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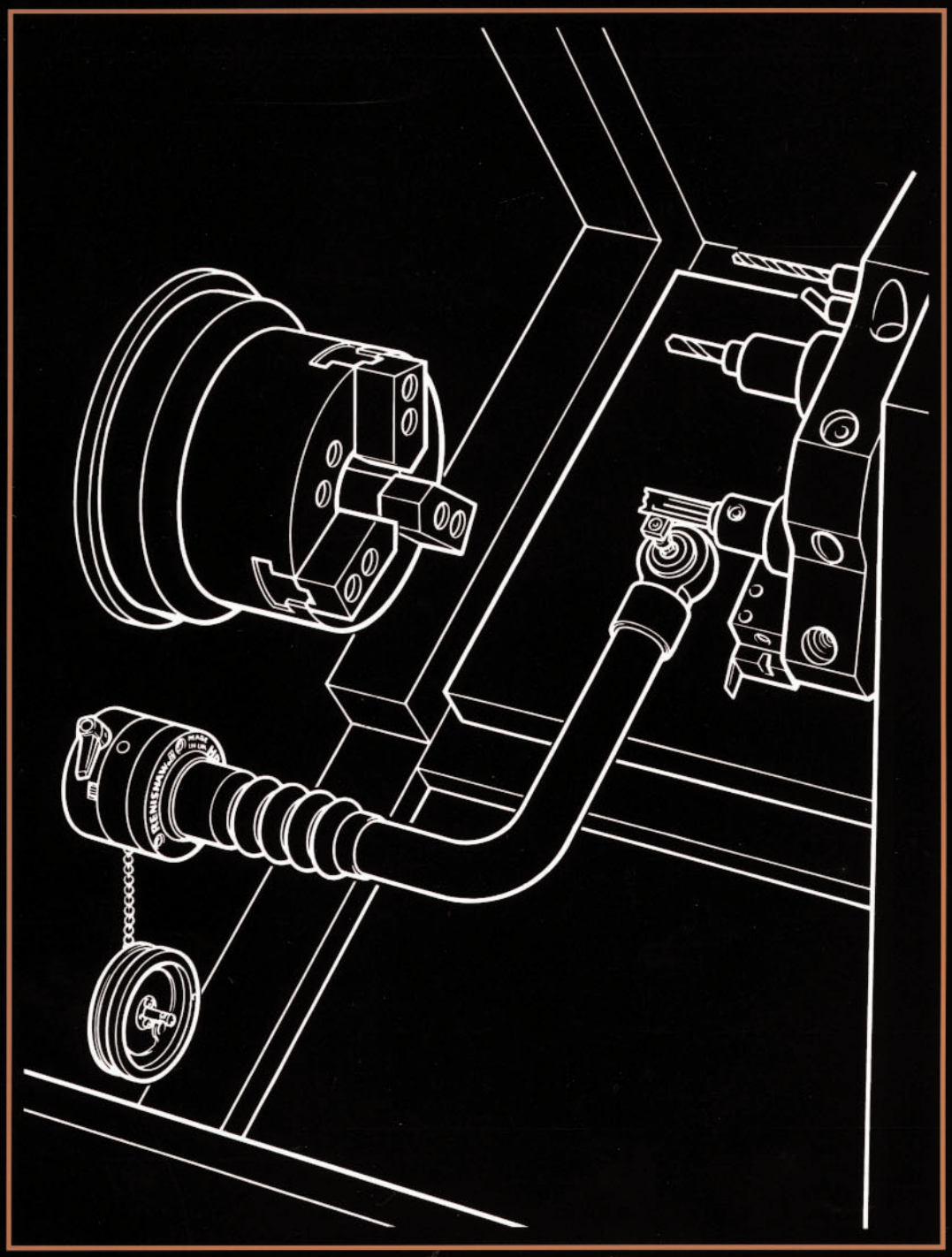

RENISHAW

Installation & Users Guide

HPA
HIGH PRECISION ARM

H-2000-5039-01-A

Installation & User's Guide

HIGH PRECISION ARM

RENISHAW®
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CE

This product conforms to the following European standards:
BS EN 61010-1, BS EN 50081-2, and BS EN 50082-2.

It complies with the relevant essential health and safety and protection requirements of the following EC Directives:
89/336/EEC as amended (EMC), 73/23/EEC as amended (LOW VOLTAGE) and 93/68/EEC (CE MARKING).

All relevant safety information, including that incorporated in the installation instructions, user instructions and maintenance instructions must be observed.

FCC

Information to user (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.

Information to user (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.

Special accessories (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.

SAFETY

GB

Information for the User

In all applications involving the use of Machine Tools or CMMs, eye protection is recommended.

For instructions regarding the safe cleaning of Renishaw products, refer to the MAINTENANCE section of the relevant product documentation.

There are no user serviceable parts inside Renishaw mains powered units. Return defective units to an authorised Renishaw Customer Service Centre.

Replace blown fuses with new components of the same type. Refer to the SAFETY section of the relevant product documentation.

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.

The expected method of providing an emergency stop for Renishaw products is to remove power.

F

Informations à l'attention de l'utilisateur

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

Les conseils de nettoyage en toute sécurité des produits Renishaw figurent dans la section MAINTENANCE de votre documentation.

Aucune pièce des machines Renishaw alimentées sur secteur ne peut être réparée par l'utilisateur. Renvoyer toute machine défectueuse à un Centre Après Vente Renishaw agréé.

Remplacer les fusibles grillés par des composants neufs du même type. Consulter la section SECURITE (SAFETY) de votre documentation.

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 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.

La procédure habituelle d'arrêt d'urgence des produits Renishaw est la mise hors tension.

D

Informationen für den Benutzer

Bei der Bedienung von Werkzeugmaschinen oder Koordinatenmeßanlagen ist Augenschutz empfohlen.

Anleitungen über die sichere Reinigung von Renishaw-Produkten sind in Kapitel WARTUNG (MAINTENANCE) in der Produktdokumentation enthalten.

Die betriebenen Renishaw-Einheiten enthalten keine Teile, die vom Anwender gewartet werden können. Im Falle von Mängeln sind diese Geräte an Ihren Renishaw Kundendienst zu senden.

Durchgebrannte Sicherungen müssen mit gleichwertigen ersetzt werden. Beziehen Sie sich bitte auf die SICHERHEITSANWEISUNGEN (SAFETY) in der Produktdokumentation.

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 all 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 Meßtastersignal falscherweise melden, daß der Meßtaster nicht ausgelenkt ist. Verlassen Sie sich nicht allein auf Sondensignale, um sich über Maschinenbewegungen zu informieren.

Renishaw-Produkte sollen im Notfall durch Trennen der Stromversorgung gestoppt werden.

I

Informazioni per l'utente

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

Per le istruzioni relative alla pulizia dei prodotti Renishaw, fare riferimento alla sezione MANUTENZIONE (MAINTENANCE) della documentazione del prodotto.

All'interno degli apparecchi Renishaw ad alimentazione di rete elettrica, non vi sono componenti adatti a interventi di manutenzione da parte dell'utente. In caso di guasto, rendere l'apparecchio a uno dei Centri di Assistenza Renishaw.

I fusibili bruciati dovranno essere sostituiti con quelli dello stesso tipo. Consultare la sezione SICUREZZA (SAFETY) della documentazione del prodotto.

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.

Lo stop d'emergenza per i prodotti Renishaw è l'isolamento dall'alimentazione elettrica.

E

Información para el usuario

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

Para instrucciones sobre seguridad a la hora de limpiar los productos Renishaw, remitirse a la sección titulada MANTENIMIENTO (MAINTENANCE) en la documentación sobre el producto.

Dentro de las unidades Renishaw que se enchufan a la red, no existen piezas que puedan ser mantenidas por el usuario. Las unidades defectuosas deben ser devueltas a un Centro de Servicio al Cliente Renishaw.

Sustituir los fusibles fundidos con componentes nuevos del mismo tipo. Remitirse a la sección titulada SEGURIDAD (SAFETY) en la documentación sobre el producto.

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 erroneamente que la sonda está asentada. No fiarse de las señales de la sonda para parar el movimiento de la máquina.

El método previsto para efectuar una parada de emergencia de los productos Renishaw es el de quitar la corriente.

P

Informações para o Utilizador

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

Para instruções relativas à limpeza segura de produtos Renishaw, consultar a secção MANUTENÇÃO (MAINTENANCE) da documentação do produto.

Não há peças que possam ser consertadas pelo utilizador dentro das unidades Renishaw alimentadas pela rede. Devolver unidades avariadas a um Centro de Atendimento a Clientes Renishaw.

Substituir fusíveis fundidos por novos componentes do mesmo tipo. Consultar a secção SEGURANÇA (SAFETY) da documentação do produto.

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 e 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.

O método esperado de proporcionar uma paragem de emergência para produtos Renishaw é desligar a alimentação.

P

Informações para o Utilizador

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

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O método esperado de proporcionar uma paragem de emergência para produtos Renishaw é desligar a alimentação.

DK

Oplysninger til brugeren

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

Se afsnittet VEDLIGEHOLDELSE (MAINTENANCE) i produktdokumentationen for at få instruktioner til sikker rengøring af Renishaw-produkter.

Der er ingen dele inde i Renishaw-enhederne, som sluttes til lysnettet, der kan efterses eller repareres af brugeren. Send alle defekte enheder til Renishaws kundeservicecenter

Udskift sikringer, der er sprunget, med nye komponenter af samme type. Se i afsnittet SIKKERHED (SAFETY) i produktdokumentatione

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.

Den forventede metode til nødstop af Renishaw-produkter er afbrydelse strømforsyningen.

GR

Πληροφορίες για τους χρήστες

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

Για οδηγίες που αφορούν τον ασφαλή καθαρισμό των προϊόντων Renishaw, βλέπετε το κεφάλαιο ΣΥΝΤΗΡΗΣΗ (MAINTENANCE) στο διαφωτιστικό υλικό του προϊόντος.

Σε μονάδες της Renishaw με σύνδεση με το ηλεκτρικό ρεύμα δεν υπάρχουν εξαρτήματα που να χρειάζονται συντήρηση από το χρήστη. Τυχόν ελαπωματικές μονάδες επιστρέφονται σε εξουσιοδοτημένο Κέντρο Εξυπηρέτησης των Πελατών της Renishaw.

Τυχόν ασφάλειες που καίονται πρέπει να αντικαθιστούνται με νέες ασφάλειες του ίδιου τύπου. Βλέπετε το κεφάλαιο ΑΣΦΑΛΕΙΑ στο διαφωτιστικό υλικό του προϊόντος.

Αποσυνδέστε το μηχάνημα 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 εξασθαλίσει ότι ο χρήοτης είναι ενήμερος τυχόν κινδύνων που συνεπάγεται η λειτουργία, συμπεριλαμβανομένων και όσων αναφέρονται στο διαφωτστικό 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.

Η ελκεκριμένη μέθοδος θέσεως των μηχανημάτων Renishaw εκτός λειτουργίας σε πορίπιωση αναγκης είναι η αποσύνδεση από το ηλεκτρικό ρεύμα.

NL

Informatie voor de Gebruiker

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

Voor het veilig reinigen van Renishaw produkten wordt verwezen naar het hoofdstuk ONDERHOUD (MAINTENANCE) in de produktendocumentatie.

De onderdelen van Renishaw units die op het net worden aangesloten kunnen niet door de gebruiker onderhouden of gerepareerd worden. U kunt defecte units naar een erkend Renishaw Klantenservice Centrum brengen of toezenden.

Doorgeslagen zekeringen met nieuwe componenten van hetzelfde type vervangen. U wordt verwezen naar het hoofdstuk VEILIGHEID (SAFETY) in de produktendocumentatie.

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 ervoor verantwoordelijk 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 veiligheidsgrendelinrichtingen.

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

In geval van nood wordt er verwacht dat het Renishaw produkt wordt stopgezet door de stroom uit te schakelen.

SW

Information för användaren

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

För instruktioner angående säker rengöring av Renishaws produkter, se avsnittet UNDERHÅLL (MAINTENANCE) i produktdokumentationen.

Det finns inga delar som användaren kan utföra underhåll på inuti Renishaws nätströmsdrivna enheter. Returnera defekta delar till ett auktoriserat Renishaw kundcentra.

Byt ut smälta säkringar med nya av samma typ. Se avsnittet SÄKERHET (SAFETY) i produktdokumentationen.

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 produktdokumentation, samt att tillräckligt goda skydd och säkerhetsförreglingar tillhandahålls.

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

Metoden för nödstopp för Renishaws produkter förutsätter att strömmen kopplas bort.

FIN

Käyttäjälle tarkoitettuja tietoja

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

Renishaw-tuotteiden turvalliset puhdistusohjeet löytyvät tuoteselosteen HUOLTOA (MAINTENANCE) koskevasta osasta.

Sähköverkkoon kytkettävät Renishaw-tuotteet eivät sisällä käyttäjän huollettavissa olevia osia. Vialliset osat tulee palauttaa valtuutetulle Renishaw-asiakaspalvelukeskukselle.

Vaihda palaneiden sulakkeiden tilalle samantyyppiset uudet sulakkeet. Lue tuoteselosteen TURVALLISUUTTA (SAFETY) koskeva osa.

Kytke pois sähköverkosta ennen huoltotoimenpiteitä.

Katso koneen toimittajalle tarkoitettuja käyttöhjeita.

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 suojia ja lukkoja.

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

Renishaw-tuotteiden hätäpysäytys tehdään tavallisesti kytkemällä sähkö pois.

Care of equipment
Renishaw probes and associated systems are precision tools used for obtaining precise measurements and must therefore be treated with care.

Changes to Renishaw products
Renishaw plc reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

Warranty
Renishaw plc warrants its equipment for a limited period (as set out in our Standard Terms and Conditions of Sale) provided that it is installed exactly as defined in associated Renishaw documentation.

Prior consent must be obtained from Renishaw if non-Renishaw equipment (e.g., interfaces and/or cabling) is to be used or substituted. Failure to comply with this will invalidate the Renishaw warranty.

Claims under warranty must be made from authorised Service Centres only, which may be advised by the supplier or distributor.

Patents
Features of Renishaw's HPA High Precision Arm and of other products described in this User's Guide are the subjects of the patents and patent applications listed below -

EP 293036 B

JP 339/1996 B

Contents

1.0 INTRODUCTION

1.1 Description (as shown in Appendix1)

The Renishaw High Precision Arm (HPA) is supplied in kit form and the components must be assembled so that the final configuration positions the probe stylus on the machine's axes.

Two sizes of mounting base are available; these are Ø85mm and Ø120mm. The Ø120mm mounting base has been designed for larger machines with longer arms. This document covers both Ø85mm and Ø120mm arms.

The product comprises a permanently mounted base with cover, an arm assembly, a storage base and an electrical interface.

2.0 SYSTEM COMPONENTS

2.1 Base with Cover

The base (as shown in Figures 1, 2, 3 and 4) must be securely fixed to a firm mounting, such as the bulkhead, or the machine bed of a lathe, or a special metal bracket (sheet metal guarding is unsuitable). The base position should be determined prior to ordering the arm.

CAUTION: ENSURE THAT THE 'O' RINGS PROVIDED ARE FITTED UNDER THE HEADS OF THE M8 SOCKET CAPHEAD SCREWS, PRIOR TO THE BOLTING DOWN OF THE Ø120MM BASE. WASHERS MUST NOT BE FITTED UNDER THE HEADS OF THE M8 SOCKET CAPHEAD SCREWS.
The base is retained by four M6 socket caphead screws on the Ø85mm base (as shown in Figure 1), and three M8 socket caphead screws on the Ø120mm base (as shown in Figure 2).

Rear exit bases (Part Nos. A-2048-2041 for Ø85mm base and A-2048-2031 for Ø120mm base) require a clearance hole for the cable gland.

The cable gland seals the unit against coolant ingress and must not be removed.

The cable from side exit bases (Part Nos. A-2048-2040 for Ø85mm base and A-2048-2030 for Ø120mm base), should be protected from damage within the machine environment using a suitable conduit (such as Anaconda Sealtite, Type EF) or a steel tube.

Figure 1, Preferred Base Orientation for Ø85mm Base (Elevation View)

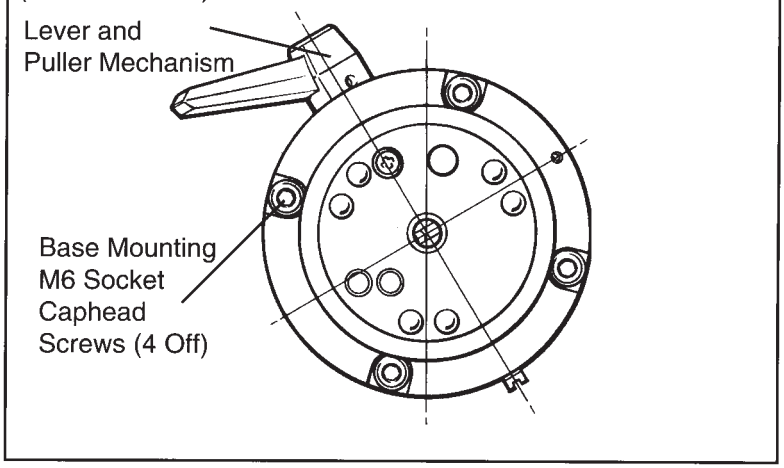
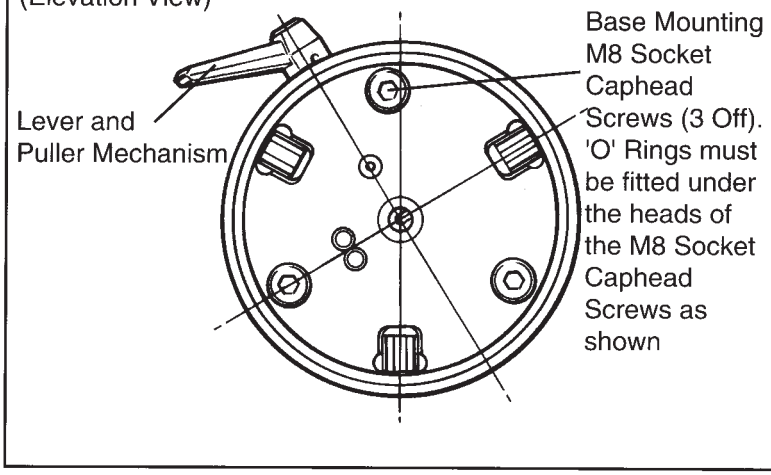


Figure 2, Preferred Base Orientation for Ø120mm Base (Elevation View)



2.0 SYSTEM COMPONENTS continued

2.1 Base with Cover continued

Figure 3, Ø85mm Base with Cover - dimensions in mm (in)

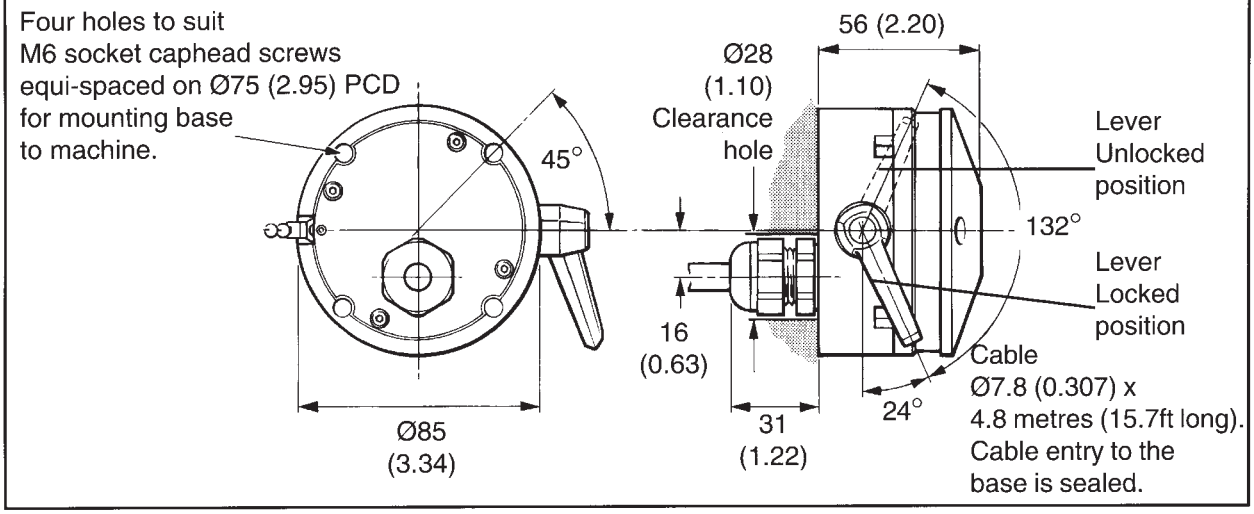
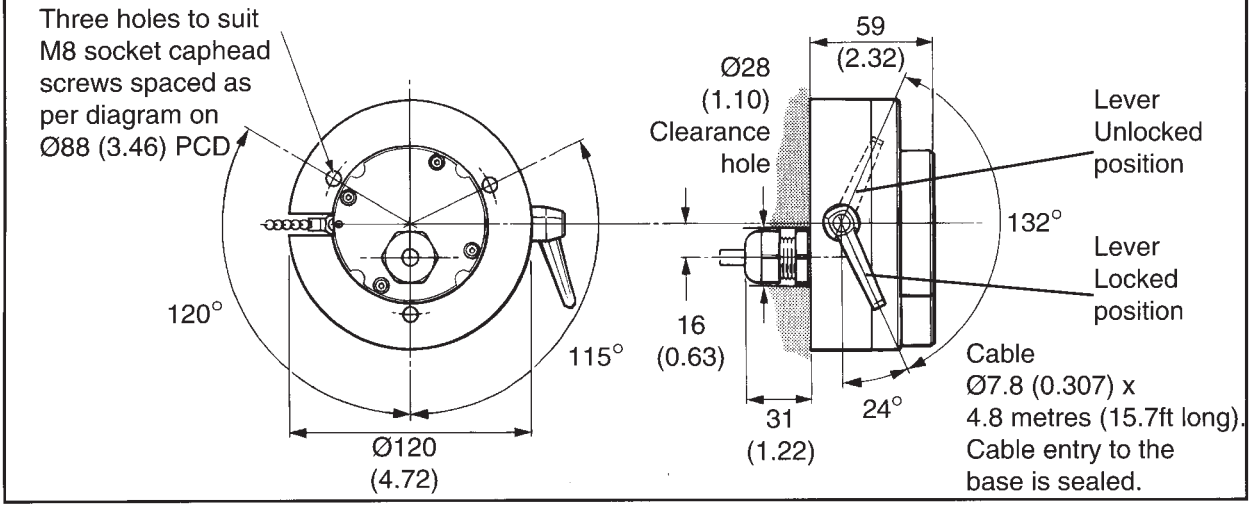


Figure 4, Ø120mm Base with Cover - dimensions in mm (in)



2.2 Arm

The arm/roller housing assembly (as shown in Figure 5) is complete except for the probe and its associated modular components.

Electrical connections for the probe are terminated at a connector for simple connection to the probe. The arm orientation is adjustable relative to the base.

2.0 SYSTEM COMPONENTS continued

2.2 Arm continued

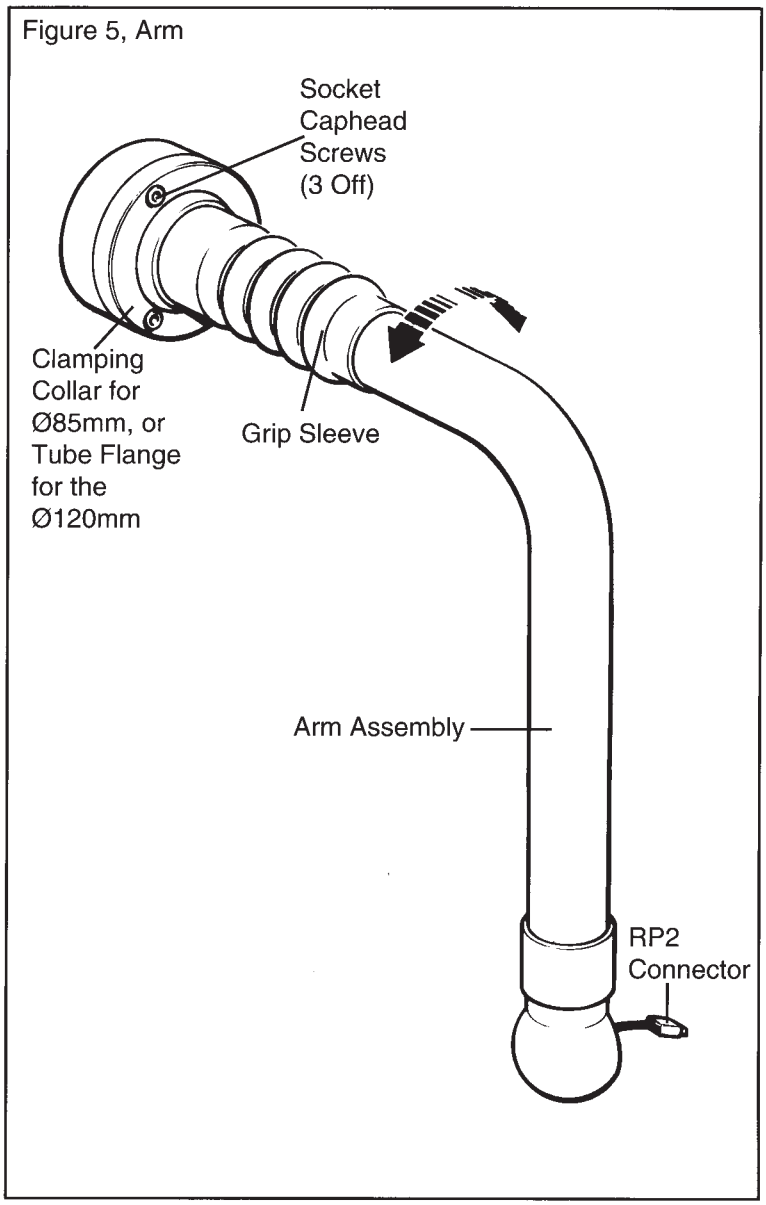
To adjust:

1. Slacken the three socket head screws holding the clamping collar for Ø85mm, or tube flange for the Ø120mm.

2. Rotate the arm to the required position. (Ensure the arm is not rotated more than 360° to prevent damage to the internal wiring).

3. Finally tighten the three socket head screws.

Figure 5, Arm



3.0 ASSEMBLY

3.1 Assembly of Probe into Arm (as shown in Figure 6)

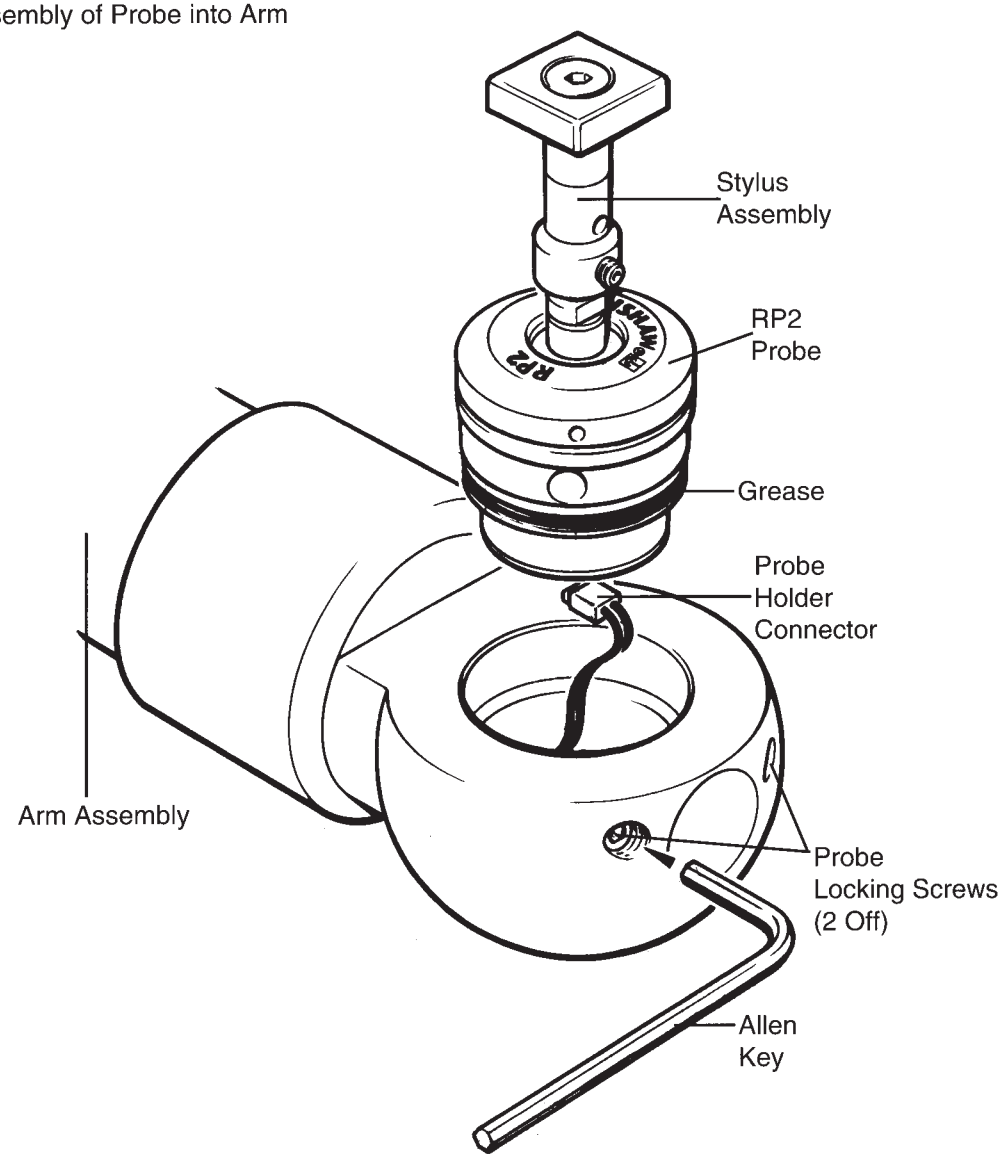
1. Connect the probe to the connector in the probe holder.

2. Lightly grease the 'O' ring on the probe (Molybdendum grease is recommended).

3. Push the probe fully home to achieve a positive location.
   NOTE: Take care that the two countersinks in the probe body align with the two locking screws in the probe holder.

4. Final locking of the probe is completed on the machine using the two set screws. Ensure that the two set screws engage correctlywith the two countersinks in the probe holder and provide fine rotational adjustment of the probe (see section 5.1).

Figure 6, Assembly of Probe into Arm



3.0 ASSEMBLY continued

3.2 Mounting an Arm and Cover on the Base (as shown in Figure 7)

To release the arm or the cover from the base, the lever should be turned fully anti-clockwise.

The arm will be released and should be pulled clear.

Mount the base to the machine using the socket caphead screws supplied (see section 2.1).

To mount the arm onto the base, the lever must be fully unlocked. Offer the arm up to the base ensuring that the alignment mark on the arm is aligned with the red dot on the lever.

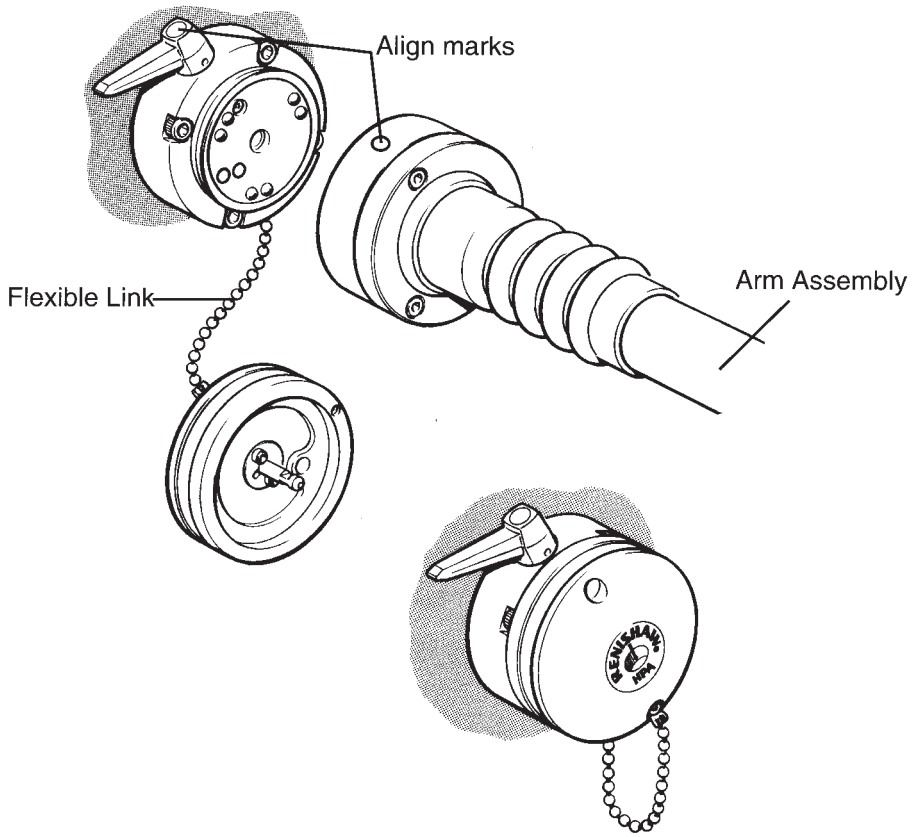
When the arm is seated, turn the lever clockwise through its full travel.

Align probe stylus tip to machine centre line using the 3 caphead screws (see section 2.2). Fine adjustment of the stylus tip to machine centre line can be carried out using the stylus stem adjustment (see section 5.1).

Always replace the cover on the base when the arm is removed. This protects the base and will complete an electrical circuit that can be sensed by the control and used to enable/disable machine movement.

The cover fitting procedure is the same as for the arm.

Figure 7, Mounting an Arm on the Base



Base with Base Cover

4.0 RP2 PROBE

4.1 The RP2 Probe

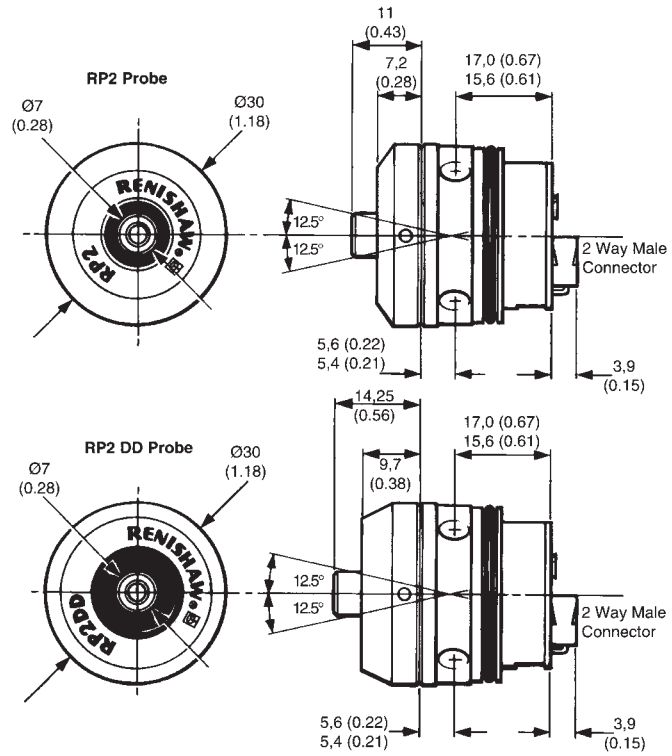
The Renishaw RP2 probe is fitted into a purpose designed mounting and is also available in a Double Diaphragm version (RP2 DD).

The RP2 is fitted to the Renishaw High Precision Arm (HPA).

The RP2/RP2 DD is fitted with a connector assembly.

4.2 RP2/RP2 DD Dimensions (as shown in Figure 8)

Figure 8, RP2/RP2 DD Dimensions dimensions mm (in)

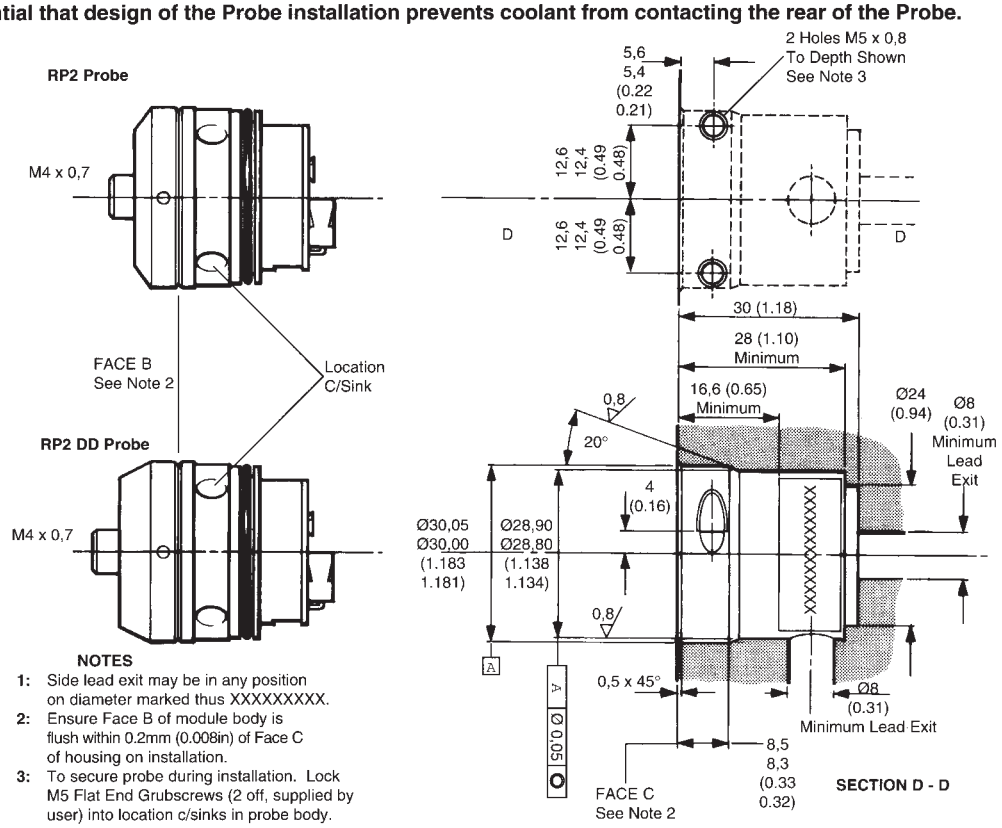


4.0 RP2 PROBE continued

4.3 RP2/RP2 DD Installation (as shown in Figure 9)

Figure 9, RP2/RP2 DD Installation dimensions mm (in)

NOTE: It is essential that design of the Probe installation prevents coolant from contacting the rear of the Probe.



NOTES

1: Side lead exit may be in any position on diameter marked thus XXXXXXXXX.
2: Ensure Face B of module body is flush within 0.2mm (0.008in) of Face C of housing on installation.
3: To secure probe during installation. Lock M5 Flat End Grubscrews (2 off, supplied by user) into location c/sinks in probe body.

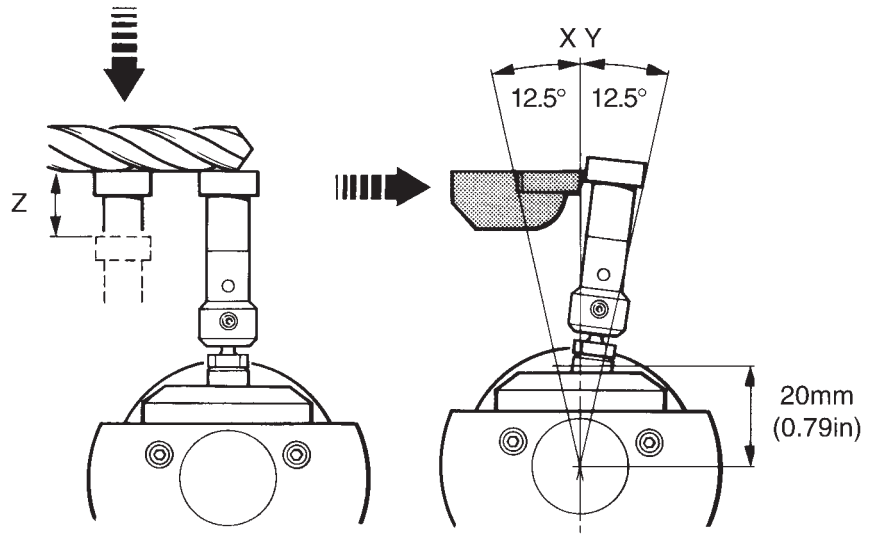
4.0 RP2 PROBE continued

4.4 RP2 Probe Specification

Sense directions	5-way
Stylus overtravel	12.5° in X and Y
(as shown in Figure 10)	4mm (0.157in) in Z
Probe repeatability (2σ)	1.0µm (with a 35mm (1.38in) stylus at 480mm/min)
Stylus trigger force	Factory set with a 35,0mm (1.38in) stylus.
X Y	125g (4.4oz) maximum in high force direction, 70g (2.5oz) minimum in low force direction
Z	610g (21.5oz)
Operating temperature	5°C to 60°C (41°F to 140°F)
Storage temperature	-13°C to +60°C (9°F to 140°F)

A Renishaw Calibration Certificate is supplied with each probe.

Figure 10, Stylus Overtravel Limits



4.5 RP2/RP2 DD Connection Assembly (as shown in Figures 11 and 12)

SAFETY

The RP2 probe must be installed by a competent person observing relevant safety precautions. Before commencing work, ensure the machine tool is in a safe condition with the power switched OFF and the power supply to the MI 8 - 4 Interface Unit disconnected.

Connection is made to the RP2 via a 2 way Female Connector (supplied). This is available as a Renishaw spare part, or sourced directly from Harwin Connectors.

Female Connector	Part No.
Renishaw	P-CN23-020A
or	
Harwin	M80-8980205

The following tools are required to assemble the wires and crimp sockets into the Female Connector:

Crimp Tool	Part No.
Used to crimp wire in crimp socket.	
Renishaw	P-TL04-0005
or	
Harwin	M22520/2-01
Crimp Tool setting :	6

4.5 RP2/RP2 DD Connection Assembly continued

Positioner	Part No.
Used to locate crimp socket in crimp tool.	
Renishaw	P-TL04-0006
or	
Harwin	T5747
Insertion/Removal Tool	Part No.
Used to insert/remove crimp socket in/from the connector shell.	
Renishaw	P-TL04-0007
or	
Harwin	T5748-19
Wire Sizes:	26 (AWG) 19 x 0.1
(Supplied by User)	24 (AWG) 7 x 0.2

Figure 11,
Rear View of RP2 Probe

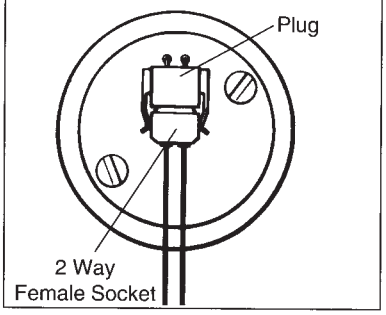
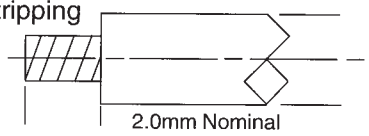


Figure 12,
Wire Stripping



5.0 STYLUS

5.1 Stylus Alignment

The stylus can be adjusted both rotationally and in height. This allows the user to align the stylus with the chuck centreline and machine axes.

Rotational and height adjustment are achieved using the following procedure (as shown in Figure 13)

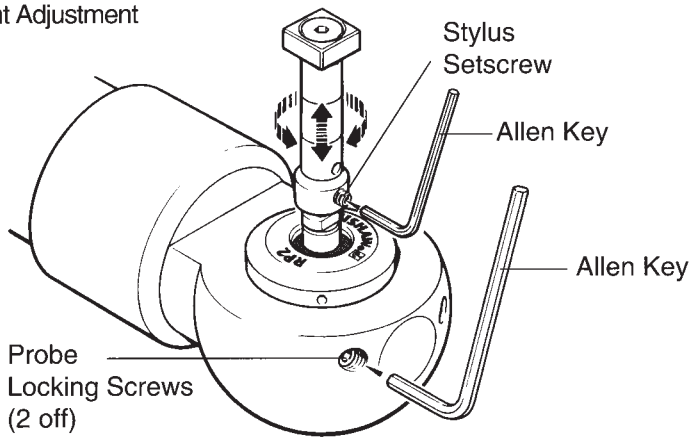
1. Loosen the stylus setscrew.

2. Rotate stylus assembly for approximate tip to machine axes alignment.
   Height adjustment is achieved by raising or lowering the stylus on its mounting within a 3mm (0.118in) limit.

3. Tighten stylus setscrew.

4. Precise rotational alignment is carried out by alternately loosening and tightening the Probe locking screws. Ensure both Probe locking screws are tightened to approximately 4,5Nm (39.83lbf.in) at the end of adjustment.

Figure 13, Rotational and Height Adjustment

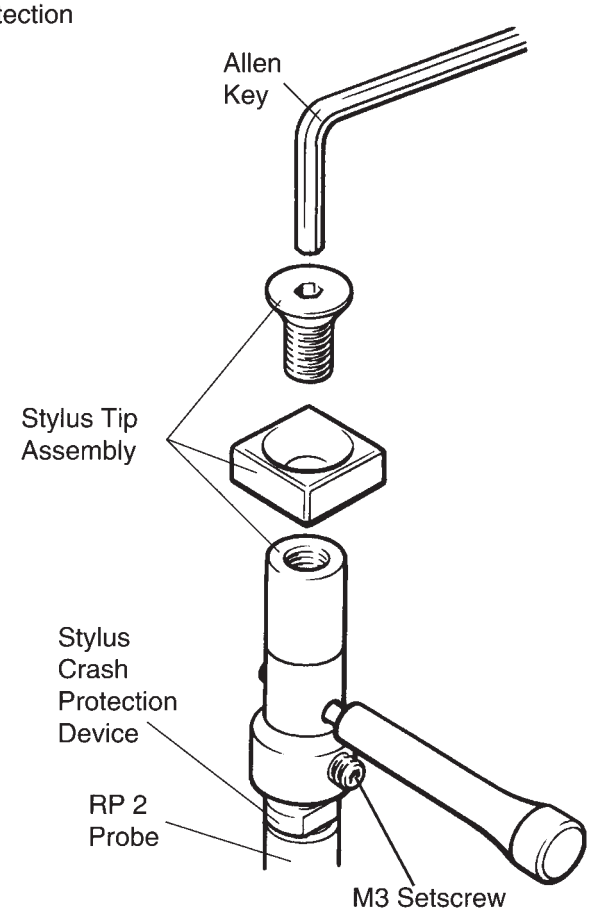


5.0 STYLUS continued

5.2 Stylus Crash Protection (as shown in Figure 14)

The stylus incorporates a crash protection device which is designed to break if the stylus is overtravelled.

Figure 14, Stylus Crash Protection



5.3 Removal of the Stylus Crash Protection Device

1. Loosen the M3 setscrew and remove the stylus tip assembly.

2. Loosen and remove the stylus crash protection device from the RP2 Probe.

5.4 Replacement of the Stylus Crash Protection Device

CAUTION : THE STYLUS CRASH PROTECTION DEVICE IS BRITTLE. CARE MUST BE TAKEN WHEN TIGHTENING THE STYLUS TO THE PROBE.

1. Secure the stylus crash protection device to the RP2 Probe using the 5mm A/F spanner provided. Tighten only on the spanner flats closest to the RP2 Probe.

2. Fit the stylus tip assembly onto the stylus crash protection device and adjust the stylus position (see Section 5.1).

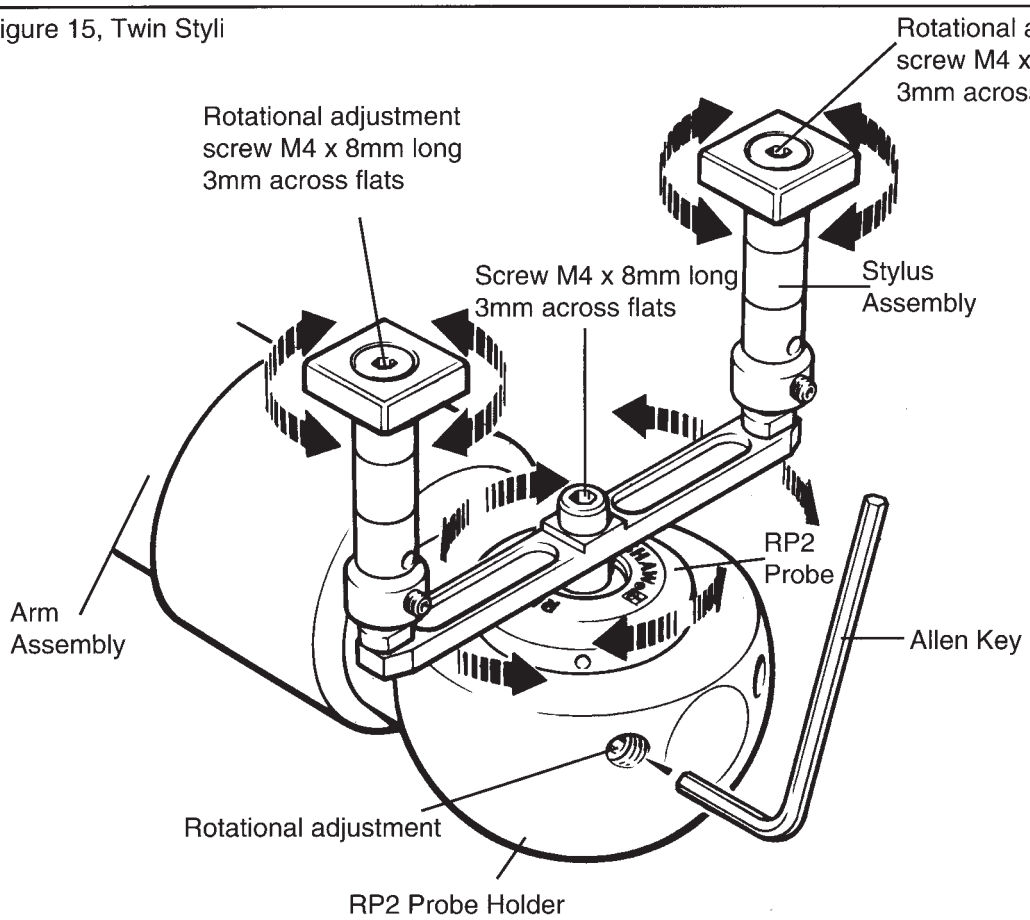
3. Recalibrate the Probe.

5.0 STYLUS continued

5.5 Twin Styli (as shown in Figure 15)

Where two styli are mounted on a bar the styli should be set parallel to one another (recommended to within 10μm) and then fitted to the probe.

Figure 15, Twin Styli



6.0 HIGH PRECISION ARM (HPA)

6.1 Electrical Specification (as shown in Figure 16)

The HPA assembly includes the following electrical terminations:-

1. Probe Circuit:
   The RP2 probe is terminated at the arm cable. The two connections from the RP2 probe should be connected to their relevant positions in the MI 8 - 4 Interface Unit.

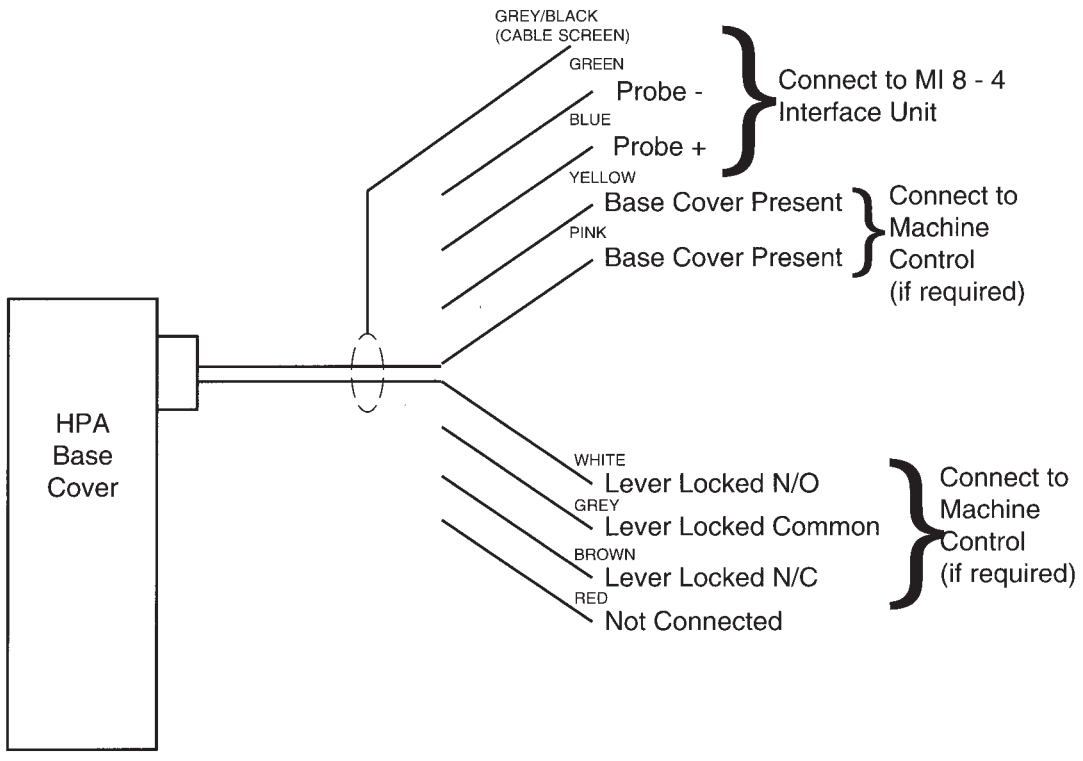
2. Cover Present Signal:
   A reed switch is incorporated within the arm base that provides a signal to indicate when the base cover is present. This is a Normally Open signal that goes Closed when the cover is present, 30V dc 100mA maximum.

   NOTE: This signal is for direct connection to the machine controller and is not intended to be connected to the MI 8 - 4 Interface Unit.

3. Lever Signal:
   A micro switch is also incorporated within the arm base, that provides a signal which indicates when the lever is in its locked position. Both Normally Open and Normally Closed options are available, 30V dc 100mA maximum.

   NOTE: This signal is for direct connection to the machine controller and is not intended to be connected to the MI 8 - 4 Interface Unit.

Figure 16, High Precision Arm (HPA) Electrical Specification



7.0 MI 8 - 4 INTERFACE UNIT

7.1 The MI 8 - 4 Interface Unit (as shown in Figure 17)

CNC machine tools using a Renishaw probe system for tool setting or workpiece set-up and inspection require an Interface Unit, to convert probe signals into an acceptable form for the CNC machine control. The MI 8 - 4 Interface Unit is part of probe systems using hard wired signal transmission.

The MI 8 - 4 Interface Unit processes signals from Renishaw hard wired probes and converts them into compatible outputs, for transmission to the CNC machine control. The control stores work offsets and responds to probe inputs. It is designed to allow the Renishaw probe to connect directly into the standard Fanuc 'Automatic Length Measurement' input
(XAE, ZAE).
The machine tool builder must provide four outputs from the control to indicate which machine axis is moving, in order to obtain a probe trigger.
($\overline{\text{SELX}}$– $\overline{\text{SELX}}$+ $\overline{\text{SELZ}}$– $\overline{\text{SELZ}}$+).
This signal will instruct the MI 8 - 4 Interface Unit to send the probe trigger signal out through one of four possible output channels (X–, X+, Z– or Z+).

An example of a typical Fanuc OTC control probe interface PMC ladder logic is shown in Figure 19.

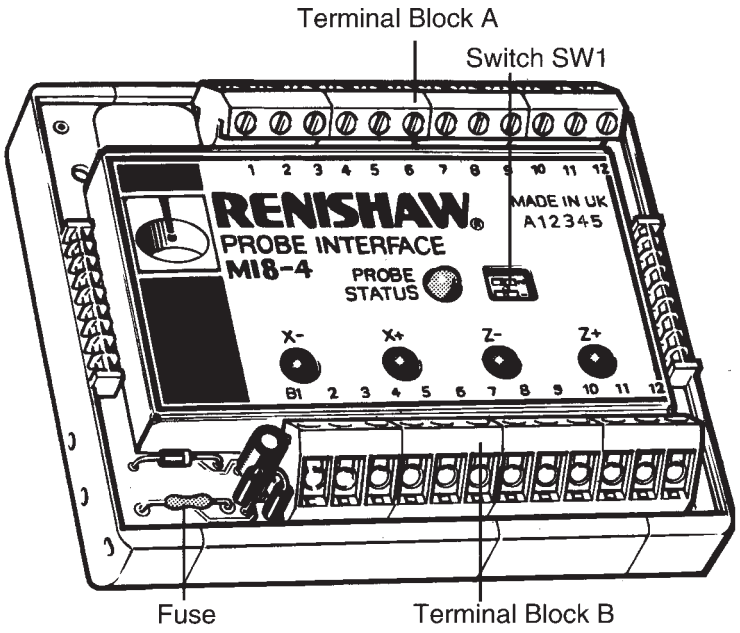
Probe Status LED:
The bi-colour probe status LED is off when the MI 8 - 4 Interface Unit's power is off. It is green when the probe stylus is seated (at rest), or the Interface Unit is inhibited. It is red when the probe is triggered.

When the stylus deflects on contact with a tool or workpiece the MI 8 - 4 Interface Unit output changes state, and the LED changes from green to red.

As the probe moves clear of the contact surface, the LED changes back to green, indicating that the probe stylus has reseated, and the probe is available for the next contact in the probing routine.

Machine Movement Indicating LEDs:
Four green diagnostic LEDs are also provided to indicate which machine axis is moving.
e.g. During an X– move the X– LED will illuminate.

Figure 17, MI 8 - 4 Interface Unit



7.0 MI 8 - 4 INTERFACE UNIT continued

7.2 The MI 8 - 4 Interface Unit Assembly (as shown in Figure 18)

MI 8 - 4 Interface Unit Installation
Ideally install the MI 8 - 4 Interface Unit in the CNC machine control cabinet.

Take care to avoid potential sources of interference such as three phase transformers and motor controllers.

MI 8 - 4 Interface Unit Mounting
The MI 8 - 4 Interface Unit is DIN rail mounted and is compatible with all DIN EN carrier rails.

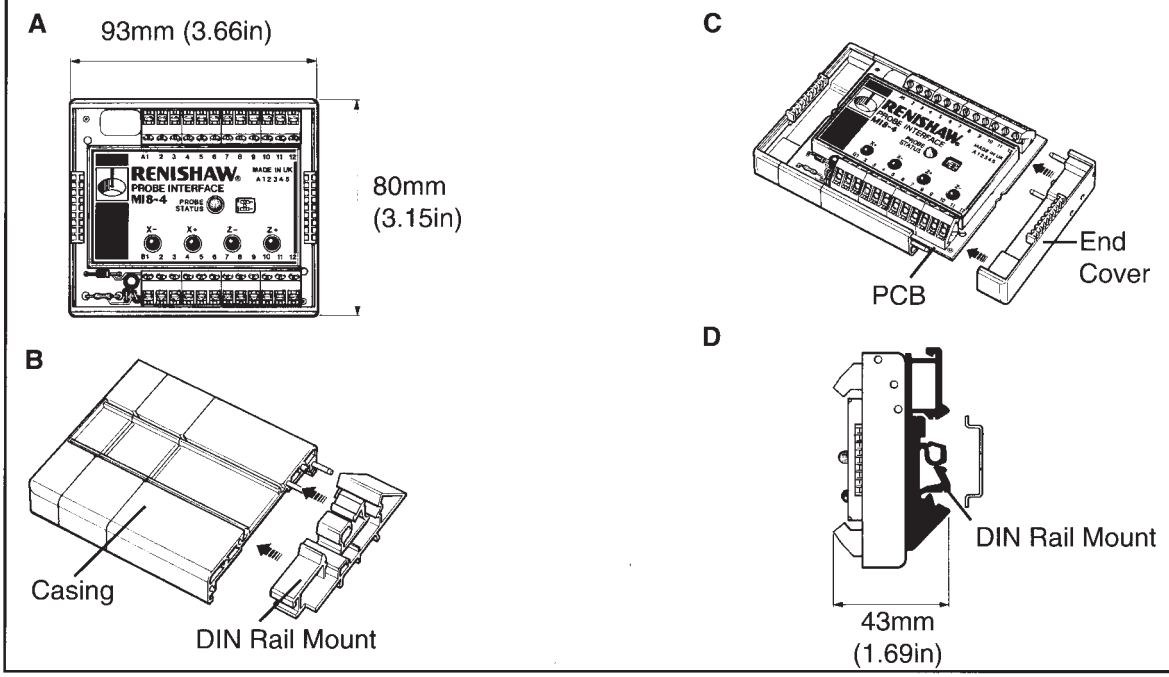
DIN Rail Mount

1. Fit the DIN rail mount onto back of casing.

2. Slide the PCB into the casing.

3. Fit the end cover. Press in to make a snap fit.

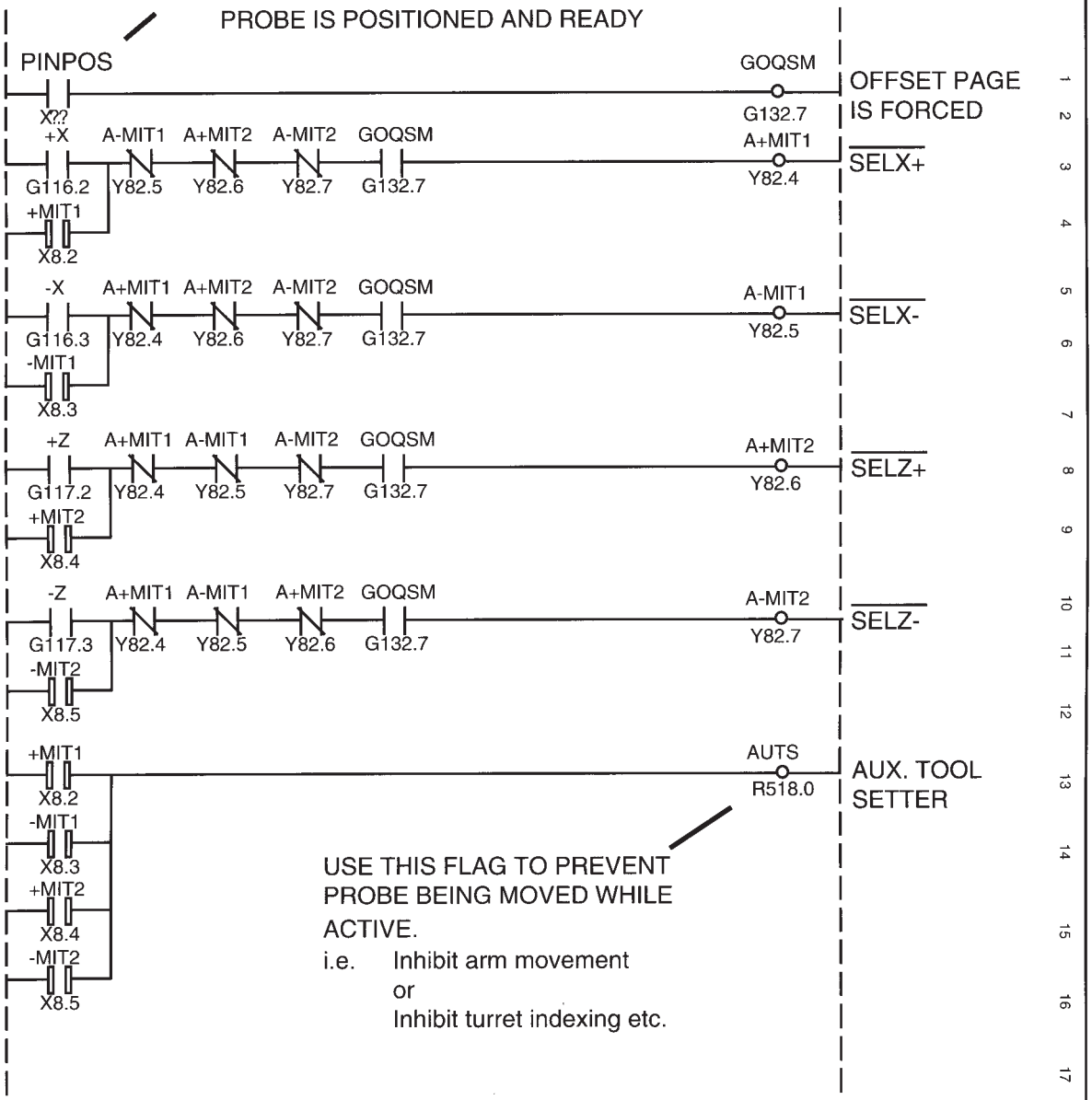
Figure 18, MI 8 - 4 Interface Unit Assembly



7.0 MI 8 - 4 INTERFACE UNIT continued

7.3 Fanuc OTC Control

Figure 19, Fanuc OTC control (Example of a typical PMC ladder logic diagram)



7.0 MI 8 - 4 INTERFACE UNIT continued

7.4 Electrical Specification

Power Supply:
The MI 8 - 4 Interface Unit can draw its power from the CNC machine 24V nominal dc supply. Alternatively it can be powered from a Renishaw PSU3 Power Supply Unit.

The MI 8 - 4 Interface Unit input voltage range is 15V dc to 30V dc and it presents a nominal load of 50mA.

The maximum load with outputs disconnected is 80mA. (Supply voltage with ripple -16,5V to 28,5V with 3V peak to peak ripple at 100Hz).
NOTE: Each XAE/ZAE output connection will add to the supply current.

Probe Input:
Normally closed, open for trigger.

Inhibit Input:
Pulling this inhibit low, will force the probe outputs into the seated state, irrespective of actual probe status. Releasing it will remove the inhibit function.

Two Probe Operation - Toolsetting and Inspection:
The MI 8 - 4 Interface Unit has a facility for connecting an output from a different Renishaw probe system (i.e. inspection) and then selecting which probe input (toolsetter or inspection) is routed out through the outputs. The selection of the probe is controlled by a machine control input to the MI 8 - 4 Interface Unit (M Code).

Pulling the Select Input low, routes the Inspection System input through to the outputs. Releasing it routes the Probe input (toolsetter) through to the outputs.

The Inhibit, Inspection Probe System, and Select Inputs are Open Collector Transistor (OCT) and Normally Open (N/O) Relay compatible.

Active - 3,2V max, 3mA max sink current.
Inactive - 8,8V min.

Probe Status Output:
This is an isolated totem-pole output which requires a three wire connection (signal, power and ground). It works over a 4V to 30V supply range and will source and sink up to 20mA.

Output Voltage High:
(V supply minus 1,8V max) at 20 mA.

Output Voltage Low:
1,5V max at 20mA.
0,8V max at 1,6mA (TTL).

Supply Current:
3mA max at 5V.
10mA max at 30V.

The three wires are protected against short circuit by current limiting circuitry

7.0 MI 8 - 4 INTERFACE UNIT continued

7.4 Electrical Specification continued

Fanuc 'Automatic Length Measurement':
The four 'Machine Axis Moving' inputs (B4, B6, B8 and B10) to the MI 8 - 4 Interface Unit are Open Collector Transistor (OCT) and Normally Open (N/O) Relay compatible.

Active - 3,2V max, 3mA max sink current.
Inactive - 8,8V min.

The four outputs (B5, B7, B9 and B11) are totem-pole outputs supplied by the 15V to 30V power supply to the MI 8 - 4 Interface Unit.

Output Voltage High:
(V supply minus 3,0V max) at 20mA.
(V supply minus 1,5V max) at 1,6mA.

Output Voltage Low:
1,5V max at 20mA.
0,5V max at 1,6mA.

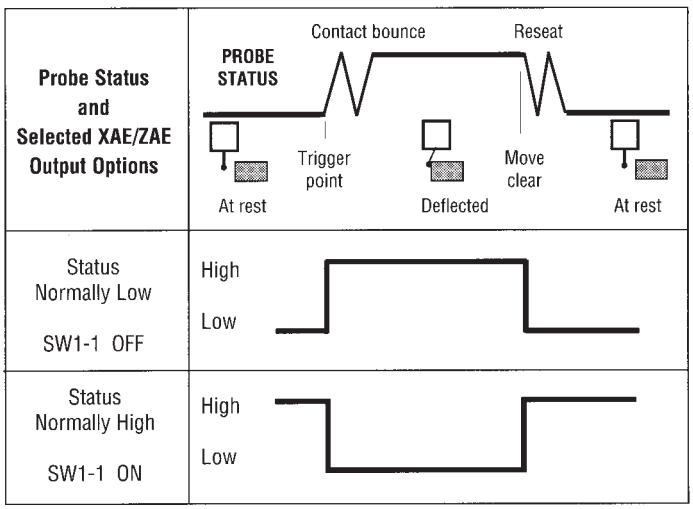
Maintenance:
No maintenance is required.

Environment:
Temperature:
The MI 8 - 4 Interface Unit is specified for storage over -10°C to 70°C (14°F to 158°F) and operation over 0°C to 60°C (32°F to 131°F) ambient temperature range.

The outputs are protected against short circuit by current limiting circuitry and will source and sink up to 20mA each.

7.5 MI 8 - 4 Interface Unit Output Waveforms

The output signals from the interface must be compatible with the machine control.
NOTE: Change of state debounce time is 20ms ± 5ms.
Debounce time is the time delay after the MI 8 - 4 Interface Unit has responded to a probe trigger, before it can be used again.



7.0 MI 8 - 4 INTERFACE UNIT continued

7.6 MI 8 - 4 Interface Unit Outputs

DIAGRAM OF OUTPUTS FOR XAE, ZAE

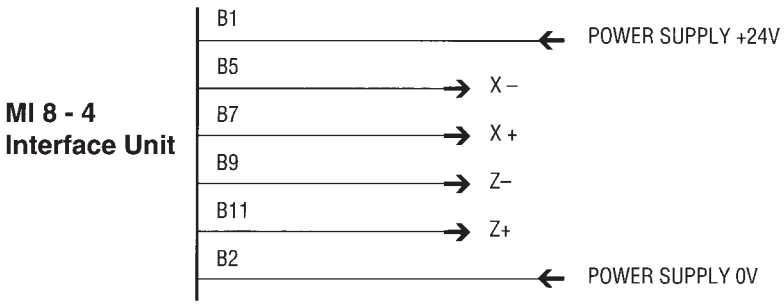
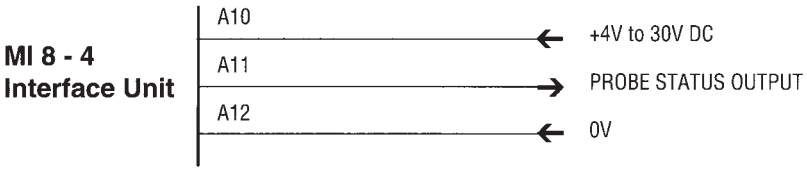
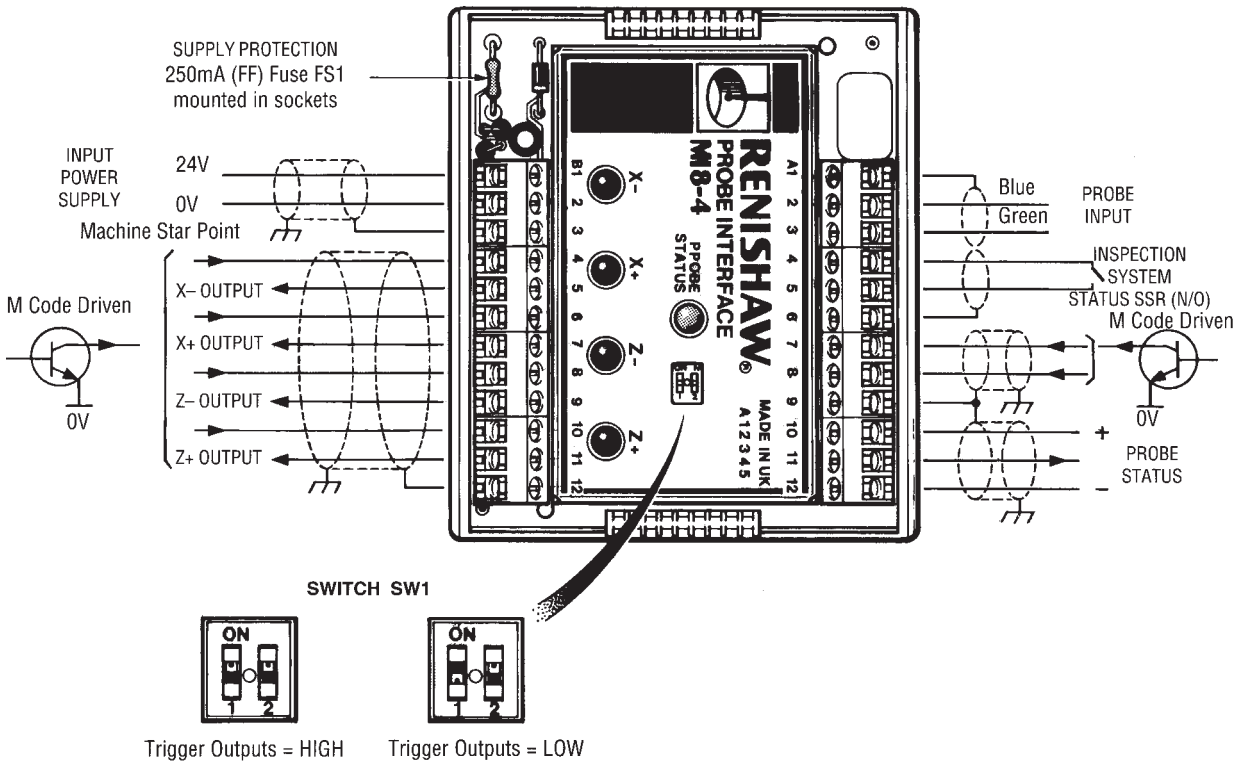


DIAGRAM OF PROBE STATUS OUTPUT



7.7 MI 8 - 4 Interface Unit Terminal Connections and Switch SW1

Figure 20, MI 8 - 4 Interface Unit Terminal Connections and Switch SW1



7.0 MI 8 - 4 INTERFACE UNIT continued

7.7 MI 8 - 4 Interface Unit Terminal Connections and Switch SW1 continued

PIN	DESCRIPTION	PIN	DESCRIPTION
A1	PROBE SCREEN	B1	POWER SUPPLY 24V
A2	PROBE INPUT +	B2	POWER SUPPLY 0V
A3	PROBE INPUT –	B3	MACHINE STAR POINT
A4	INSPECTION PROBE SYSTEM INPUT +	B4	$\overline{\text{SELX}}$–
A5	INSPECTION PROBE SYSTEM INPUT –	B5	X– OUTPUT
A6	INSPECTION PROBE SYSTEM SCREEN	B6	$\overline{\text{SELX}}$+
A7	PROBE SELECT	B7	X+ OUTPUT
A8	PROBE INHIBIT	B8	$\overline{\text{SELZ}}$–
A9	SCREEN	B9	Z– OUTPUT
A10	OUTPUT SUPPLY +	B10	$\overline{\text{SELZ}}$+
A11	PROBE STATUS OUTPUT	B11	Z+ OUTPUT
A12	OUTPUT SUPPLY –	B12	SCREEN

NOTE: The four inputs $\overline{\text{SELX}}$– $\overline{\text{SELX}}$+ $\overline{\text{SELX}}$+ and $\overline{\text{SELZ}}$– are active low.

i.e. If $\overline{\text{SELX}}$+ is pulled low. The X+ output will be selected.

Switch SW1 controls the polarity of the output signals i.e.
SW1-1 OFF = Output Trigger = HIGH
SW1-1 ON = Output Trigger = LOW
NOTE: SW1-2 should be in the off position. This switch activates an in-line filter circuit.

It is not to be adjusted by the end user.

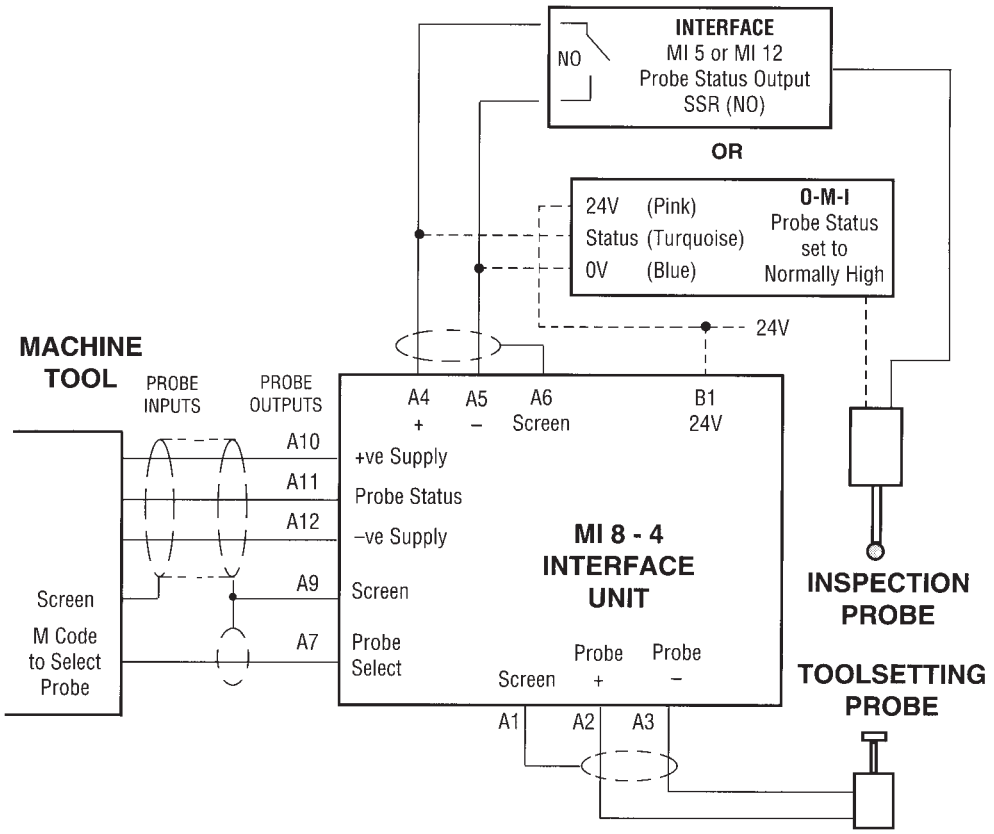
WIRING - MI 8 - 4 Interface Unit to CNC CONTROL
Use multi-core screened cable.
Each core Ø2,5mm sq. (Ø0,10in sq.) maximum.
Maximum permitted length 10m (32,8ft).

7.8 MI 8 - 4 Interface Unit Wiring for Two Probes (as shown in Figure 21)

Probe select functions for an inspection probe and a toolsetting probe

For installations where an inspection probe and a toolsetting probe are fitted to the same machine, the MI 8 - 4 Interface Unit features a circuit that allows the machine control to select which probe is to be used. An M code will select which probe signal is sent to the machine control probe inputs.

Figure 21, MI 8 - 4 Interface Unit Wiring for Two Probes



8.0 OPERATION

8.1 Operating the Arm

The arm is precision gauging equipment, and must always be handled with care. In the event of collision, it must be reset and re-calibrated.

The position of the stylus tip must be calibrated. Once this is known the arm can be used without further calibration, under normal circumstances (see section 9 for details).

Remove the cover from the arm base, ensuring no swarf or coolant enters the exposed face of the arm base. Mount the arm onto the arm base as section 3.2, taking care to avoid collisions between the probe or arm and the machine.
NOTE: Care should be taken to hold the arm only by the grip sleeve (see Figure 5) to avoid thermal distortion of the arm, caused by heat from the hand.

Ensure the arm is seated on the base and the lever is in the fully locked position.

Tools can be datumed and their offsets recorded.

When not mounted on the base on the machine, the arm should be stored on the Renishaw stand, in a safe place and at ambient temperature to limit thermal effects. This will ensure the balls and rollers/vee grooves, which provide the repeatable arm location are kept as clean as possible.

8.2 Cleaning

The faces of the base, arm and cover, within the normally sealed area should be kept clean, dry and free of swarf. Particular attention should be paid to keeping the electrical contacts and the balls and rollers/ vee grooves clean and free of contamination when exposed. If these areas become wet or contaminated with swarf or dust, they should be cleaned with a dry air blast and a soft cloth. The use of solvents and polishes are not recommended.

9.0 CALIBRATION

9.1 Calibrating the Toolsetting Probe

The exact procedure adopted is specific to each machine, control system and software package. However certain rules are common.

Before setting tools, it is necessary to calibrate the stylus position to establish its trigger points in relation to a datum on the machine. This can be achieved by the use of a known reference tool.

Re-calibration is necessary periodically (at least every 6 months), and in special circumstances (e.g. if the arm has been subjected to a crash or if the stylus has been replaced).

Accuracy of toolsetting is dependant on the integrity of the offsets of the reference tool (usually stored in tool offset registers).

There are many possible automatic and manual options to establish the trigger positions of the stylus. Many methods will be satisfactory provided that the same relative conditions prevail when subsequently setting tools, particularly feed rates where high accuracy is required.

The following guidelines should be read in conjunction with relevant instructions provided with your software option. The following procedure is the preferred method of obtaining probe calibration data.

9.2 Principle

The method utilises a minimum of two cutting tools mounted in a turret as references in order to account for the dynamic effects of tool and workpiece deflection. It enables actual part dimensions produced by the reference tools, to be used to establish the stylus position.

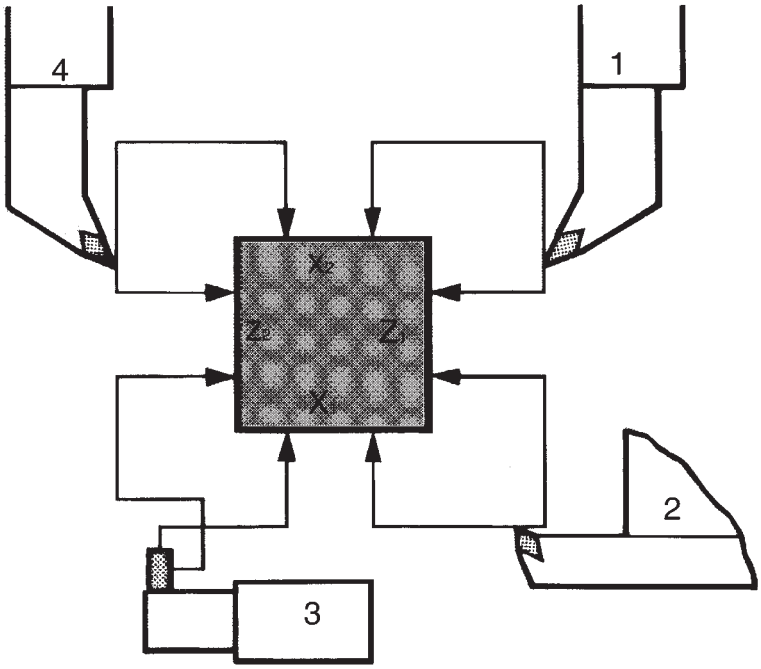
9.3 Method

Step 1. Select turning tools which can access all cube faces
A good practice is to choose finishing tools which require accurate setting.
Figure 22 shows typical combinations to achieve access.

9.0 **CALIBRATION** continued

9.3 **Method** continued

Figure 22, Calibration : Step 1



Tool 1	moves to X_2 & Z_1
Tool 2	moves to X_1 & Z_1
Tool 3	moves to X_1 & Z_2
Tool 4	moves to X_2 & Z_2

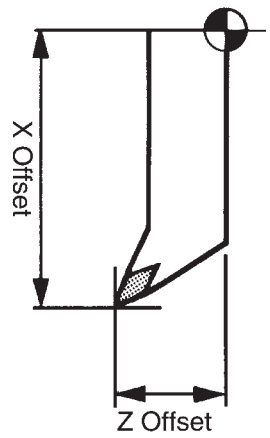
A minimum of two touches (as shown in Figure 22) will be required for all faces but more may be chosen depending on the tooling being used (e.g. 4 & 2 or 1 & 3).

9.3 Method continued

Step 2. **Estimate the tool length of these reference tools** (as shown in Figure 23)
Load this to the relevant tool offset and mechanically mount the tools on the turret.

This estimation can be made from the tooling catalogue, or by manual measurement.
0.5mm (0.02in) accuracy is sufficient at this stage.

Figure 23, Calibration : Step 2

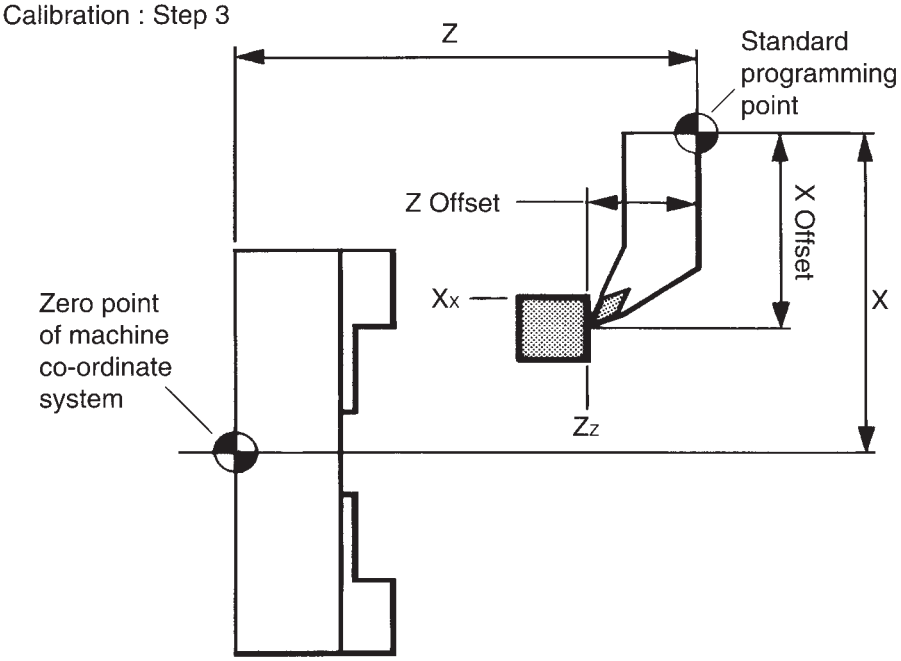


9.3 Method continued

Step 3. Estimate the mechanical position of the stylus (as shown in Figure 24)
Bring the tool into contact with the stylus under jog or manual control.
Calculate the position of the stylus in the axis system. The purpose of this is to provide either:

An estimated programming position of the stylus before running an automated calibration cycle
or
An estimate of the position for manual calibration

Figure 24, Calibration : Step 3



Refer to software instructions for specific details

9.0 CALIBRATION continued

9.3 Method continued

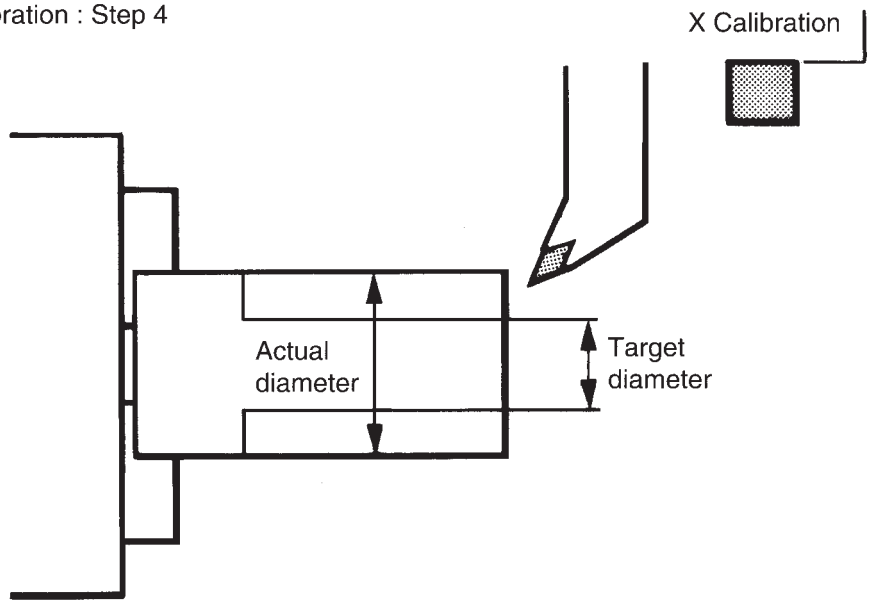
Step 4. **Obtain the true tool length of the reference tool** (as shown in Figure 25)
Select a depth of cut, speed and feed to suit the typical application of each reference tool.
Machine a target size with tool lengths active.

4a) **Diameter** (e.g. -X +X internal/external respectively).
Measure the actual diameter produced and obtain the error from the target.
The difference is due to the error in the tool length in operation.
This error is then used to update the calibration value for the stylus with respect to the X axis.

Target diameter - Actual diameter = (Error)

NOTE: Negative error indicates oversize. Positive error indicates undersize.

Figure 25, Calibration : Step 4



Typically, tool positions are stored as radial offsets. The measured diameter error must be halved in order to update the offset.
Therefore:

[Tool Offset New] = [Tool Offset Old] + [Error/2]

Recalibrate the probe

1) By running the automatic calibration routine with the new tool offset active.

or

2) Adjusting the probe calibration value manually to account for the inaccurate tool length. In this case the operator must have access to the parameter stores for the calibration data and modify as follows:
X_2 Calibration New = X_2 Calibration Old - [Error/2]

4b) **Z**
The Z length of a tool can be checked by machining a feature or by the setting of a known feature to Z diameter (eg the chuck face, or jaws).

For greater accuracy in continuous production the initial calibration data can be modified manually to take account of experience.

10.0 TROUBLE SHOOTING

10.1 Trouble Shooting Charts

POOR SYSTEM REPEATABILITY	
POSSIBLE CAUSE	RECTIFICATION ACTION
Mounting screws not fully tightened.	Tighten screws to specified torque. Re Datum Probe.
Loose Arm.	Verify tightness of Arm on Roller Housing. Re Datum Probe.
Loose Probe.	Verify tightness of Probe in mounting. Re Datum Probe.
Loose Stylus.	Tighten Stylus. Re Datum Probe.
Swarf on tool tip.	Remove swarf.
Calibration and updating of offsets is not occuring.	Review software.
Calibration and probing speeds are not the same.	Review software.
Probing is being performed within the machine acceleration/deceleration zones.	Review software.
Probing feedrate is too high for machine controller.	Perform repeatability trials at various speeds (see section 11.1).
Temperature variation is causing excessive movement in the machine and the HPA.	Minimise machine and HPA temperature changes. Increase the frequency of calibration.
Machine has poor repeatability due to loose encoders, backlash, tight slideways and/or accident damage.	Perform health check on machine tool.
Excess machine vibration.	Eliminate vibration.
Minor collision	Release lever, then re-lock to ensure the arm is correctly seated. **NOTE: This procedure does not guarantee correct positioning in the event of a major crash.**

10.1 Trouble Shooting Charts continued

NO PROBE OUTPUT	
POSSIBLE CAUSE	RECTIFICATION ACTION
Damaged or dirty kinematic balls and rollers/vee grooves	Check condition of kinematic balls and rollers/vee grooves and clean, if necessary (see section 13.3). Test for arm repeatability (see section 11.2).
Probe not connected.	Check wiring to machine. Remove Probe and check Probe to Arm connection. Remove Arm and check spring pin connections.
Probe open circuit	Remove Probe and check continuity of Probe (should be less than 1kΩ)

11.0 PRODUCT TESTING

11.1 Probe Repeatability

To test for repeatability of the complete machine, control, arm and probe system, a program should be written which continuously datums a reference tool (or a new tool) and records the updating of the appropriate tool offset. This should be done without removing the arm from the base.

The changes in the tool offsets will enable the system repeatability to be defined.
NOTE: The machine repeatability should be taken into account when analysing results.
A minimum of 10 readings is recommended to provide a satisfactory assessment.

Probe repeatability should be checked in all relevant axes
i.e. +X, -X, +Z, -Z.

11.2 Arm Repeatability

In order to assess the influence of the arm to base joint on the system repeatability the following test can be performed.

The probe repeatability test above should be performed after removing and replacing the arm. This cycle, i.e. measuring probe repeatability and then removing and replacing the arm, should be performed at least 10 times. Any increase in probe repeatability (measured as "span" of tool offsets) is a measure of the repeatability of the arm to base location repeatability.
NOTE: Machine repeatability should be taken into consideration when analysing results.

12.0 ELECTRICAL INTEGRITY

12.1 Probe Continuity (as shown in Figure 26)

To test the arm continuity:

1. Release the arm from the base.

2. Check continuity between the two spring pin contacts.
   NOTE: Triggering the probe will cause an open circuit. Probe continuity to the machine controller can be checked between the contact pins in the arm base and the terminations in the machine control.

Lever signal:

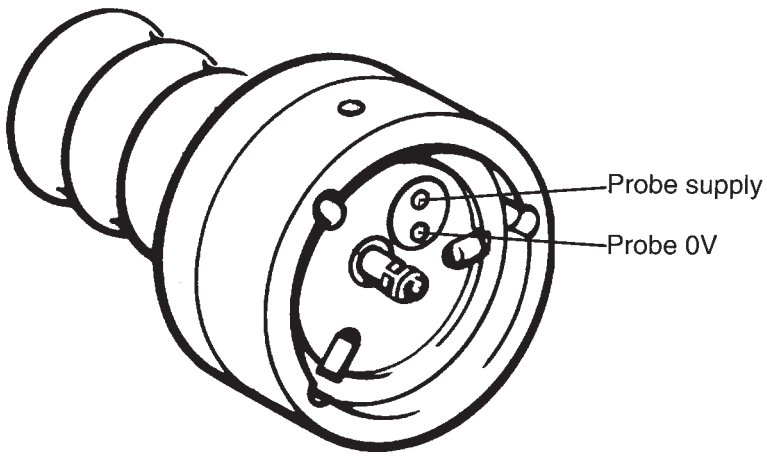
2. Check continuity between the White wire and the Grey wire for the N/O option, and the Brown wire and the Grey wire for the N/C option and operate the lever to check the function.

Cover present signal:

3. Check continuity between the Yellow wire and the Pink wire.

   Continuity will exsist when the cover is present. Remove and replace the cover to check function (see section 3.2)

Figure 26, Roller Housing



13.0 MAINTENANCE

13.1 RP2 Probe Maintenance (as shown in Figure 27)

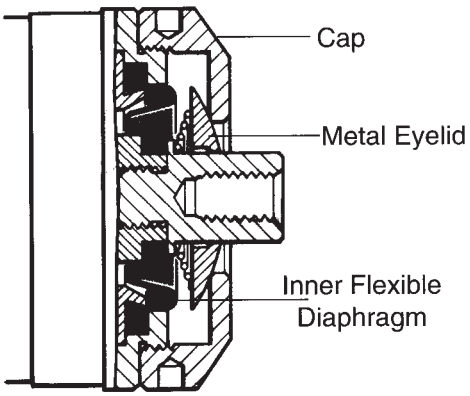
NOTE: The probe is a precision tool, handle with care. Ensure the probe is firmly secured to its mounting.
The probe requires minimal maintenance as it is designed to operate as a permanent fixture on CNC machining centres, where it is subject to a hot chip and coolant environment.

1. Do not allow excessive waste material to build up around the probe.

2. The probe mechanism is protected by an outer metal eyelid and an inner flexible diaphragm seal (see Figure 27).

   Approximately once a month, inspect the probe inner diaphragm seal. If it is pierced or damaged, return the probe to your supplier for repair. The service interval may be extended or reduced dependent on experience.

Figure 27, RP2 Probe



13.2 Probe Diaphragm Maintenance (as shown in Figure 28)

Removal:

1. Remove the stylus.

2. Use the C spanner supplied to remove the probe cap.

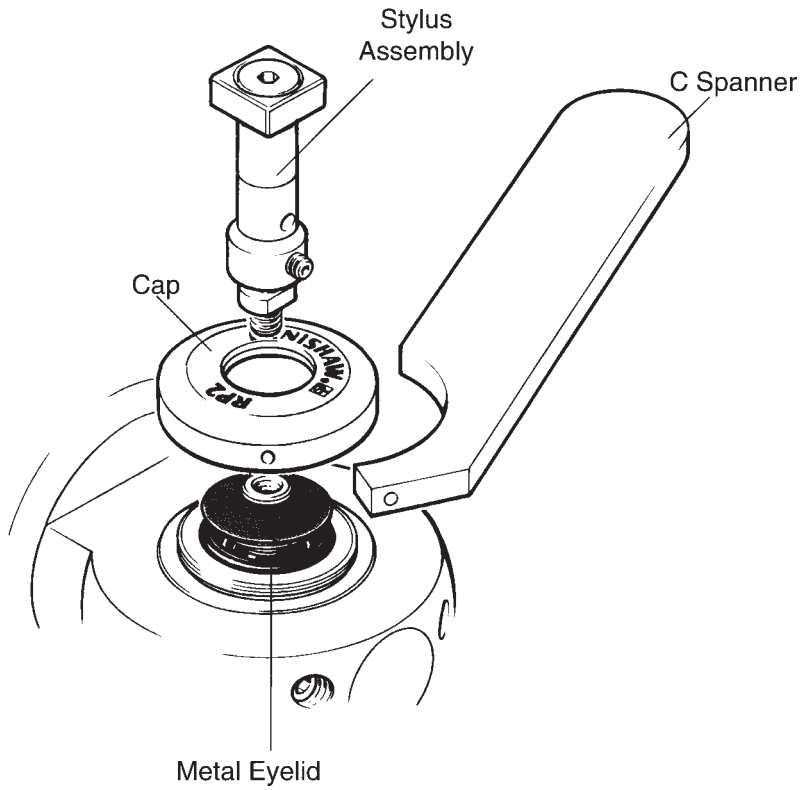
3. Remove metal eyelid and spring. This will expose the inner flexible diaphragm seal.

4. Wash the inner flexible diaphragm seal, using clean coolant (DO NOT use sharp metal objects to clean out debris).

5. Inspect the diaphragm seal for signs of piercing or damage. In the event of damage return the probe to your supplier for repair, as coolant entering the probe mechanism could cause the probe to fail.

13.2 Probe Diaphragm Maintenance continued

Figure 28, Probe Diaphragm



Refit:

1. Refit the spring and the metal eyelid seal.
2. Refit the probe module cap. Tighten using the C spanner.
3. Refit the stylus.
4. Recalibrate the Probe (see section 9.0).

13.3 Cleaning

Solvents and metal polishes are not recommended for cleaning HPA High Precision Arm components. Balls and rollers/vee grooves should be cleaned with a dry air blast and a soft dry cloth (see section 8.2).

14.0 REPAIRS

14.1 RP2 Probe

The probe has no user servicable parts, and should be replaced if damaged or considered faulty.

15.0 PARTS LIST

15.1 Parts List

Please quote the Part No. when ordering equipment

TYPE	PART NO	DESCRIPTION
High Precision Arm	A-2048-2000	SL150 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2001	SL200 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2002	SL250 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2007	SL300 Kit, Rear Exit: comprising of Arm, Stylus, Ø120mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2003	CL150 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2004	CL200 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2005	CL250 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2006	DL150 Kit, Rear Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2012	SL150 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2013	SL200 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2014	SL250 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2019	SL300 Kit, Side Exit: comprising of Arm, Stylus, Ø120mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand

15.0 PARTS LIST continued

15.1 Parts List continued

Please quote the Part No. when ordering equipment

TYPE	PART NO	DESCRIPTION
High Precision Arm	A-2048-2015	CL150 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2016	CL200 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2017	CL250 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
High Precision Arm	A-2048-2018	DL150 Kit, Side Exit: comprising of Arm, Stylus, Ø85mm Base, RP2 Probe, MI 8 - 4 Interface Unit and Stand
Ø85mm Stand	A-2048-2044	Stand for Storing Arm
Ø85mm Base	A-2048-2040	Base - Side Exit
Ø85mm Base	A-2048-2041	Base - Rear Exit
Ø120mm Stand	A-2048-2034	Stand for Storing Arm
Ø120mm Base	A-2048-2030	Base - Side Exit
Ø120mm Base	A-2048-2031	Base - Rear Exit
RP2 Probe Kit	A-2116-0172	RP2 Probe Kit (Basic): including Tool Kit (TK1) and C Spanner
RP2 DD Probe Kit	A-2116-0150	RP2 DD Probe complete with 2 Way Female Connector, C Spanner and Tool Kit (TK1)
Outer Diaphragm	M-2063-7606	Replacement Diaphragm for RP2 DD Probe
2 Way Female Connector	P-CN23-020A	Replacement Connector for RP2/RP2 DD Probe
C Spanner	A-2116-0153	Replacement Spanner for Removing Probe Cap
Spanner	P-TL09-0003	5mm A/F Spanner for removing stylus

15.0 PARTS LIST continued

15.1 Parts List continued

Please quote the Part No. when ordering equipment

TYPE	PART NO	DESCRIPTION
Crimp Tool	P-TL04-0005	Tooling Required to Assemble Female Connector P-CN23-020A
Positioner	P-TL04-0006	Tooling Required to Assemble Female Connector P-CN23-020A
Insertion/Removal Tool	P-TL04-0007	Tooling Required to Assemble Female Connector P-CN23-020A
MI 8 - 4 Interface Unit	A-2157-0003	MI 8 - 4 Interface Unit (DIN Rail Mounting)
Fuse	P-FS20-1A25	250mA (FF) Fuse
Arm	A-2048-2181	Length 'A' 385mm x Length 'B' 324mm
Arm	A-2048-2180	Length 'A' 353mm x Length 'B' 300mm
Arm	A-2048-2182	Length 'A' 598mm x Length 'B' 425mm
Stylus Assembly	A-2048-2050	M4 x 23,2 mm Long Stylus Assembly [Stylus Crash Protection Device (3off), Stylus Adaptor, Countersunk Screw, 15mm x 15mm x 4mm Square Tip, M3 Grubscrew]
Stylus Assembly	A-2048-2051	M4 x 32mm Long Stylus Assembly [Stylus Crash Protection Device (3off), Stylus Adaptor, Countersunk Screw, 15mm x 15mm x 4mm Square Tip, M3 Grubscrew]
Stylus Crash Protection Device	M-2116-0127	Stylus Crash Protection Device

14.2 Related System Data Sheets

Title	Part No.
DS RP1 & RP2 - Toolsetting/Inspection Probes	H-2000-2025
Brochure - Styli and Accessories	H-1000-3200

16.0 APPENDIX 1

16.1 Detailed Product Information

Figure 29, High Precision Arm for Ø85mm Base

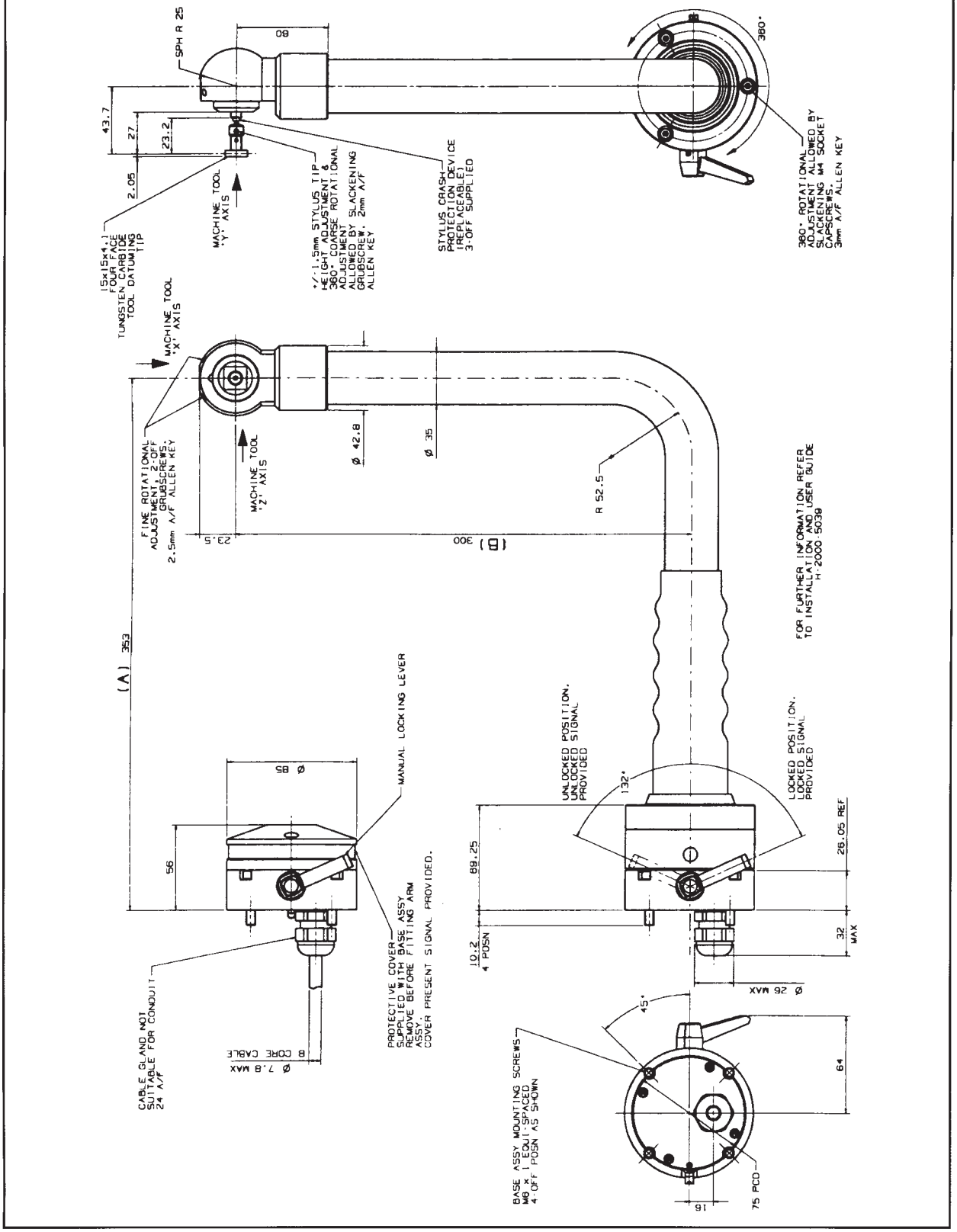
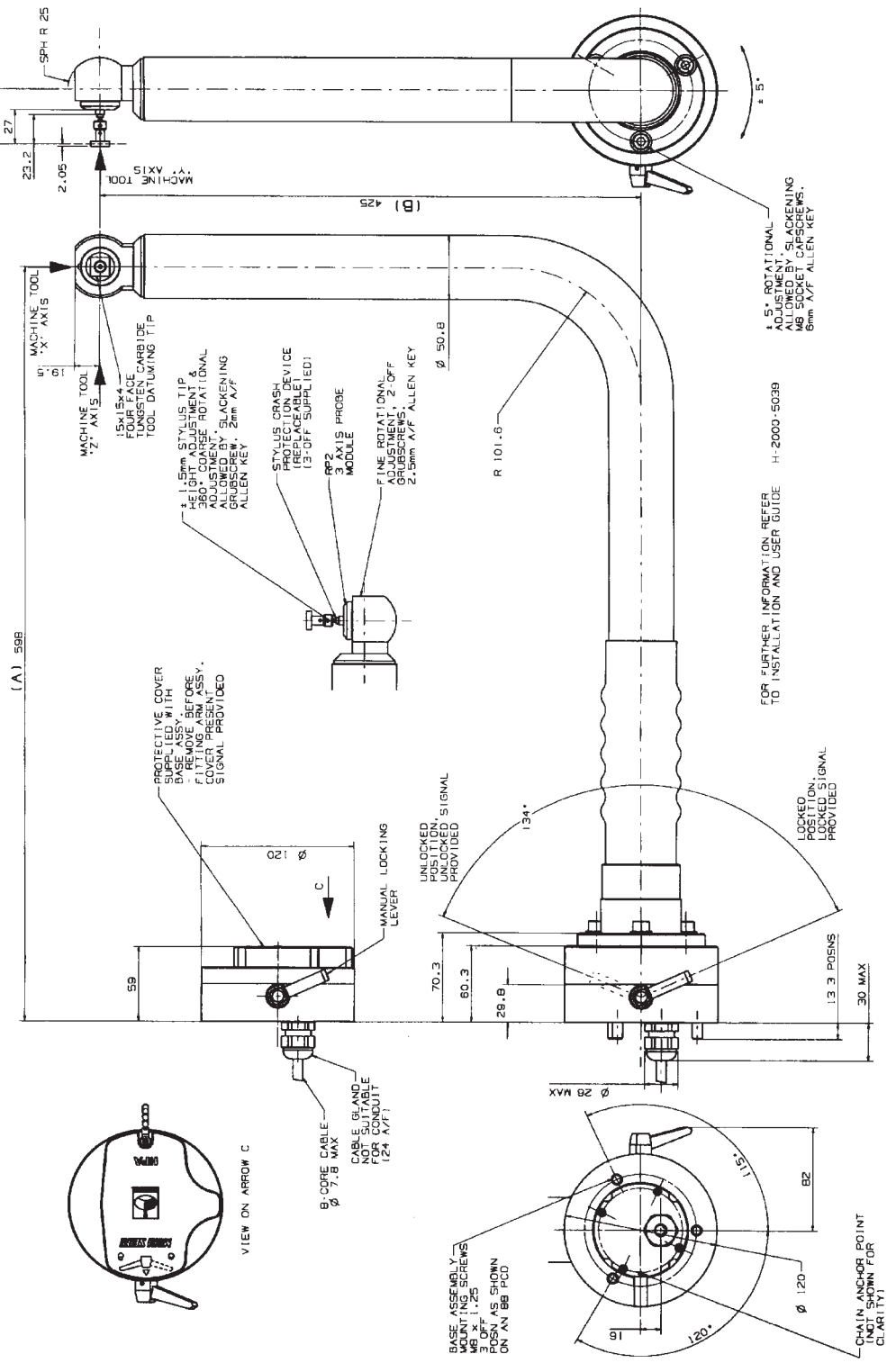


Figure 30, High Precision Arm for Ø120mm Base



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