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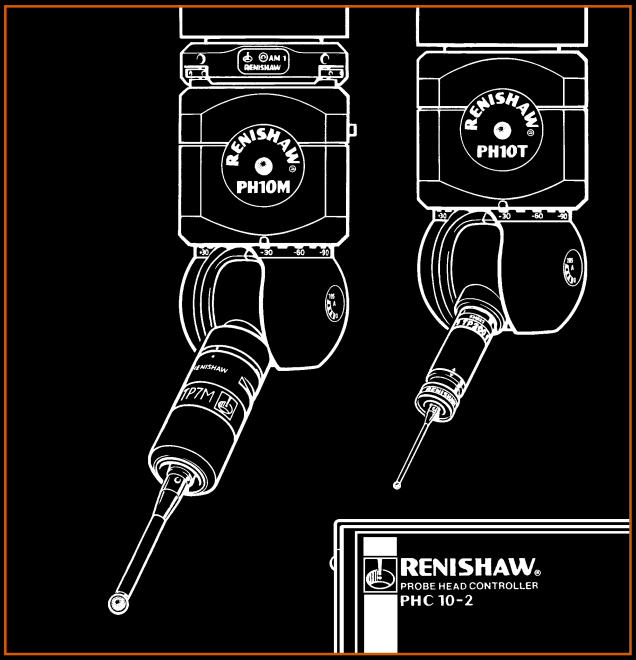

RENISHAW®

PH10 Series User's Guide

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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 equipment
Renishaw 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 for Renishaw equipment. 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 the products shown in this guide, and features of similar products, are the subjects of the following patents and patent applications.

EP 0068899	JP 1556462	US 4462162	TW UM-099300
EP 0142373	JP 2,098,080	US 4651405	
EP 0243766	JP 2,510,804	US 4813151	
EP 0293036	JP 2,545,082	US 4916339	
EP 0388993	JP 2,647,881	US 5,323,540	
EP 0501710	JP 501,776/1994	US 5,327,657	
EP 0544854	JP 503,652/1994	US 5,339,535	
EP 0740768	JP 507,918/1997	US 5,345,689	
EP 0750171	JP 508,476/1993	US 5,404,649	
EP 279828 B		US 5,505,005	
EP 548328 B		US 5,755,038	
EP 566719 B			

Renishaw plc

PH10
Motorised Probe Head Series
User's Guide

CE

FCC (U.S.A.)
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 its 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.

GB

Pinch hazards exist between moving parts and between moving and static parts. Do not hold the probe head during movements, or during manual probe changes.

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

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

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.

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

Remove power before performing any maintenance operations.

Refer to the machine supplier's operating instructions.

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

L'effet de pincement dû au mouvement des pièces mobiles entre elles ou avec des pièces fixes présente des dangers. Ne pas tenir la tête du palpeur lorsqu'elle se déplace ou que le palpeur est changé à la main.

Attention aux mouvements brusques. L'utilisateur doit toujours rester en dehors de la zone de sécurité des installations multiples tête de palpeur/ rallonge/palpeur.

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

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 SAFETY (SECURITE) de votre documentation.

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

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 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

Zwischen beweglichen und zwischen beweglichen und statischen Teilen besteht eine Einklemmgefahr. Den Meßtasterkopf nicht anfassen, wenn er sich bewegt oder wenn ein manueller Meßtasterwechsel durchgeführt wird.

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

Bei der Bedienung von Werkzeugmaschinen oder Koordinatenmeßanlagen ist Augenschutz empfohlen.

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 SAFETY (SICHERHEITSANWEISUNGEN) in der Produktdokumentation.

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

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

Beziehen Sie sich auf die Wartungsanleitungen des Lieferanten.

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 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

Tra le parti in moto o tra le parti in moto e quelle ferme esiste effettivamente il pericolo di farsi del male pizzicandorsi. Evitare di afferrare la testina della sonda quando è in moto, oppure quando si effettuano spostamenti a mano.

Fare attenzione ai movimenti inaspettati. Si raccomanda all'utente di tenersi al di fuori dell'involucro operativo della testina della sonda, prolunghe e altre varianti della sonda.

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

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 SAFETY (SICUREZZA) della documentazione del prodotto.

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

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

Existe el peligro de atraparse los dedos entre las distintas partes móviles y entre partes móviles e inmóviles. No sujetar la cabeza de la sonda mientras se mueve, ni durante los cambios manuales de la sonda.

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.

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

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 SAFETY (SEGURIDAD) en la documentación sobre el producto.

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

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.

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

P

Figo de constrição entre peças móveis e entre peças móveis e estáticas. Não segurar a cabeça da sonda durante o movimento ou durante mudanças manuais de sonda.

Tomar cuidado com movimento inesperado. O utilizador deve permanecer fora do perímetro da área de trabalho das combinações cabeça da sonda/ extensão/sonda.

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

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.

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

Desligar a alimentação antes de efectuar qualquer operação de manutenção.

Consultar as instruções de funcionamento do 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.

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

DK

Der er risiko for at blive klemt mellem bevægelige dele og mellem bevægelige og statiske dele. Hold ikke sondehovedet under bevægelse eller under manuelle sondeskift.

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

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

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 SAFETY (SIKKERHED) i produktdokumentatione.

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

Afbryd strømforsyningen, før der foretages vedligeholdelse.

Se maskinleverandørens brugervejledning.

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.

NL

Er is risico op klemmen tussen de bewegende onderdelen onderling en tussen bewegende en niet-bewegende onderdelen. De sondekop tijdens beweging of tijdens manuele sondeveranderingen niet vasthouden.

Oppassen voor onverwachte beweging. De gebruiker dient buiten het werkende signaalveld van de sondekop/extensie/sonde combinaties te blijven.

Het dragen van oogbescherming wordt tijdens gebruik van machine-werktuigen en CMM's aanbevolen.

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 SAFETY (VEILIGHEID) in de produktendocumentatie.

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

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

De bedieningsinstructies van de machineleverancier raadplegen.

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

Risk för klämning existerar mellan rörliga delar och mellan rörliga och stillastående delar. Håll ej i sondens huvud under rörelse eller under manuella sondbyten.

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

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

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 SAFETY (SÄKERHET) i produktdokumentationen.

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

Koppla bort strömmen innan underhåll utförs.

Se maskintillverkarens bruksanvisning.

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

Liikkuvien osien sekä liikkuvien ja staattisten osien välillä on olemassa puristusvaara. Älä pidä kiinni anturin päästä sen liikkuessa tai vaihtaessasi anturia käsin.

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

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

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 SAFETY (TURVALLISUUTTA) koskeva osa.

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

Kytke pois sähköverkosta ennen huoltotoimenpiteitä.

Katso koneen toimittajalle tarkoitettuja käyttöhjeita.

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.

GR

Υπάρχει κίνδυνος πιασίματος μεταξύ των κινούμενων μερών όπως και μεταξύ των κινούμενων και στατικών μερών. Δεν πρέπει να κρατείτε την κεφαλή του ανιχνευτή κατά την κίνηση ούτε και κατά τη διάρκεια χειροκίνητων αλλαγών του ανιχνευτή.

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.

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

Σε μονάδες της Renishaw με σύνδεση με το ηλεκτρικό ρεύμα δεν υπάρχουν εξαρτήματα που να χρειάζονται συντήρηση από το χρήστη. Τυχόν ελαττωματικές 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 SAFETY (ΑΣΦΑΛΕΙΑ) στο διαφωτιστικό υλικό του προϊόντος.

Για οδηγίες που αφορούν τον ασφαλή καθαρισμό των προϊόντων Renishaw, βλέπετε το κεφάλαιο MAINTENANCE (ΣΥΝΤΗΡΗΣΗ) 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.

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 και συνδέσεις ασφαλείας.

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 εγκεκριμένη μέθοδος θέσεως των μηχανημάτων Renishaw εκτός λειτουργίας σε περίπτωση ανάγκης είναι η αποσύνδεση από το ηλεκτρικό ρεύμα.

ELECTRICAL REQUIREMENTS

The PHC10-2 is powered from the a.c. mains supply via an IEC 320 connector. The operating voltages of the unit are as follows:

85 - 264V ac 47 - 66Hz 30W maximum

FUSE REPLACEMENT

There are two 2 Amp (T) slow-blow fuses which are used for all voltages (one is a spare). Fuses are replaced as follows:

1. Disconnect the mains power.
2. Use a screwdriver to lever out the fuseholder to reveal the fuse.
3. Remove the fuse and replace it with a 2 Amp (T) HBC 20mm x 5mm fuse, rating as IEC 127.
4. Replace the fuseholder.
5. Reconnect the mains power.

WARNING: Make sure that only fuses of the specified type are used for replacement.

This equipment must be connected to a protective earth conductor via a three core mains (line) cable. The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. The protective earth contact shall not be negated by the use of an extension cable without protective conductor.

WARNING: Any interruption of the protective conductor may make the equipment dangerous. Make sure that the grounding requirements are strictly observed.

ENVIRONMENTAL REQUIREMENTS

The following environmental conditions comply with (or exceed) BS EN 61010-1:1993

Indoor use		IP30 (no protection against water)
Altitude		Up to 2000m
Operating temperature	PH10	+10°C to 40°C
	PHC10-2	0°C to +50°C
Storage temperature		-10°C to +70°C
Relative humidity	PH10	80% maximum for temperatures up to +31°C, linear decrease to 50% at +40°C
	PHC10-2	80% maximum for temperatures up to +31°C, linear decrease to 50% at +50°C
Transient overvoltages		Installation category II
Pollution degree		2

CONTENTS **Page**

1.0 INTRODUCTION

This User's Guide will enable you to maximise the performance of your PH10 system and ensure, safe reliable operation.

Please fill in the user registration form at the end of this guide and return it to Renishaw plc to obtain further information on the PH10 system and accessories. This will enable Renishaw to keep you informed of the latest product information, special offers, upgrade news and new product developments.

You may find it useful to note below information about your system.

CMM make	
CMM model	
Head serial number	
PHC10-2 serial number	
PHC10-2 version number	

NOTE

There may be variations in the installation and use of the PH10 range of motorised probe heads on different CMMs

This User's Guide must be read in conjunction with the documentation provided by your CMM supplier

2.0 SYSTEM DESCRIPTION

2.1 Introduction

This User's Guide describes an automated inspection system using the Renishaw PH10 series of motorised probe heads; the PH10T, PH10M and PH10MQ.

Information is given on the elements of the system and accessories.

A typical installation is shown, followed by a description of manual mode and automatic mode operation.

A list of possible operating errors is also given together with maintenance information.

The installation of the PH10 system is described in the PH10 Series Installation Guide (Renishaw Part Number H-1000-5071) which is intended primarily for use by the OEM (or supplier of the CMM) for installation and commissioning purposes.

WARNING

The components of the PH10 system are not compatible with PH9 system components. No attempt should be made to connect PH10 system components to a PH9 system, as this will result in damage to the product.

2.2 PH10 motorised probe head range

Each of the heads in the PH10 range is a general-purpose, versatile unit designed specifically for use on Direct Computer Controlled (DCC) Coordinate Measuring Machines (CMMs).

The range consists of three heads:

- PH10T — a shank-mounted head with two-wired probe capability and an M8 thread
- PH10M — a shank-mounted head with multiwired probe capability and a Renishaw Autojoint
- PH10MQ — a quill-mounted head with multiwired probe capability and a Renishaw Autojoint

2.3 Features

All the heads in the range incorporate the following features:

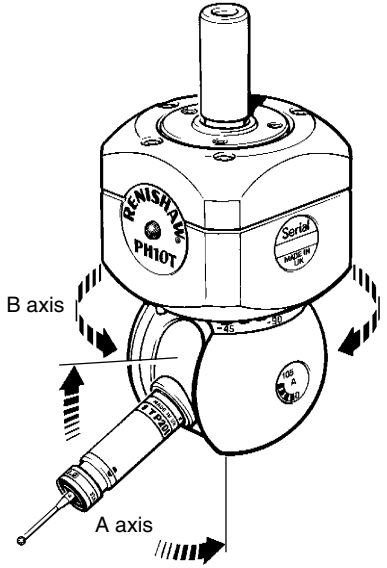
- 720 indexing positions
- 0.5µm indexing repeatability*
- 7.5° indexing steps in both axes
- 300mm (maximum) extension bar capability*

* See Section 2.7 for specifications and test conditions.

2.4 PH10T

Figure 1 shows the PH10T motorised probe head fitted with a TP200 probe.

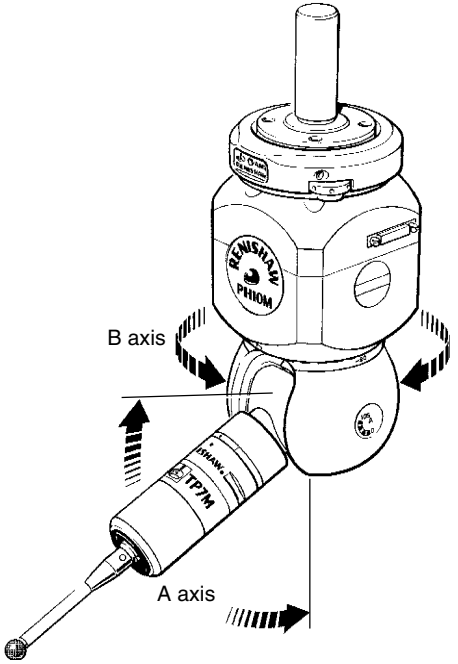
Figure 1 - PH10T



2.5 PH10M

Figure 2 shows the PH10M motorised probe head fitted with an AM1 adjustment module and a TP7M probe.

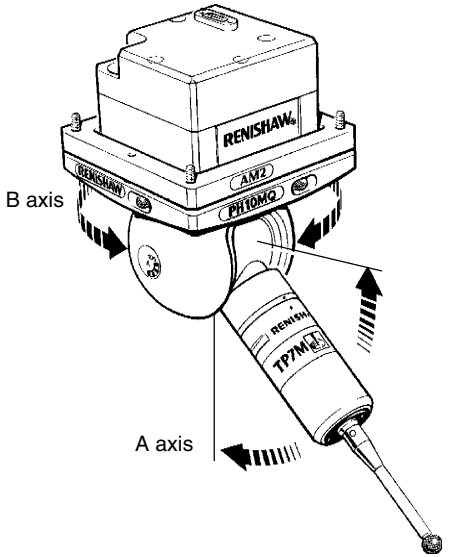
Figure 2 - PH10M



2.6 PH10MQ

Figure 3 shows the PH10MQ motorised probe head fitted with an AM2 adjustment module and TP7M probe.

Figure 3 - PH10MQ



2.7 Probe head specification

Table 1 - Probe head specification			
Repeatability of position (2**F**)			0.5µm (0.00002in)
Positioning	Step		7.5°
	A axis	0° to 105°	15 positions
	B axis	-180° to +180°	48 positions
	Total		720 positions
Probe mounting	PH10T		M8 thread, 18mm (0.709in) diameter bush face
	PH10M PH10MQ		Multiwired Autojoint
Dimensions from quill face	XY		62mm (2.44in) square
	Z	PH10T	102mm (4.09in)
		PH10M	117mm (4.6in)
		PH10MQ	73mm (2.87in)
Weight	PH10T		595g (20.9oz)
	PH10M		620g (21.8oz)
	PH10MQ		730g (25.7oz)
System operating temperature			10°C to 40°C (50°F to 104°F)
System storage temperature			-10°C to 70°C (14°F to 158°F)

2.8 PHC10-2 probe head controller

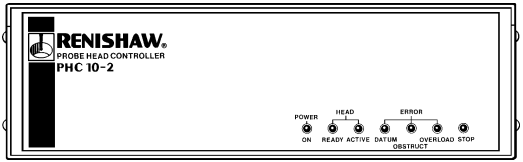
The PH10 series of motorised probe heads can only be used in conjunction with the PHC10-2 controller. The PHC10-2 incorporates an integral power supply for the head, manages all head and probe functions and communicates via a suitable interface with the CMM computer.

It is available in two versions:

- PHC10-2 RS232
- PHC10-2 IEEE

Figure 4 shows the front panel.

Figure 4 - PHC10-2 front panel



2.8 PHC10-2 probe head controller *continued*

2.8.1 PHC10-2 specification

Table 2 - PHC10-2 probe head controller specification	
Data transmission	RS232 serial or IEEE488 parallel
Power supply	Universal, autoselecting
Voltage range	85-264V, 47-66Hz
Power connector	IEC320
Fuse	2A(T) HBC 20mm x 5mm
Dimensions	2/3 19in rack wide, 2U high 290mm x 88mm x 220mm (11.42in x 3.46in x 2.66in)
Mounting	19in rack mounting or stand-alone

2.8 PHC10-2 probe head controller *continued*

2.8.2 PHC10-2 front panel

Figure 5 shows the LEDs on the front panel of the PHC10-2. The names, colours and functions of the LEDs are given in Table 3.

Figure 5 - LEDs

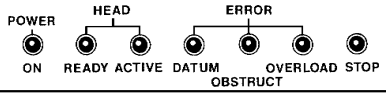


Table 3 - LEDs

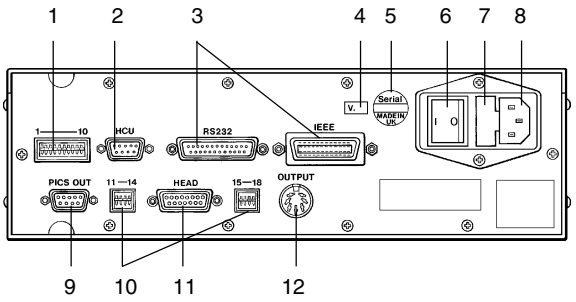
LED NAME	COLOUR	DESCRIPTION
POWER ON	Green	Power on when lit
HEAD READY	Green	Head correctly locked up and waiting for a command
HEAD ACTIVE	Yellow	Head moving
DATUM ERROR	Red	Head not locked
OBSTRUCT ERROR	Red	Head obstructed
OVERLOAD ERROR	Red	Head overloaded
STOP	Red	PHC10-2 signal to CMM computer

2.8 PHC10-2 probe head controller *continued*

2.8.3 PHC10-2 rear panel

Figure 6 shows the rear panel of the PHC10-2.

Figure 6 - rear panel



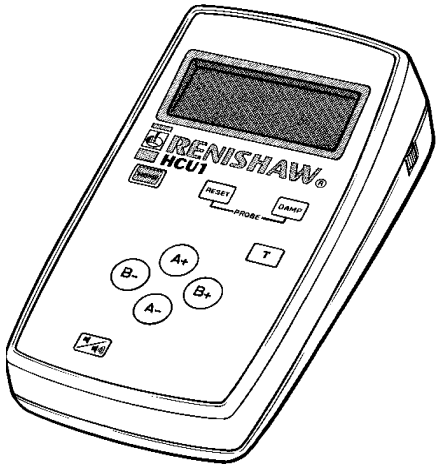
Key

1 Switches 1-10, communications protocol selection
2 HCU1 connector
3 *Either* RS232 communications connector *or* IEEE488 communications connector
4 Version number
5 Serial number
6 Main power ON/OFF switch
7 Fuse holder
8 Mains power input
9 PICS output connector
10 Switches 11-14 and 15-18, probing system format selection
11 Probe head connector
12 Probe output connector

2.9 HCU1 hand control unit

The HCU1 hand control unit shown in Figure 7 is an optional control which enables the system to be used in manual mode or in a teach cycle. An LCD dot matrix display provides information on system status.

Figure 7 - HCU1

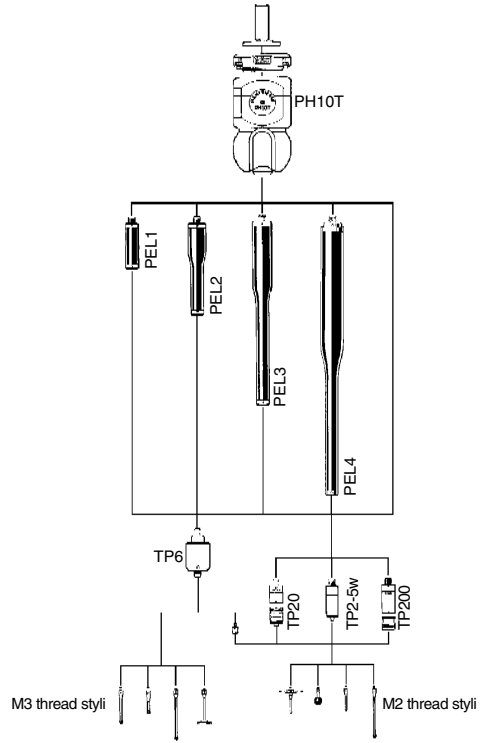


For further information on features and operation, see the HCU1 User's Guide (Renishaw Part Number H-1000-5016) or contact your Renishaw supplier.

2.10 PH10 probe carrying capability

Figure 8 shows the range of extensions, probes and styli which can be used in conjunction with the PH10T head.

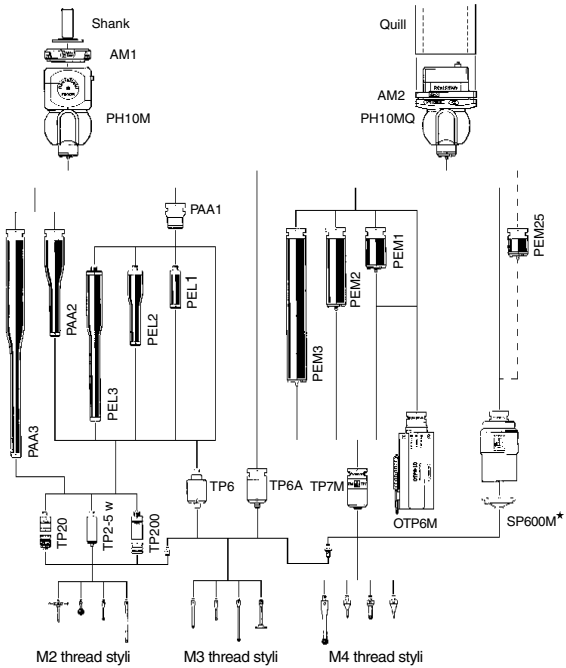
Figure 8 - Extensions, probes and styli



2.10 PH10 probe carrying capability *continued*

Figure 9 shows the range of extensions, probes and styli which can be used in conjunction with the PH10M and PH10MQ heads.

Figure 9 - Extensions, probes and styli



* When using a PH10MQ with SP600M a PEM25 extension bar is required to achieve A = 97.5° or A = 105° in all B-axis positions

2.11 Connection of probes and extensions

2.11.1 M8 connection

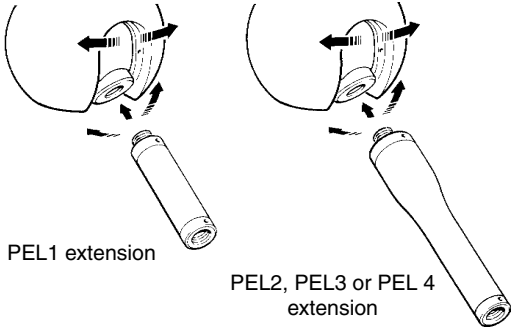
The PH10T is designed to carry Renishaw probes and extensions with an M8 screw thread (see Figure 10).

Probes and extensions are screwed into the probe head bush and tightened with the appropriate spnner.

CAUTION

Never use anything other than the Renishaw spanner provided and do not apply excessive force.

Figure 10 - M8 connection

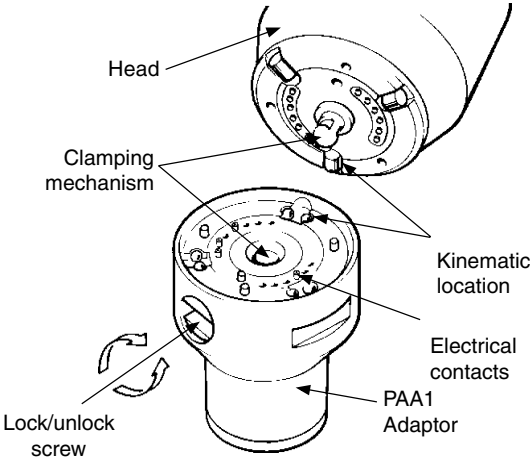


2.11.2 Autojoint connection

The PH10M and PH10MQ heads all use a Renishaw Autojoint (Figure 11) which is a highly repeatable kinematic joint, one half of which forms part of the head. The other half forms part of the adaptor, extension bar or probe.

Locking and unlocking the Autojoint is carried out either manually, using the Autojoint key, or automatically using the Renishaw Autochange rack system. In both cases, the connection repeatability eliminates the need for probe requalification after exchange.

Figure 11 - Autojoint connection



2.12 Probes

2.12.1 M8 touch-trigger probes

This range of probes (see Table 4) utilises the M8 bush as a mounting to the head. These can be fitted directly onto the PH10T head, but when used with the PH10M or PH10MQ heads, one of the Autojoint to M8 bush extension bars or the PAA1 adaptor must be used (see Figure 8).

Table 4 - M8 touch-trigger probes

Probe	Diameter	Application	User's Guide
TP2-5W	13mm	Universal probe for DCCC and manual CMMs	H-1000-5021
TP6*	25mm	Universal probe for DCCC and manual CMMs	H-1000-5021
TP20	13mm	Universal probe for DCCC and manual CMMs with module changing	H-1000-5008
TP200	13mm	Universal probe with strain gauges for DCC CMMs. Upto 100mm stylus carrying ability	H-1000-5150

* An Autojoint version (TP6A) is also available.

2.12 Probes *continued*

2.12.2 Multiwired probes

This range of probes (see Table 5) are compatible with the PH10M and PH10MQ heads only and utilise the Renishaw multiwired Autojoint connection to the head.

Table 5 - Multiwire probe

Probe	Application	Diameter	Weight	User's Guide
TP7M	Universal probe with strain gauges for DCC CMMs	25mm	85g (without stylus)	H-1000-5010
SP600M ⋆	Analogue contact scanning probe	50mm	216g (without stylus)	H-1000-5175
OTP6M	Laser non-contact optical trigger probe	49mm	253g max (fitted with PEM1)	H-1000-5007

Probes in this range require comprehensive integration to your CMM.

⋆ When using a PH10MQ with SP600M a PEM25 extension bar is required to achieve A = 97.5° or A = 105° in all B-axis positions

2.13 Probe extension bars

Renishaw manufacture a comprehensive range of extension bars and adaptors to allow increased component penetration (see Figures 8 and 9 for allowable combinations).

There are three types in the range:

- Autojoint to M8 bush (PAA series)
- Autojoint to Autojoint (PEM series)
- M8 thread to M8 bush (PEL series)

2.13.1 Autojoint to M8 bush

These extension bars connect directly to Autojoint of the PH10M or PH10MQ head and terminate in an M8 bush (see Table 6). This permits use of two-wire touch trigger probes.

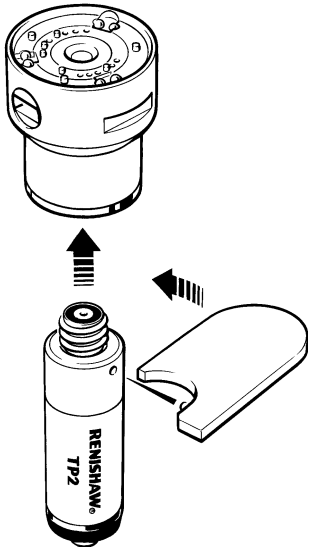
Table 6 - Autojoint to M8 bush extensions

Extension	Length	Material	Weight
PAA1	30mm (1.18in)	Steel	57g
PAA2	140mm (5.51in)	Aluminium	85g
PAA3	300mm (11.81in)	Aluminium	144g

2.13.1 Autojoint to M8 bush *continued*

The probe is fitted to the extension by hand and tightened by use of the S1 spanner as shown in Figure 12.

Figure 12 - Fitting the PAA1 extension



The S1 spanner is designed to fail before damage can occur to the mechanical joint between the two parts.

2.13 Probe extension bars *continued*

2.13.2 Autojoint to Autojoint

These extension bars are compatible with the PH10M and PH10MQ heads. They allow direct connection to the head via the Autojoint and terminate in an Autojoint (see Table 7). This permits use of a multiwired probe.

Table 7 - Autojoint to Autojoint extensions

Extension	Length	Material	Weight
PEM25	25mm (0.98in)	Aluminium	53g
PEM1	50mm (1.97in)	Aluminium	64g
PEM2	100mm (3.94in)	Aluminium	93g
PEM3	200mm (7.87)	Aluminium	145g

2.13 Probe extension bars *continued*

2.13.3 M8 thread to M8 bush

These extension bars can be used directly with the PH10T head, and also with the PH10M and PH10MQ heads using the PAA1 adaptor.

Table 8 - M8 thread to M8 bush extension bars

Extension	Length	Material	Weight
PEL1	50mm (1.97in)	Aluminium	24g
PEL2	100mm (3.94in)	Aluminium	57g
PEL3	200mm (7.87in)	Aluminium	86g
PEL4	300mm (11.81in)	Aluminium	135g

2.14 Styli

Renishaw manufactures an extensive range of precision styli and stylus accessories. They are available in M2, M3, M4 and M5 thread sizes with steel, tungsten carbide, graphite fibre and ceramic stems. Each is fitted with a precision industrial synthetic ruby ball available in diameters from 0.3mm (0.012in) to 8.0mm (0.31in).

Special application styli including discs, cylinders, pointers, stars and large ceramic balls up to 30mm (1.18in) are available in M2 and M3 thread sizes.

For further information on the Renishaw stylus range, please refer to the Styli and Accessories Technical Specifications (Renishaw Part No H-1000-3200).

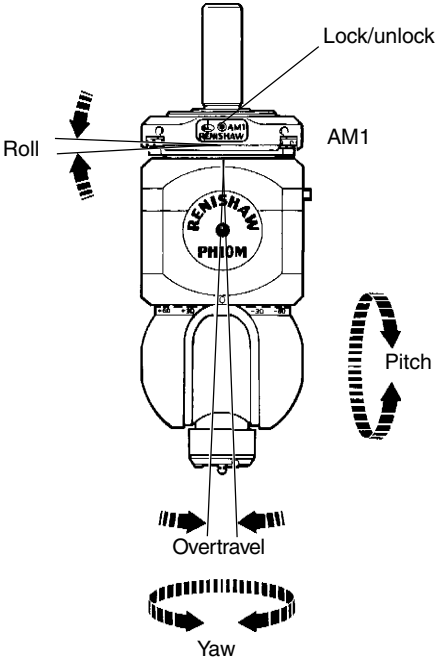
Renishaw also offers a custom design service if your requirements are not met by the standard range. Please contact your Renishaw supplier for details.

3.0 ACCESSORIES

3.1 Adjustment modules

The AM1 adjustment module shown in Figure 13 is designed for use on the PH10T and PH10M.

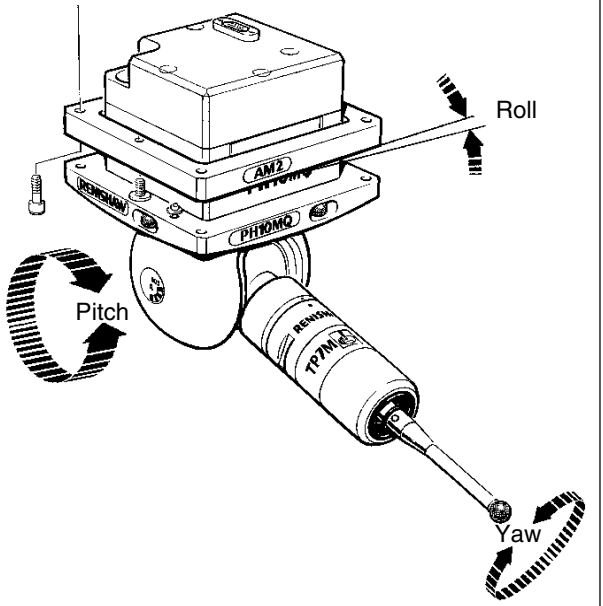
Figure 13 - AM1 adjustment module



3.1 Adjustment modules *continued*

The AM2 adjustment module shown in Figure 14 is designed for use with the PH10MQ.

Figure 14 - AM2 adjustment module



3.1 Adjustment modules *continued*

Both modules enable adjustment in pitch, roll and yaw and allow accurate alignment with machine quill or workpiece.

The AM1 offers a quick release mechanism for rapid head exchange, and features inbuilt overtravel protection.

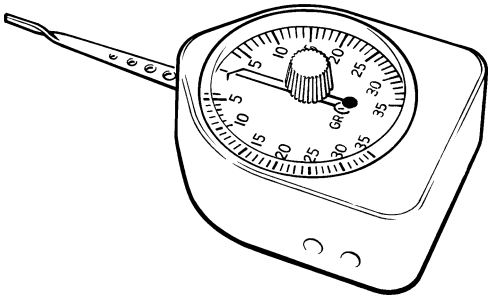
For further information on the AM1, please refer to the AM1 User's Guide (Renishaw Part Number H-1000-4010). For further information on the AM2, please refer to the AM2 New Product Information sheet (Renishaw Part Number H-1000-2051).

If your CMM has been fitted with either of the modules, the relevant documentation should have been included. If not present, please contact your Renishaw supplier who will arrange for a free copy to be sent.

3.2 Gram gauge

Probe trigger force is critical to ensure accuracy and reliable operation, and can be easily measured and set using the gram gauge as shown in Figure 15.

Figure 15 - Gram gauge



It is strongly recommended that the gram gauge is used when adjustments are to be made to probe trigger force.

For further information on the gram gauge, please refer to the Gram Gauge Product Information sheet (Renishaw Part Number H-1000-2033).

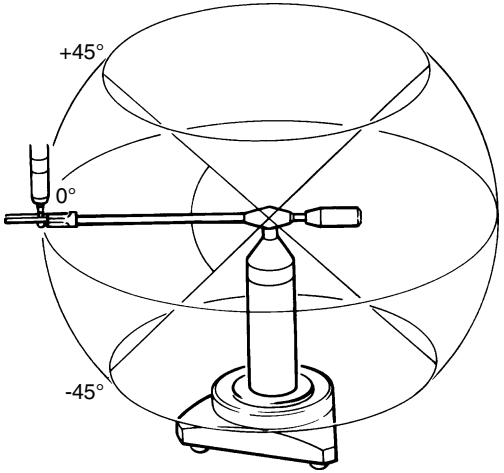
Note: To convert probe trigger force in grams to Newtons the following equation is to be used.

$$\text{Trigger force in grams} = \frac{\text{Trigger force in Newtons}}{100}$$

3.3 Machine checking gauge

The Renishaw machine checking gauge shown in Figure 16 enables rapid and effective interim checking of CMM performance as recommended by many standards for CMM volumetric performance assessment.

Figure 16 - Machine checking gauge

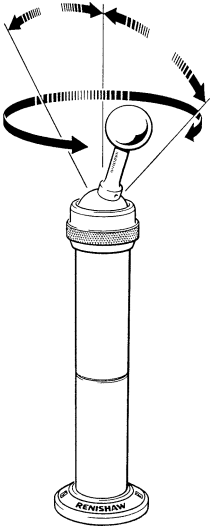


Please contact your Renishaw representative to arrange a demonstration, or refer to the Machine Checking Gauge User's Guide (Renishaw Part Number H-1000-5080).

3.4 Universal datum sphere

The Renishaw universal datum sphere shown in Figure 17 features quick and easy alignment of its ball stem over a wide range of angles, allowing clearance for probe qualification above, centrally and below the ball.

Figure 17 - Universal datum sphere

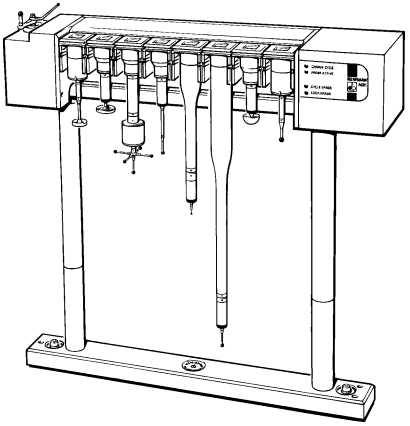


Each hard-wearing tungsten carbide sphere is supplied with a test certificate traceable to UK (National Physical Laboratory) standards. For further information on the sphere please refer to the Universal Datum Sphere Data Sheet (Renishaw Part Number H-1000-2055).

3.5 Autochange rack

Renishaw's Autochange rack shown in Figure 18 is a fully-integrable probe exchange system available for use with the PH10M and PH10MQ probe heads. Mounted within the CMM working envelope, the Autochange system facilitates fast, automatic probe exchange without the need for requalification.

Figure 18 - Autochange rack



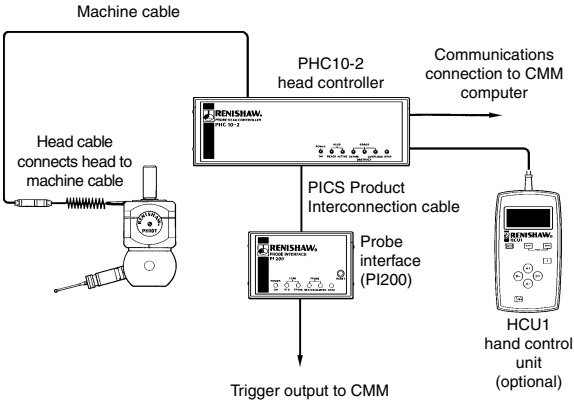
Fast 'probing to probing' cycles are achieved by the head docking one probe and selecting another. The highly repeatable Autojoint removes the need to requalify after each exchange.

4.0 SYSTEM OPERATION

4.1 Introduction

Figure 19 shows the basic installation configuration for the PH10 system.

Figure 19 - System configuration



4.2 Operating modes

The PH10 system can operate in one of two modes:

- Manual mode
- Automatic mode

4.2.1 Manual mode

In manual mode the optional HCU1 hand control unit is used to control head and probe functions.

If the HCU1 is connected to the PHC10-2 controller when power is applied to the system, the system will enter manual mode.

For further information refer to the HCU1 User's Guide (Renishaw Part Number H-1000-5016).

4.2.2 Automatic mode

In automatic mode the system is under the control of the CMM computer. The HCU1 cannot be used to control head or probe functions in automatic mode.

With no HCU1 fitted when power is applied to the system, the system will enter automatic mode. The system must be switched to manual mode under CMM control (and an HCU1 connected) for operation under manual mode.

Please refer to the documentation provided by your CMM supplier for further details on controlling the PH10 series of heads using the CMM computer.

4.3 Dos and don'ts

DO ensure that the head is mounted as rigidly as possible in the CMM quill.

DO take care to avoid collisions between the head and workpiece or CMM bed.

DO ensure that the head is moved clear of any obstruction before requesting a position change.

DO NOT apply force to any moving parts of the head.

DO NOT move the head axes by hand when locked or unlocked.

5.0 TROUBLESHOOTING

5.1 Introduction

Table 9 will help you to identify problems you may be experiencing with your system.

Table 9 - Troubleshooting	
Observation	**Section**
Poor measurement performance	5.2
No probe signal	5.3
No head movement	5.4
Datum error	5.5
Obstruct error	5.6
Overload error	5.7

If you experience problems which you are not able to identify or solve satisfactorily, please contact your Renishaw representative for further advice.

The optional HCU1 is also able to diagnose certain error conditions. Please refer to the HCU1 User's Guide (Renishaw Part Number H-1000-5016) for further information.

5.1 Introduction *continued*

NOTE

Before seeking technical assistance please make a note of the following information:

- **Your CMM make and model**
- **The probe head model number**
- **The probe head serial number**
- **The PHC10-2 serial number**
- **The PHC10-2 version number**
- **The LED sequence on the PHC10-2**
- **The stylus configuration fitted**

You may already have recorded some of this information in Section 1.0

5.2 Poor measurement performance

Table 10 - Poor measurement performance	
Possible cause	**Checks/remedies**
Loose head mounting	Ensure all mounting screws are tight and mounting to the CMM is secure
Probe incorrectly installed	Remove probe and refit
Force applied to head during lock up	Unlock and relock
Incorrect lock up position or position not qualified	Reposition head correctly. Check qualification information.

5.3 No probe signal

Table 11 - No probe signal	
Possible cause	**Checks/remedies**
Probe incorrectly installed	Remove probe and refit
Cable/connection fault	Check connections and integrity of cabling from head to controller
Probe failure	Contact your CMM supplier or Renishaw representative for further assistance
Probe output disabled by CMM	Check probe output

5.4 No head movement

Table 12 - No head movement	
Possible cause	**Checks/remedies**
Power loss	Check controller POWER ON LED is lit. Check mains cable connections and integrity, observing electrical safety precautions. Check controller fuse, observing electrical safety precautions (see page 14). Check CMM emergency stop condition - power may have been removed from the system by the CMM.
Cable/connection fault	Check connections and integrity of cabling from head to controller.

5.5 Datum error

The DATUM ERROR LED is lit on the controller. The head has rotated to the required position but locked in a non-repeatable condition (a maximum of four attempts to lock will be made before the error is reported).

Table 13 - Datum error

Possible cause	Checks/remedies
Cable/connection fault	Check connections and integrity of cabling from head to controller
Head/stylus configuration obstructed	Remove obstruction and update head using the HCU1 or under CMM control
Extension bar too long	Use shorter bar
Internal head fault	Contact your Renishaw representative, CMM manufacturer or distributor

5.6 Obstruct error

The OBSTRUCT ERROR and STOP LEDs are lit on the controller. The head has been obstructed while moving but is unable to reach the requested position or to lock into it.

Table 14 - Obstruct error

Possible cause	Checks/remedies
Head/stylus configuration obstructed	Check head for damage. Remove obstruction and repeat head move
Probe/extension combination too long	Use shorter/lighter combination
Internal head fault	Contact your Renishaw representative, CMM manufacturer or distributor

5.7 Overload error

The OVERLOAD ERROR and STOP LEDs are lit on the controller. The head has been overloaded while locked.

Table 15 - Overload error	
Possible cause	**Checks/remedies**
Head lock up holding force exceeded during CMM acceleration	Reduce mass of probe/extension combination. Reduce acceleration
Collision with workpiece or CMM	Check head for damage. Remove obstruction and repeat move

6.0 MAINTENANCE

6.1 Maintenance

There are no user serviceable parts inside any of the PH10 system units. The only maintenance required is fuse replacement. See page 14 for instructions on fuse replacement.

Units requiring attention must be returned to an authorised Renishaw Customer Service Centre.

6.2 Cleaning

The probe head, controller and hand control unit may all be wiped using a soft cloth.

USER REGISTRATION

To obtain further information on your PH10 system, and to enable Renishaw to keep you informed with the latest product news, please complete the user registration form overleaf and send it to:

Customer Support Department
Renishaw plc
Wotton-under-Edge
Gloucestershire
GL12 8JR
United Kingdom

NOTE

This information will be treated as strictly confidential and will be used by Renishaw for internal purposes only as described above

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Please register me as a PH10 system user

Name _____

Position _____

Company name _____

Address _____

_____

_____

_____

_____

Telephone/fax _____

e-mail _____

CMM make and model _____

Please send me:

- ❑ PH10 Series Installation Guide
- ❑ Basic Command Set for Indexing Heads Programmer's Guide
- ❑ HCU1 User's Guide
- ❑ Styli and Accessories Technical Specifications
- ❑ Probing Systems for CMMs, Technical Specifications

- ❑ Please arrange for my nearest Renishaw representative to contact me

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