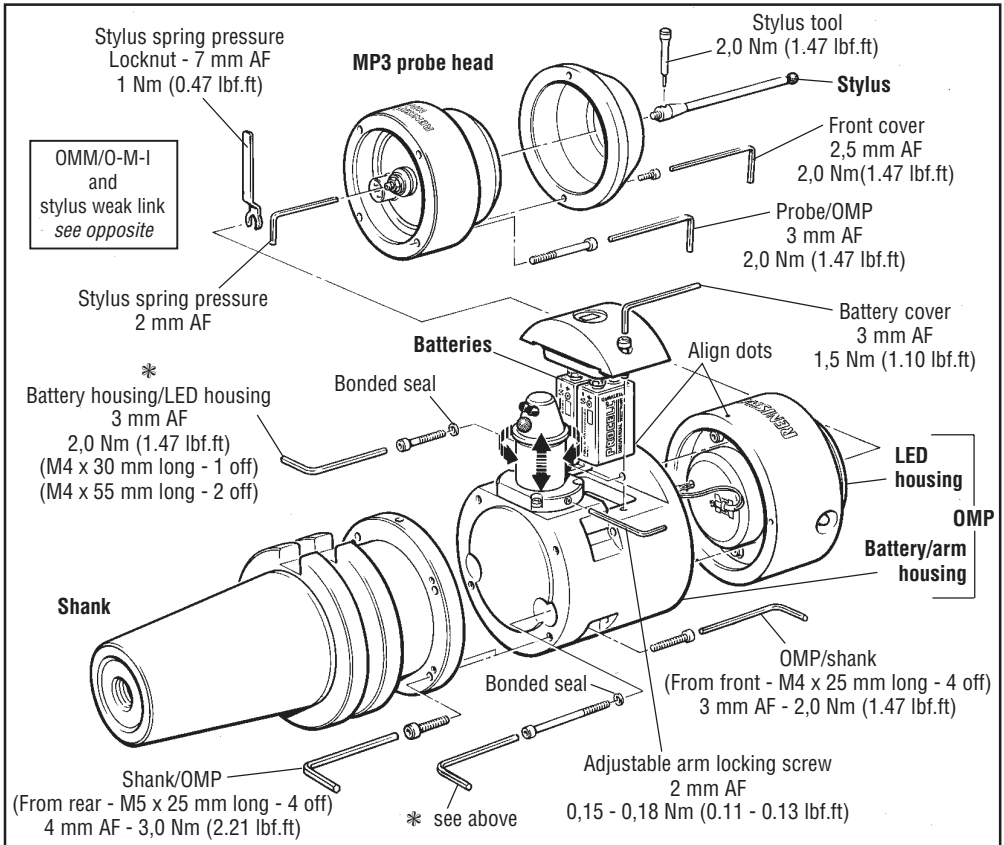
6. Screw tool fully into stylus holder.
7. Fit new diaphragm.
8. The diaphragm must locate centrally in the stylus holder groove.
9. Press diaphragm to expel trapped air.
10. Remove tool.
11. Lightly lubricate diaphragm rim surface. Then refit front cover.
12. Refit stylus.



360° OPTICAL SYSTEM - SCREW TORQUE VALUES - Nm (lbf.ft)



WIDE ANGLE OPTICAL SYSTEM - SCREW TORQUE VALUES - Nm (lbf.ft)



APPENDIX 1 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.

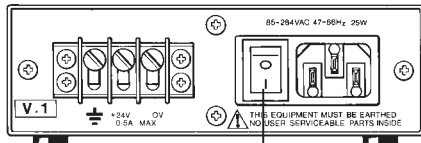
Front view



Power LED

(Light emitting diode)
When the green LED is lit,
the power supply is on.

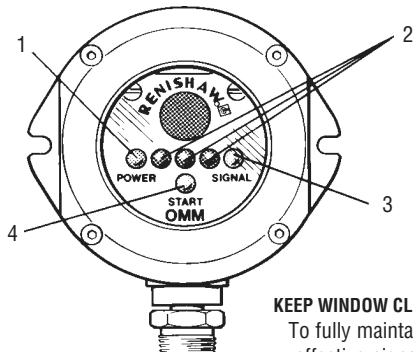
Rear view



Mains switch
On/Off

APPENDIX 2 OMM (OPTICAL MODULE MACHINE)

The OMM is used with an MI 12 interface
unit. The OMM is fully described in
User's Guide H-2000-5044



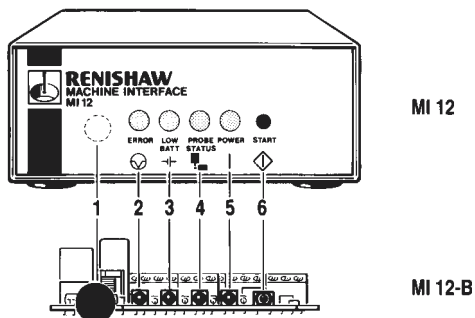
KEEP WINDOW CLEAN
To fully maintain
effective signal
transmission

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

APPENDIX 3

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 batteries 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 4**O-M-I (OPTICAL MACHINE INTERFACE)**

The O-M-I 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.

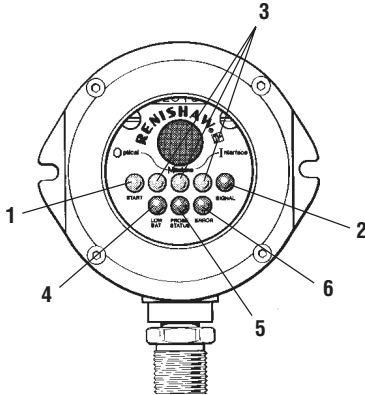
2. LED (Red, Yellow, Green) – Infra red SIGNAL strength received from probe.

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 O-M-I 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.



3. LED (Clear x 3)

These LED's 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.

KEEP WINDOW CLEAN

To fully maintain effective signal transmission



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

5. LED (Red, Green) – PROBE STATUS.

This bi-colour LED is lit when the O-M-I 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.

APPENDIX 5 ADAPTOR and EXTENSIONS

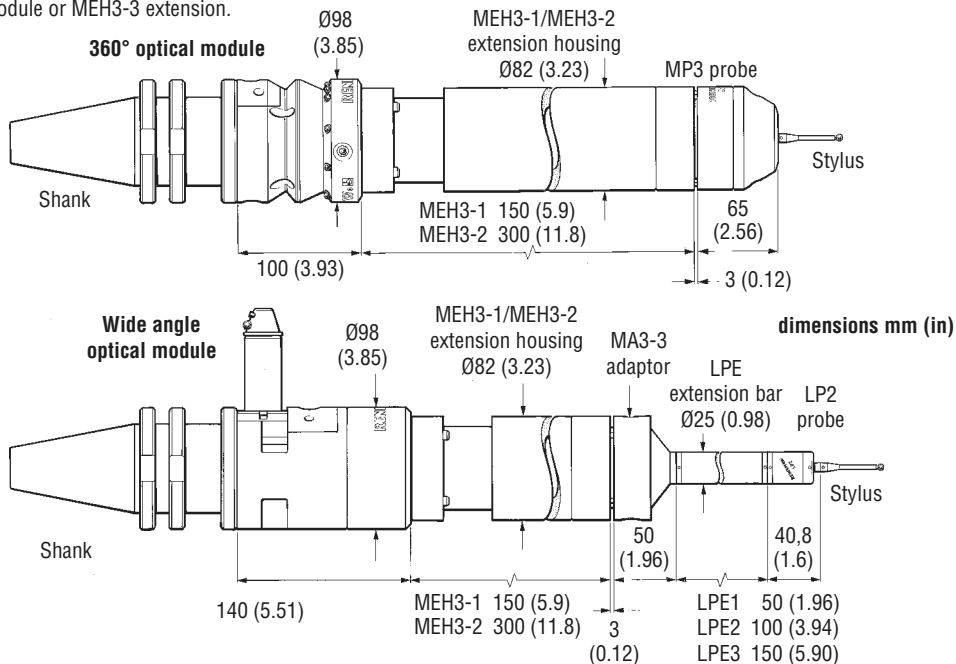
Adaptors and extensions are fully described in Data Sheet H-2000-2120

ADAPTORS

Features with restricted access can be probed using an LP2 probe. The MP3 probe can be replaced by an MA3-3 adaptor and LP2 probe. The MA3-3 connects directly to the optical module or MEH3-3 extension.

EXTENSIONS

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



WEAK LINK FOR STYLI WITH STEEL SHAFT - Optional

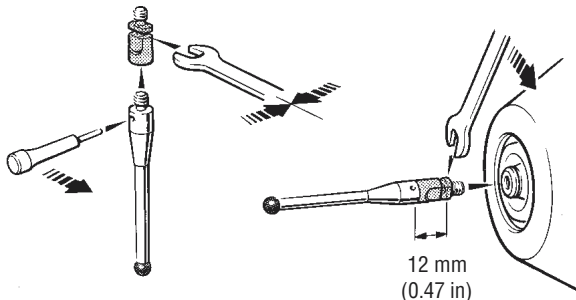
In the event of excessive stylus overtravel the weak link stem is designed to break, thereby protecting the probe from damage.

FITTING STYLUS WITH WEAK LINK ONTO A TYPICAL PROBE

Take care to avoid stressing the weak link during assembly.

Screw torque value - 2 Nm (1.7 lbf.ft)

Weak link stem



Attach the weak link to the stylus, by rotating the tommy bar and holding the spanner steady.

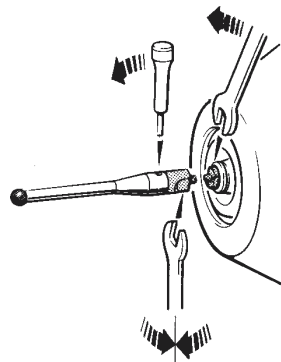
Fit the stylus with weak link to the probe.

Note:

THE WEAK LINK IS NOT USED WITH CERAMIC SHAFT STYLI

TO REMOVE A BROKEN STEM

The broken portion of stem attached to the probe is removed with the spanner.



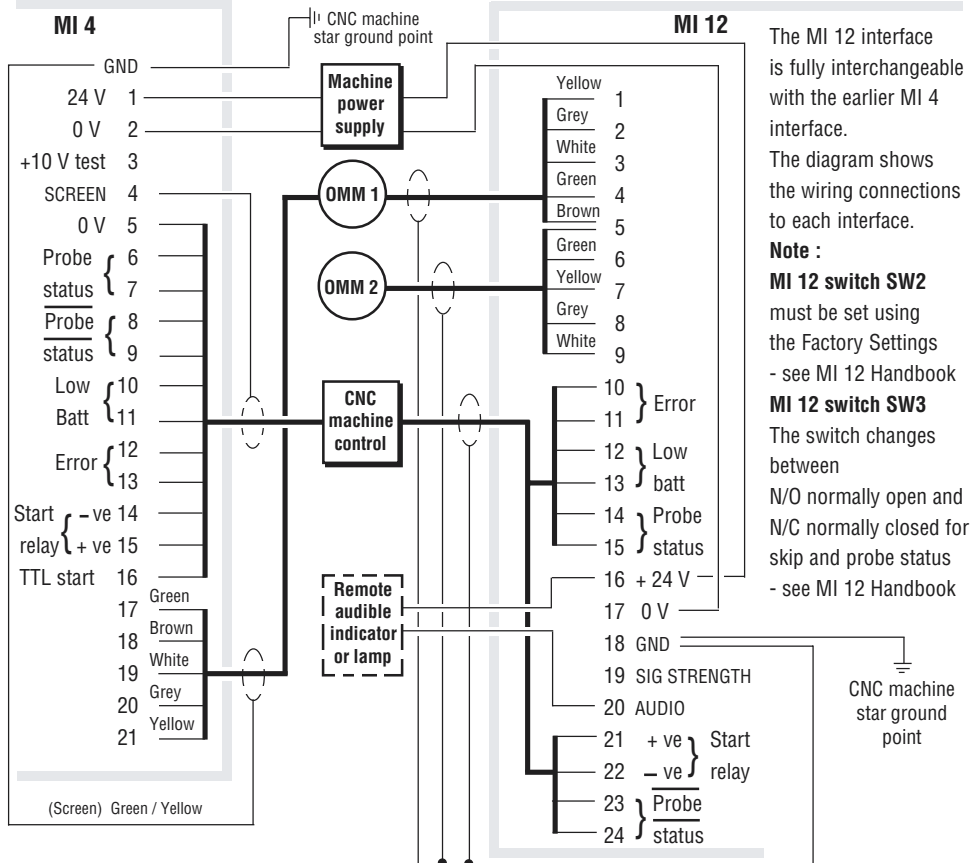
To remove broken portion of stem from the stylus, use the spanner and tommy bar.

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

Type	Part No.	Description
MP3 probe	A-2053-5358	<p align="center">MP3 PROBE for 360° and WAO SYSTEMS</p> MP3 probe complete with holding screws and TK1 tool kit.
MP3 + 40° OMP + OMM + MI 12	A-2103-0005	<p align="center">360° OPTICAL TRANSMISSION</p> MP3 + 40° OMP with batteries, stylus, OMM with mounting bracket, MI 12 interface unit, and tool kit.
MP3 + 40° OMP + OMM + MI 12-B	A-2103-0006	MP3 + 40° OMP with batteries, stylus, OMM with mounting bracket, MI 12 interface board, and tool kit.
MP3 + 40° OMP	A-2103-0007	MP3 + 40° OMP with two batteries and accessories.
40° OMP	A-2103-0008	40° OMP with two batteries and accessories.
OMP - Short arm	A-2033-1165	<p align="center">WIDE ANGLE OPTICAL (WAO) TRANSMISSION</p> Wide angle OMP assembly with short arm and two batteries.
OMP - Long arm	A-2033-1166	Wide angle OMP assembly with long arm and two batteries.
Styli	—	<p align="center">ACCESSORIES for MP3 PROBE and OMP</p> For complete listing - See Renishaw Styli Guide H-1000-3200.
Stylus	A-5000-3709	Ceramic stylus 50 mm long with Ø6 ball.
Stylus	A-5000-3712	Ceramic stylus 100 mm long with Ø6 ball.
Weak link kit	A-2085-0068	Weak link kit comprising : Two stylus weak link stems and spanner.
Weak link	A-2085-0069	Stylus weak link stem.
Screw	P-SC01-0308	Cap head screw M3 x 0,5 - 8 mm long, for probe cover - 2 required.

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

Type	Part No.	Description
ACCESSORIES for MP3 PROBE and OMP continued		
TK1 kit	A-2053-7531	TK1 - Probe head tool kit comprising :
DK3 kit	A-2053-8156	Stylus tool, 1,5 mm, 2,0 mm, 2,5 mm 3,0 mm and 4,0 mm hexagon keys.
Battery	P-BT03-0001	DK3 - MP3 outer diaphragm replacement kit.
		PP3 9 V alkaline battery - two required (Duracell MN 1604 or equivalent).
ADAPTOR and EXTENSIONS		
MEH3-1	A-2053-7286	MEH3-1 extension housing Ø82 x 150 mm long with holding screws.
MEH3-2	A-2053-7287	MEH3-2 extension housing Ø82 x 300 mm long with holding screws.
MA3-3	A-2063-7583	MA3-3 adaptor - allows LP2 probe to be used in place of MP3 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.
ADDITIONAL SYSTEM COMPONENTS		
OMM	—	Optical module machine - See Users Guide H-2000-5044.
MI 12	—	MI 12 interface unit - See Users Guide H-2000-5073.
O-M-I	—	Optical machine interface - See Users Guide H-2000-5062.
PSU3	—	PSU3 power supply unit - See Users Guide H-2000-5057.
Shank	—	Taper shanks for machine tool probes - See Data Sheet H-2000-2011.
SOFTWARE		
Software	—	Probe software for machine tools - See Data Sheet H-2000-2289.



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