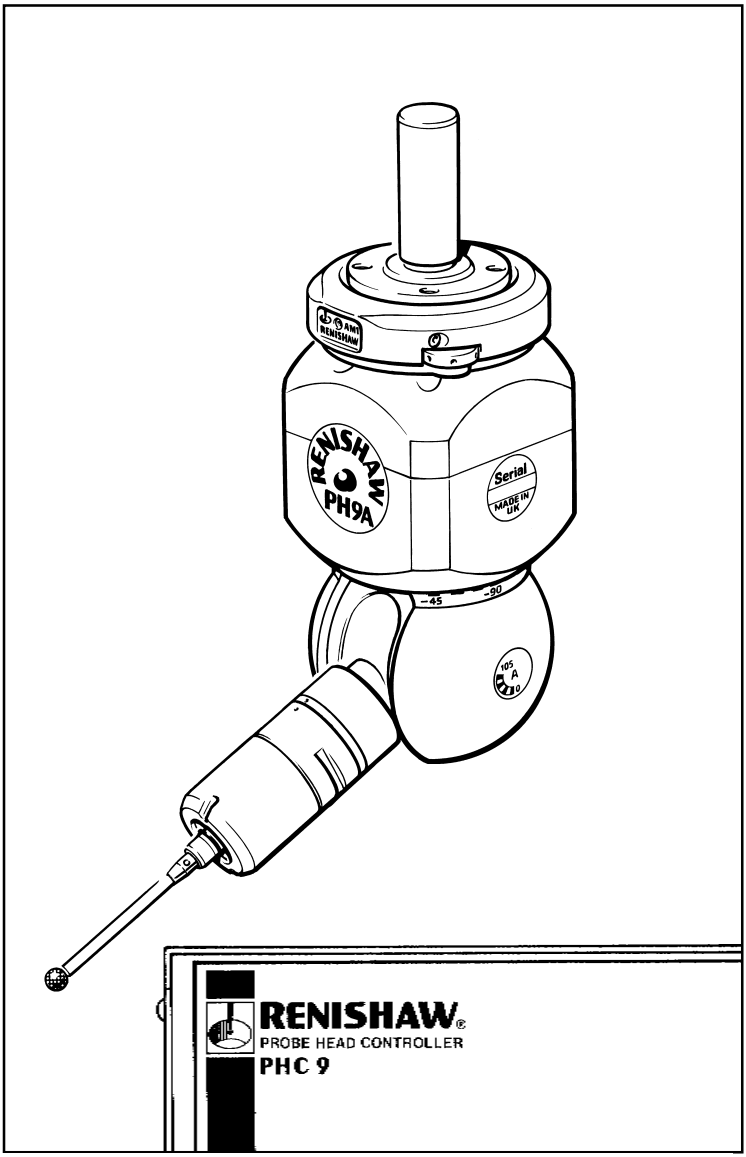


RENISHAW

PH9 and PH9A Automated Inspection System User's Guide

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 provided that it is installed exactly as defined in associated Renishaw documentation.

Consent must be obtained from Renishaw if non-Renishaw equipment (eg 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 the various products shown in this User's Guide and features of similar products are the subject of the following patents and patent applications:

EP	0142373	JP	2,098,080	US	4651405
EP	0293036	JP	2,510,804	US	4769919
EP	0501710	JP	2,539,821	US	4916339
EP	236414	JP	2,647,881	US	5,323,540
EP	242710 B			US	5,339,535
EP	279828 B			US	5,505,005

Renishaw plc

PH9 and PH9A
Automated Inspection System

User's Guide

CE

Part No. H-1000-5062-05-A

FCC (USA)

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 installation 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.

CONTENTS

GB

WARNINGS

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.

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

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

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

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

AVERTISSEMENTS

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.

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

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

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.

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

ACHTUNG

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.

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

Bei der Bedienung von Werkzeugmaschinen oder Koordinatenmeßanlagen ist Augenschutz empfohlen.

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.

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

AVVERTENZE

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.

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

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

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.

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

ADVERTENCIAS

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.

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

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

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.

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

AVISOS

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.

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

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

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.

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

ADVARSLER

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.

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

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

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

Se afsnittet MAINTENANCE (VEDLIGEHOLDELSE) i produktdokumentationen 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.

GR

ΠΡΟΕΙΔΟΠΟΙΗΣΕΙΣ

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.

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

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

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.

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.

NL

WAARSCHUWINGEN

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.

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

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

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.

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

VARNING

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.

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

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

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

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

VAROITUKSIA

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.

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

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

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

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.

GB

SAFETY

Electrical requirements
The PHC9 is powered from the a.c. mains supply via an IEC 320 connector. The operating voltages of the unit are as follows:

85 - 140V ac	46 - 66Hz	40W
170 - 275V ac	46 - 66Hz	40W

The PHC9 automatically identifies the voltage of the supply.

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) slow-blow 20mm 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: PH9/9A	+10°C to +40°C
Operating temperature: PHC9	0°C to +50°C
Storage temperature: PH9/9A	-10°C to +70°C
Storage temperature: PHC9	-10°C to +70°C
Relative humidity: PH9/9A	80% maximum for temperatures up to +31°C Linear decrease to 50% at +50°C
Relative humidity: PHC9	80% maximum for temperatures up to +31°C Linear decrease to 50% at +40°C
Transient overvoltages	Installation category II
Pollution degree	2

F

SECURITE

Spécifications électriques
Le contrôleur PHC9 est raccordé au secteur par un connecteur à la norme IEC 320. Les tensions d'alimentation pour cet équipement sont les suivants:

85 à 140V	46 à 66Hz	40W
170 à 275V	46 à 66Hz	40W

Le contrôleur PHC9 reconnaît automatiquement la tension d'alimentation à laquelle il est raccordé.

Remplacement du fusible
Deux fusibles retardés de 2A sont fournis dont un de remplacement. Pour procéder à l'échange, veuillez vous conformer à la procédure suivante:

1. Débrancher le contrôleur PHC9 du secteur.
2. Utiliser un petit tournevis pour ouvrir le porte-fusible et accéder au fusible endommagé.
3. Enlever le fusible et le replacer par un autre identique (T 20 2 amp, temp. IEC 127).
4. Remettre le porte-fusible en place.
5. Reconnecter le contrôleur PHC9 au secteur.

ATTENTION: Vérifier que le fusible de remplacement est du bon calibre.

Cet équipement doit impérativement être relié à une terre de protection par un câble secteur à 3 conducteurs. La prise équipant ce câble doit être connectée à une prise secteur effectivement équipée d'une borne reliée à la terre. La liaison entre la terre de protection et le contrôleur PHC9 ne doit en aucun cas être interrompue par l'utilisation d'un prolongateur dépourvu de conducteur reliant l'équipement à cette terre de protection.

ATTENTION: Toute interruption de la terre de protection peut rendre cet équipement dangereux. Assurez-vous que la mise à la terre a été effectuée.

Spécifications relatives a l'environnement
Les conditions d'environnement sont en accord avec la norme BS EN 61010-1:1993 ou ultérieure:

Utilisation uniquement à l'intérieur	IP30 (aucune protection contre l'eau)
Altitude	Jusqu'à 2000m
Température de fonctionnement: PH9/9A	+10°C à +40°C
Température de fonctionnement: PHC9	0°C à +50°C
Température de stockage: PH9/9A	-10°C à +70°C
Température de stockage: PHC9	-10°C à +70°C
Humidité relative : PH9/9A	80% maximum pour des températures jusqu'à 31°C avec diminution linéaire jusqu'à 50% à +50°C
Humidité relative : PHC9	80% maximum pour des températures jusqu'à 31°C avec diminution linéaire jusqu'à 50% à +40°C
Surtensions transitoires	Installation classée en 2ème catégorie
Degré de pollution	Equipement classé en niveau 2

D

SICHERHEIT

Elektrische Voraussetzungen
Die Netzversorgung des PHC9 erfolgt über einen Kaltstecker (IEC320). Die Einheit kann an folgende Spannungen angeschlossen werden:

85 - 140V (Wechselstrom)	46 - 66Hz	40W
170 - 275V (Wechselstrom)	46 - 66Hz	40W

Der PHC9 stellt sich automatisch auf die Spannungsversorgung ein.

Austausch der Sicherung
Das Gerät ist mit einer 2 Ampere Sicherung (träge) abgesichert. Eine Ersatzsicherung ist beigelegt. Das Auswechseln der Sicherung wird folgendermaßen vorgenommen:

1. Ziehen Sie den Netzstecker.
2. Mit Hilfe eines Schraubenziehers, hebeln Sie den Sicherungshalter aus, damit die Sicherung sichtbar wird.
3. Entfernen Sie die Sicherung und ersetzen Sie sie durch eine 2 Amp (T) träge, 20mm Sicherung, Leistung gemäß IEC127.
4. Bringen Sie den Sicherungshalter wieder an.
5. Stecken Sie das Gerät wieder ein.

WARNUNG: Benutzen Sie nur Austauschsicherungen mit der vorgegebenen Spezifikation.

Dieses System muß mit einem geerdeten Schutzleiter über ein 3-adriges Hauptkabel verbunden sein. Der Hauptstecker sollte nur in eine geerdete Steckdose gesteckt werden. Der geerdete Kontakt sollte nicht unwirksam gemacht werden, indem man ein Verlängerungskabel ohne Schutzleiter benutzt.

WARNUNG: Eine Unterbrechung des Schutzleiters stellt ein Sicherheitsrisiko dar. Stellen Sie sicher, daß die Erdungsvorschriften eingehalten werden.

Umgebungsbedingungen
Die Forderungen der Richtlinie BS EN 61010-1:1993 sind erfüllt:

Inneneinsatz	IP30 (kein Schutz gegen Wasser)
Höhe	bis zu 2000m
Betriebstemperatur: PH9/9A	+10°C bis +40°C
Betriebstemperatur: PHC9	0°C bis +50°C
Lagertemperatur: PH9/9A	-10°C bis +70°C
Lagertemperatur: PHC9	-10°C bis +70°C
Relative Luftfeuchtigkeit: PH9/9A	maximal 80% für Temperaturen bis +31°C, linearer Anstieg bis 50% bei +50°C
Relative Luftfeuchtigkeit: PHC9	maximal 80% für Temperaturen bis +31°C, linearer Anstieg bis 50% bei +40°C
Kurzzeitige Überspannungen	Installationsklasse II
Verschmutzungsgrad	2

I

SICUREZZA

Specifiche Elettriche
Il controllo PHC9 è alimentato in tensione A.C. tramite un connetore tipo IEC 320. Le tensione di lavoro richieste sono le seguenti:

85 - 140V a.c.	46 - 66 Hz	40W
170 - 275V a.c.	46 - 66 Hz	40W

Il controllo PHC9 seleziona automaticamente il voltaggio appropriato.

Sostituzione dei Fusibili
Il controllo ha due fusibili di protezione del tipo "slow-blow" 2 Amp (uno è di riserva). La sostituzione del fusibile se effettua come il seguenti:

1. Staccare il collegamento con l'alimentazione principale.
2. Utilizzando un cacciavite come leva estarre il porta fusibile.
3. Togliere il fusibile è sostituirlo con un altro dello stesso tipo (2 Amp (T), "slow-blow", 20mm, IEC 127).
4. Rimettere il porta fusibile nella propria sede.
5. Ricollegare l'alimentazione.

ATTENZIONE: Assicurarsi che siano utilizzati solo fusibili come specificato.

Questa apparecchiatura deve essere collegata a massa di sicurezza tramite un cavo d'alimentazione del tipo a tre conduttori (multipolare). La pressa usata deve disporredi un collegamento per la massa. L'utilizzo di una prolunga privo del collegamento di massa è vietato.

ATTENZIONE: Qualsiasi interruzione del collegamento di massa può rendere il controllo pericoloso. Assicurarsi che il collegamento a massa di sicurezza sia conforme elle norme.

Specifiche Ambientali operative
Le seguenti specifiche ambientali di lavoro sono conformi, o eccedono, la norma BS EN61010-1: 1993:

Uso Interno	IP30 (senza protezione contro l'acqua)
Altitudine	Fino a 2000m
Temperatura di lavoro del PH9/9A	da +10°C a +40°C
Temperatura del lavoro del PHC9	da 0°C a +50°C
Temperatura di immagazzinamento PH9/9A	da -10°C a +70°C
Temperatura di immagazzinamento PHC9	da -10°C a +70°C
Umidità relativa PH9/9A	Massimo 80% per temperatura fina a +31°C riduzione lineare al 50% a +50°C
Umidità relativa PHC9	Massimo 80% per temperatura fina a +31°C riduzione lineare al 50% a +40°C
Sovraccarichi di tensione (transienti)	Categoria d'installazione II
Grado di inquinamento	2

1.0 INTRODUCTION

This user's guide describes two automated inspection systems, one using the PH9 motorised probe head and the other using the PH9A motorised probe head.

The main difference between the two types is that the PH9A has the facility to automatically select probe combinations and extensions without having to requalify the probe. This 'autojoint' facility can also be used manually as a 'quick change' method of exchanging probe combinations.

Section 2 describes both systems and the options available. Figures 1 and 2 show typical installations for the PH9 and PH9A respectively. These are followed by a description of each of the component parts and their functions.

The main part of this user's guide describes how the systems should be used in manual and automatic modes. A list of possible operating errors is given, which is followed by specifications for the PH9 and PH9A probe heads.

Installation and programming of the systems is described in the PH9 and PH9A Installation and Programming Guide (Part No. H-1000-5065).

If you require further information on options available and forthcoming, contact your Renishaw distributor.

Figure 1 - PH9 system overview

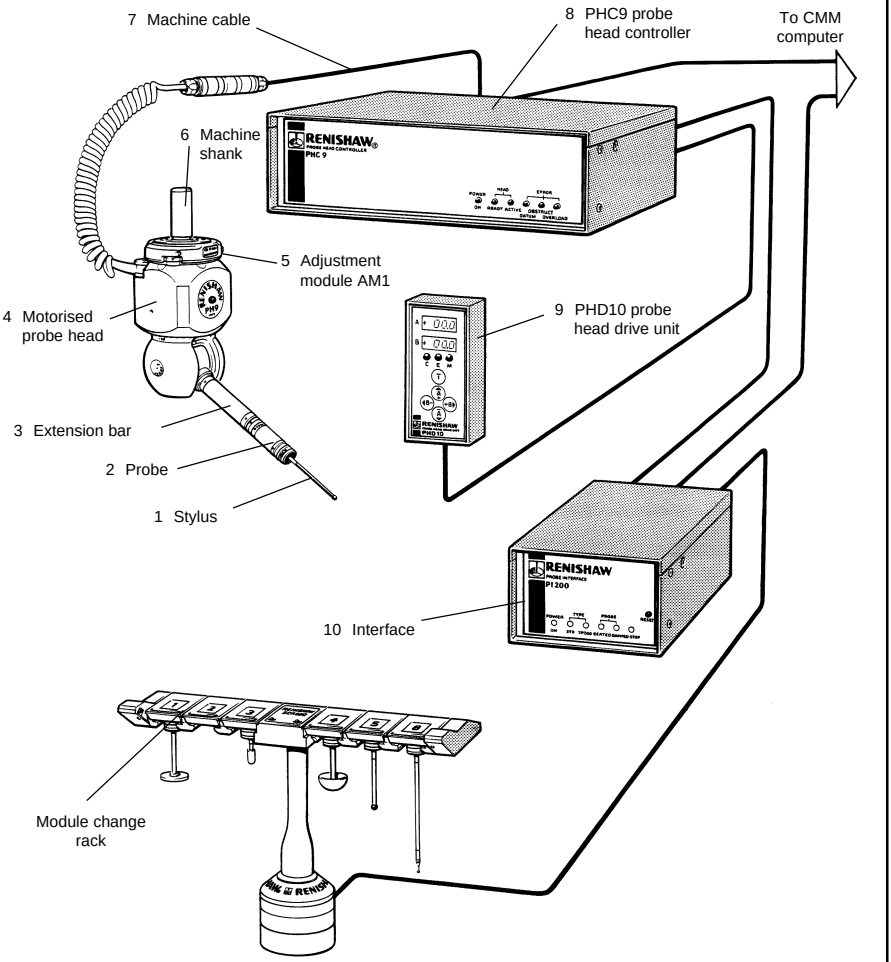
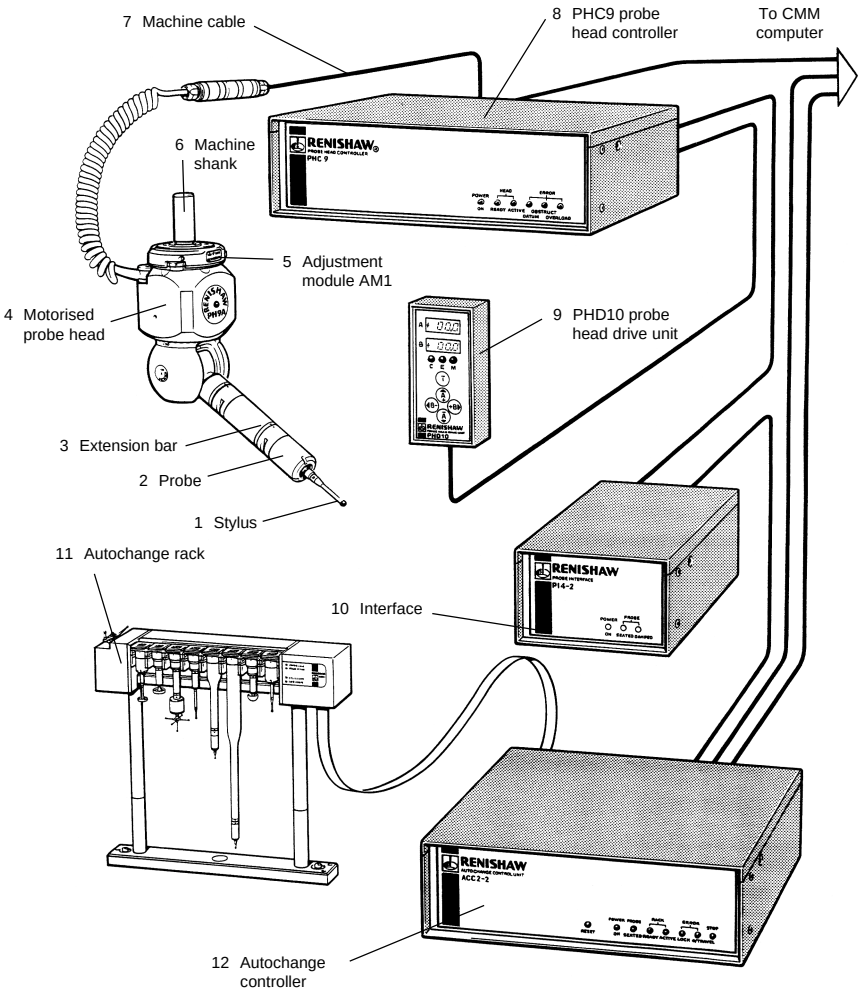


Figure 2 - PH9A system overview



2.0 PH9/PH9A AUTOMATED INSPECTION SYSTEM

2.1 General description

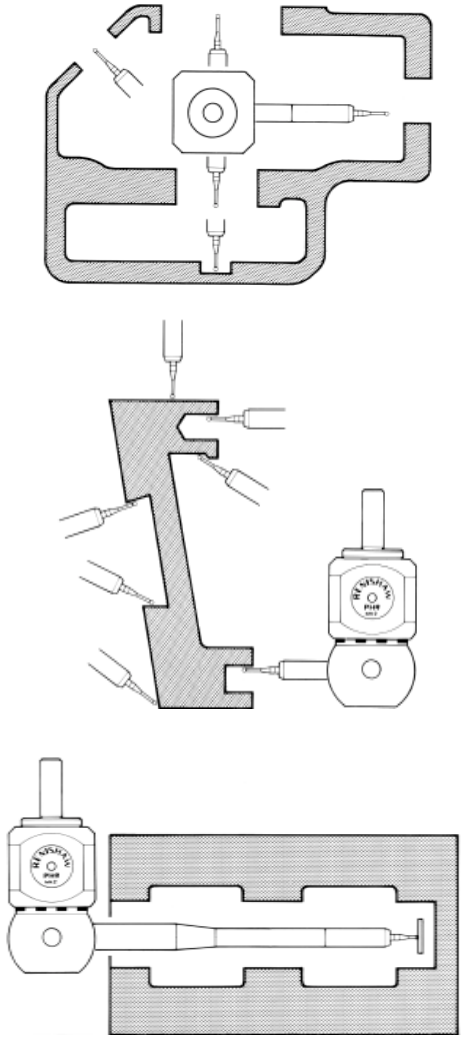
The PH9 and PH9A automated inspection systems from Renishaw are designed to enable a Coordinate Measuring Machine (CMM) to inspect complex items from many different angles. Under control of a CMM computer, the PH9/9A heads permit unsupervised operation using any combination of the 720 positions available.

The heart of the system is the motorised probe head itself, which will repeatably locate a stylus ball to within ±0.5µm of a previously qualified position (see Section 6.0 for specifications of the PH9 and PH9A).

Figure 3 shows the versatility of both the PH9 and PH9A probe heads. The PH9 motorised probe head can be used to inspect intricate and complex features, deep with a workpiece. Its compact dimensions mean that it can often be regarded as an extension of the machine quill.

2.1 General description

Figure 3 - PH9 and PH9A automated inspection systems



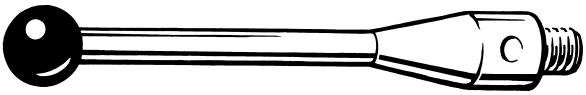
2.2 System components

Figures 1 and 2 show examples of PH9 and PH9A systems. The various items shown have been numbered to make the system easy to understand and follow. The following describes the component parts of the system in numerical order.

1 Stylus

The function of the stylus (see Figure 4) is to hold the ruby ball rigidly in position while it touches a workpiece surface. It transmits a movement triggering the probe when it is deflected. An extensive range of styli is available (see brochure H-1000-3200).

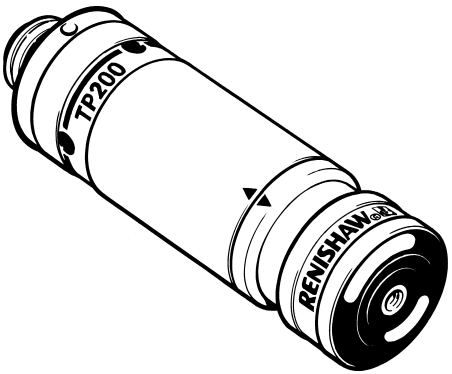
Figure 4 - Example stylus



2 Probe

The Renishaw probe (see Figure 5) is the most important fundamental part of the system. The probe is the device which signals to the CMM that a contact has been made between the stylus ruby ball and a workpiece surface. The precise coordinates at the point of contact can therefore be read and stored by the CMM. (A range of probes is available to suit most applications, see Probing System for Coordinate Measuring Machines Technical Specifications, Part No. H-1000-5050.)

Figure 5 - Example probe



2.2 System components *continued*

3 Extension bar

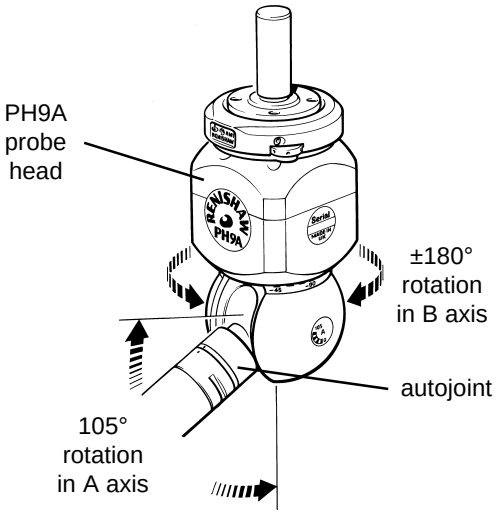
Extension bars (see Figure 6) are designed primarily to extend the range and depth of probing, particularly inside large and complicated workpieces. The PH9 and PH9A can carry a range of extension bars (see Section 3.2).

Figure 6 - Example extension bar

4 PH9 and PH9A motorised probe heads

The PH9 and PH9A probe heads are designed to position a probe in any one of 720 positions in steps of 7.5°. There are 15 discrete positions through 105° in the A axis and 48 positions through ±180° in the B axis (see Figure 7).

Figure 7 - PH9A probe head assembly



2.2 System components *continued*

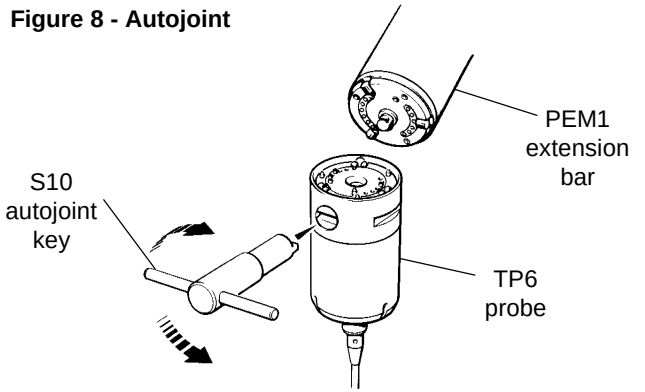
The vast number of alternative positions means that probing can be carried out from many different angles. A high degree of positional repeatability is achieved every time (thus avoiding the need to requalify when the probe is returned to a previously qualified position).

The PH9/9A probe heads are controlled by three electric motors. One drives the A axis, one the B axis and the third locks and unlocks both axes. Slipping clutches are fitted to the axis motors to prevent damage to the drive system in the event of a collision during movement. The kinematic locations which position the head accurately when locked up are also used to detect a failure to lock correctly (datum error), and probe crashes (overload error). Accidental rotation of the head beyond its normal range in both axes is prevented by overtravel stops.

The main difference between PH9 and PH9A is the joint attachment of the probe. On the PH9 swivel there is an M8 bush. Probes and/or extension bars are manually screwed into this bush before the system is used. When different combinations of probes and/or extensions are needed, these are changed by hand. The PH9A, however, has an autojoint (A for autojoint) which allows probes and extension bars to be selected from the autochange rack under program control, or 'quick changed' manually. Once the CMM has been programmed, there is little need for any human intervention, thus taking the machine one step closer to the fully automatic inspection system.

Figure 8 shows how the two halves of the autojoint connect together to give a high level of repeatability.

Figure 8 - Autojoint



2.2 System components *continued*

The signal from the touch trigger probe is routed through the contacts on the autojoint into the probe head and then through the 14 pin plug at the top corner of the head to an interface via the PHC9 controller (see Figures 1 and 2).

5 Adjustment module AM1

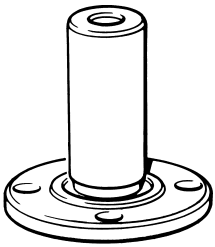
The Renishaw adjustment module AM1 shown in Figure 9 enables accurate alignment of any motorised probe head with the machine quill, or the alignment of the probe assembly to the workpiece. In an autochange system it must be fitted to achieve the required alignment of the probe head with the autochange rack ports. The AM1 also has a quick release mechanism to install and remove the attached motorised probe head. Limited additional overtravel protection is provided with this module.

Figure 9 - Adjustment module AM1

2.2 System components *continued*

6 Shanks
Renishaw provide an extensive range of shanks to fit most makes of CMM. See Figure 10 for an example of a Renishaw shank.

Figure 10 - Example shank

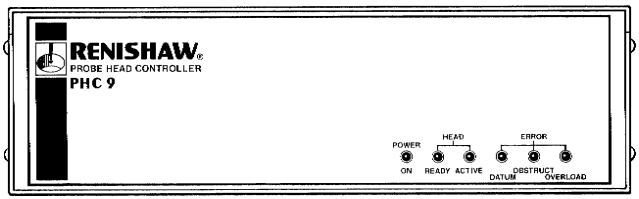


7 Cables
Various types and lengths of cables are supplied by Renishaw. Contact Renishaw or your CMM supplier for details.

8 PHC9 Probe head controller
The PHC9 probe head controller shown in Figure 11 receives instructions from the CMM computer in either serial (RS232) or parallel (IEEE488) form (note that the appropriate version must be purchased). It controls all probe head functions and reports the system status to the CMM.

Software designed for the PH9/9A system is directly compatible with that required by the PH10M system, which means that the same software can be used without modification if an inspection system is upgraded from PH9/9A to PH10M.

Figure 11 - PHC9 probe head controller



See Section 4.4 for full details of the PHC9 probe head controller.

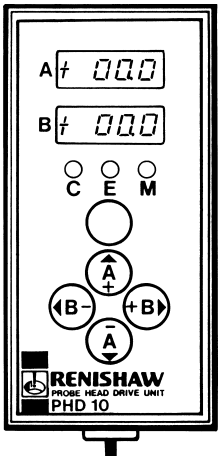
2.2 System components *continued*

9 PHD10 Probe head drive unit

The PHD10 (see Figure 12) is a remote hand control which allows the probe head to be used in manual mode. It is used during setting up and operator controlled inspection cycles and is an invaluable tool for programming using the 'teach cycle' method. The unit has four buttons which can be used to orientate the probe in both A and B axes in increments of 7.5°, and a T button which can be used to transmit positional information to the controller. The position of the probe head is displayed on the drive unit in degrees. Three LEDs on the unit show the status and error conditions.

The PHD10 supersedes the PHD9 and is functionally identical except that it will drive up to 15m of cable as standard. No damage will occur if the old PHD9 is connected to the PHC9, but it will not function.

Figure 12 - PHD10 probe head drive unit



See Section 4.3 for details on how to use the PHD10 to control the system manually.

2.2 System components *continued*

10 Interfaces

Renishaw recommend that a suitable probe interface is used for all installations (both new and retrofit) to enable users to expand the system in the most efficient way. If interfaces in the Renishaw range such as the PI4-2 or PI200 are used, different interconnection cables may be required.

11 Autochange rack and
12 ACC2 Autochange controller (for use with PH9A only)

The Renishaw autochange system is the next step towards turning the CMM into a flexible inspection system. The capabilities of the CMM are increased to a point where there is no need for human intervention even where very complex inspection cycles are required. It is ideal for applications where complex parts are to be inspected automatically and where probe types, extensions and/or accessories are to be changed several times. Once the machine has been programmed, a great deal of time and effort can be saved, as this automatic probe exchange system does not require requalification of probes when returned to the autochange rack and subsequently re-selected.

3.0 SETTING UP THE SYSTEM

3.1 Setting up using adjustment module AM1

The PH9/9A is designed to be mounted in any orientation, using a standard shank to suit your machine.

The PH9/9A can also be fitted with the AM1 adjustment module (see Figure 13). This allows fine adjustment of the head in pitch, roll and yaw, enabling the head to be accurately aligned with the machine's axes (this is particularly important when using an autochange rack).

The AM1 incorporates a bayonet fitting, allowing the head to be easily detached from the machine and to be refitted.

Pitch adjustment
Rotate the pitch adjusting capstan to alter the pitch.

Roll adjustment
Rotate the roll adjusting capstans an equal amount in opposite directions to alter the roll. The roll adjustment range is ±2°.

Yaw adjustment

1. Release the lock/unlock screw.

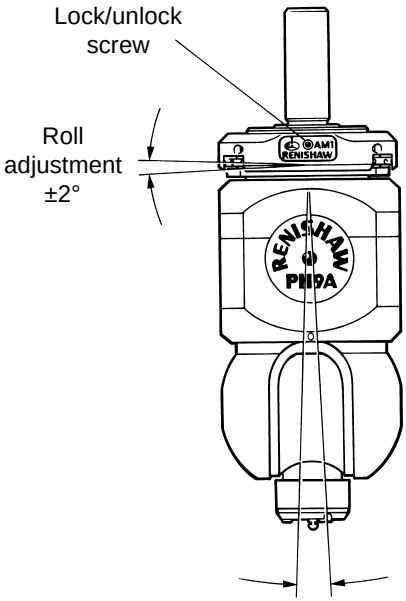
2. Release one yaw adjusting screw and tighten the other to achieve the yaw required (the yaw adjustment range is ±5°).

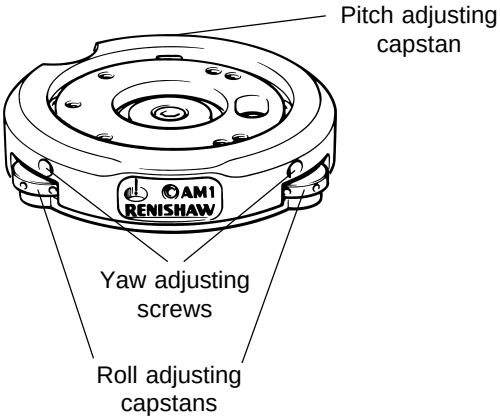
3. Tighten the yaw adjusting screws against each other without applying excessive torque.

4. Tighten the lock/unlock screw.

3.1 Setting up using adjustment module AM1 *continued*

Figure 13 - Adjustment module AM1





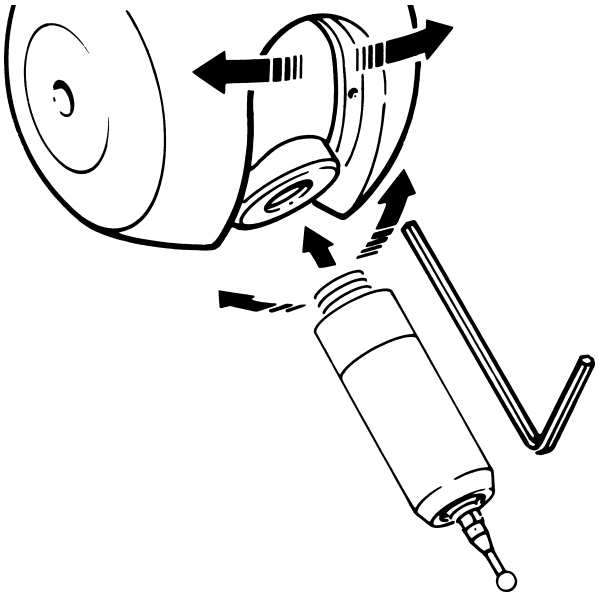
3.2 Fitting probes, extensions and accessories

The PH9 is designed to carry Renishaw probes and extensions with an M8 screw thread (see Figure 14).

Screw probes or extension bars into the probe head bush and tighten with the appropriate spanner.

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

Figure 14 - PH9 M8 connection



3.2 Fitting probes, extensions and accessories *continued*

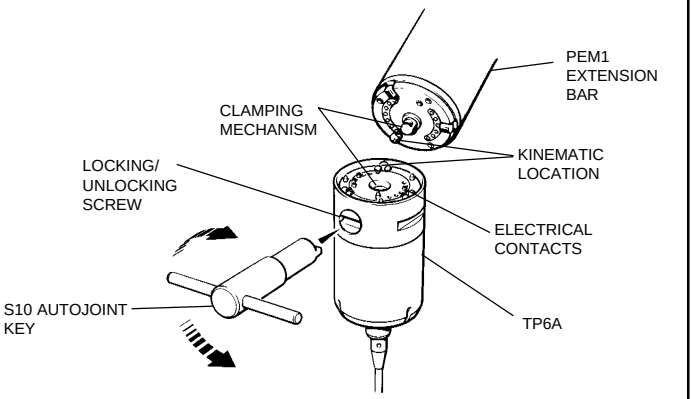
The PH9A, on the other hand, uses an autojoint to connect probes and extensions. This can be done using the Autochange rack, or can be carried out manually as follows (see Figure 15):

1. Unlock the locking/unlocking screw using the S10 autojoint key provided.
2. Align the red dots one above the other and locate the two halves of the joint together.
3. Turn the locking/unlocking screw clockwise until it locks tight.
4. Back the screwdriver slot off by approximately 5°.

The assembly is now ready for use.

To remove the extension bar assembly, undo the locking/unlocking screw on the autojoint.

Figure 15 - Autojoint

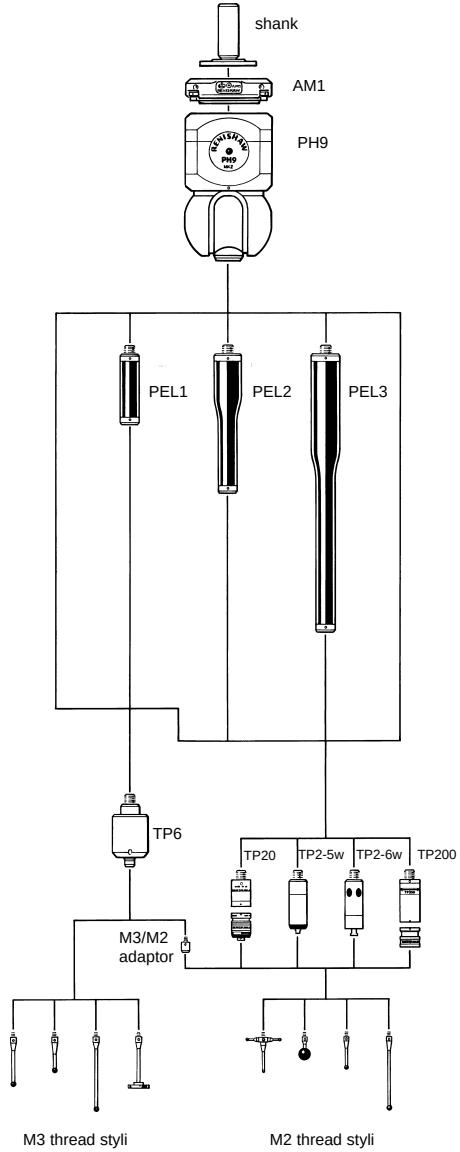


Note that the repeatability of the autojoint is such that it will locate a stylus ball 50mm from the autojoint to within ±0.5µm of a previously qualified position.

3.2 Fitting probes, extensions and accessories *continued*

3.2.1 Probes, extensions and accessories for the PH9

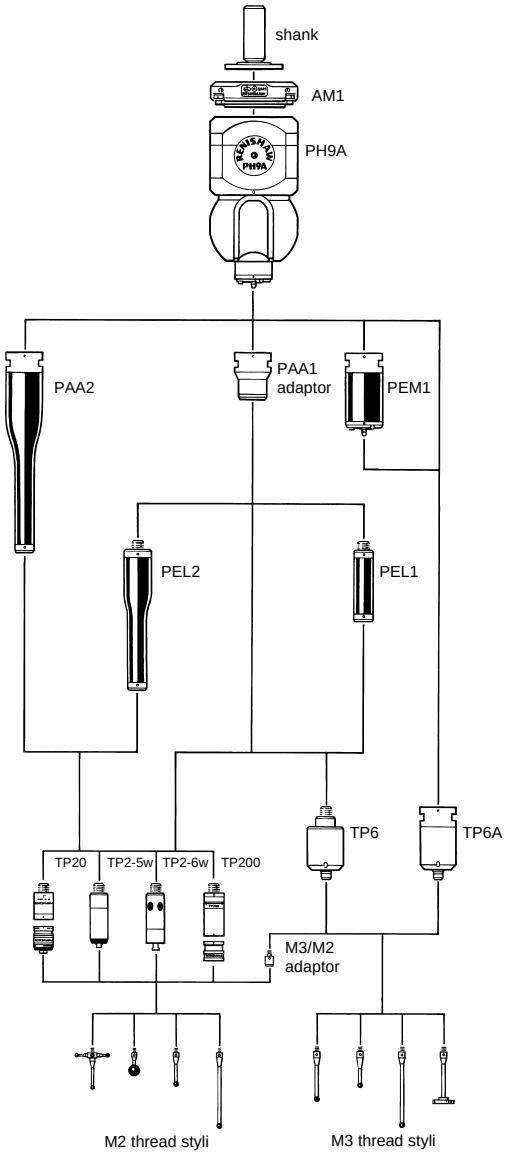
Figure 16 - Probes, extensions and accessories for PH9



3.2 Fitting probes, extensions and accessories *continued*

3.2.2 Probes, extensions and accessories for the PH9A

Figure 17 - Probes, extensions and accessories for PH9A



4.0 SYSTEM OPERATION

4.1 Using the PH9/9A inspection system

The system operates as follows:

The probe (often attached to an extension bar) is moved through the various angles to one of the 720 positions under CMM program control.

The PH9/9A locks both axes into position, and the CMM carries out a qualification routine for this specific position. This is repeated for all the required positions.

The system carries out the programmed inspection cycle without having to requalify any of the positions. This is because of the high repeatability factor (i.e. better than ±0.5µm at the stylus tip - see Section 6.0 for details).

An additional error of up to ±0.5µm is possible when probe/extension combinations are automatically exchanged during an inspection operation using the PH9A.

4.1 Using the PH9/9A inspection system *continued*

WARNING
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.

CAUTION
The PH9 and PH9A must only be used with PHC9 controller. Do not attempt to interact these systems with PH10M (PHC10-2) equipment as damage may occur and the warranty will be invalidated.

4.1.1 Checks

Once the system has been installed, check the following points:

1. Ensure that the correct connections and settings have been made.

2. Check that the PH9/9A probe head and the AM1 adjustment module are securely mounted.

Do not apply excessive force to any of the moving parts of the PH9 or PH9A probe head as this can cause excessive wear and/or internal damage.

Take care to avoid a probe head collision as this could cause severe damage to the head.

4.1 Using the PH9/9A inspection system *continued*

4.1.2 Power-up sequence

The order in which the various units (e.g. controller, interface etc) are switched on is not important.

The PHC9 controller initiates the following action on the PH9/9A when switched on:

1. If the PH9/9A is not locked up it will go to its nearest position and lock up.

2. If the PH9/9A is locked up and the system is in manual mode, position 0,0 will be displayed on the PHD10 probe head drive unit irrespective of the actual position of the probe head. If any of the direction buttons are pressed, the PH9/9A will first move to the 0,0 position but will not lock up. Only then will it move to the position requested by the PHD10 probe head drive unit.

3. If the PH9/9A is locked up and the system is in automatic mode, the PH9/9A will begin to move towards the 0,0 position, but before reaching that position, it will change direction and move to the position requested by the CMM program.

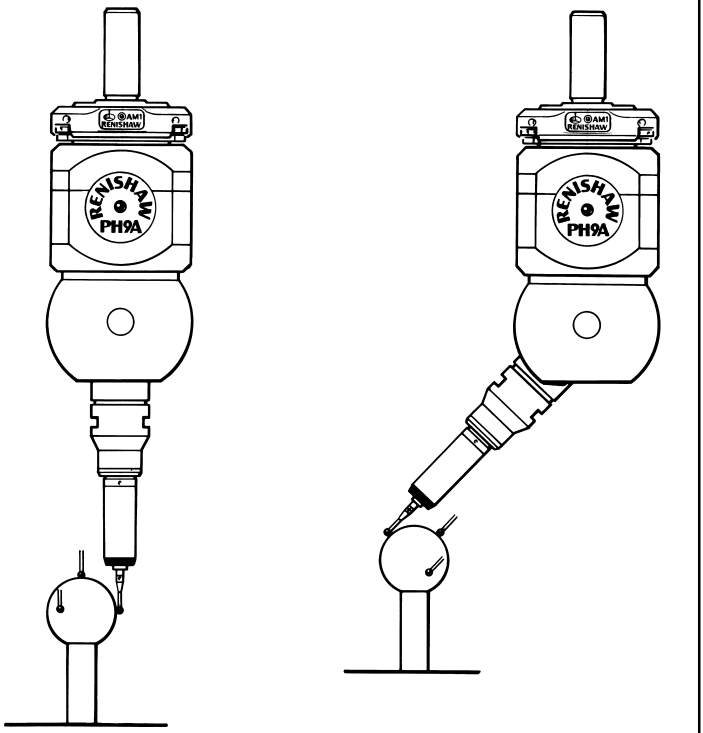
CAUTION
Renishaw recommend that the PH9/9A completes its program and is parked in the 0,0 position before switching off the power. This will prevent rapid movement of the PH9/9A when the system is switched on again.

4.1 Using the PH9/9A inspection system *continued*

4.1.3 Qualification

Qualify the stylus on a datum sphere (see Figure 18) for each of the probe orientations required. Store the qualification data in the CMM computer memory (note that for the PH9A each probe assembly to be used must be qualified).

Figure 18 - Qualification



4.1 Using the PH9/9A inspection system *continued*

4.1.4 Inspection

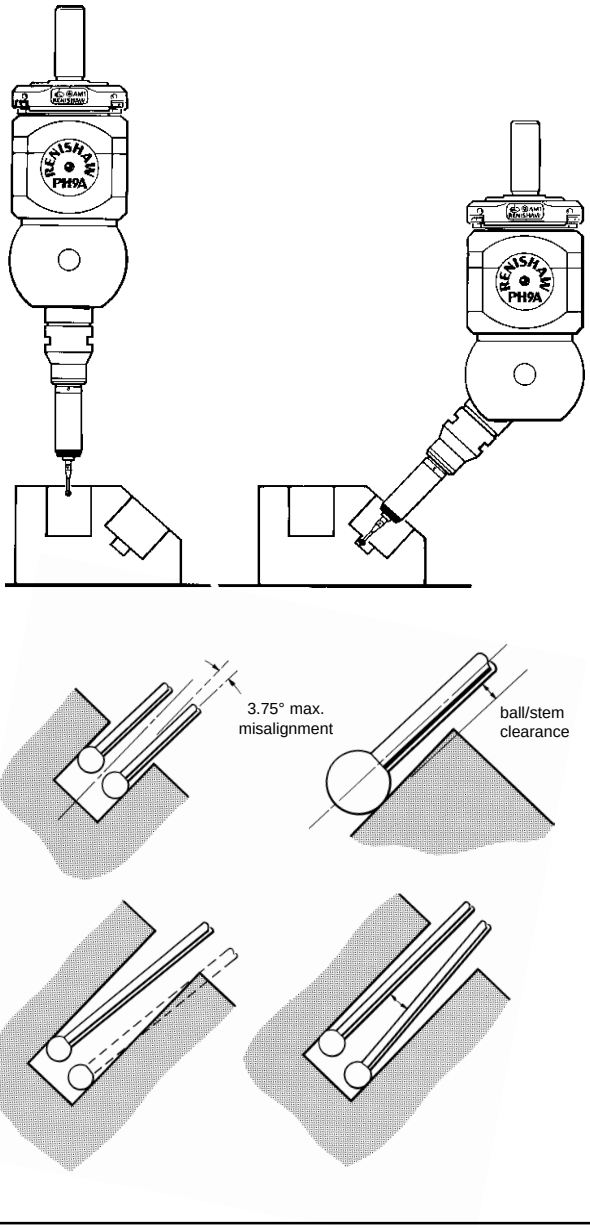
When inspecting the component, as each probe orientation is selected, the appropriate datum must be selected from the CMM computer memory. Inspection is continuous, without the need for repeated qualification cycles.

With the ability to orientate the probe in angular steps of 7.5°, holes or faces at any angle can be measured (see Figure 19). The maximum misalignment between stylus stem and component need only be 3.75°, and this is easily accommodated by the ball stem clearance.

If it is necessary to measure the diameter of a deep hole or slot, where the stem clearance is insufficient, rotate the probe head through a 7.5° step. This enables inspection of the opposite face. Alternatively, an AM1 adjustment module may be used to align the head/probe/stylus assembly to the feature, but the head may not be used with autochange rack.

4.1 Using the PH9/9A inspection system *continued*

Figure 19 - Inspection



4.2 Automatic mode

CAUTION
It is essential that the CMM is programmed so that measurements are not made during error conditions

Automatic mode is selected on power up unless the PHD10 probe head drive unit is fitted, in which case manual mode is selected.

In automatic mode the PHC9 controller and the PH9/9A probe head are under control of the CMM computer. The sequence of operation is as follows (see Figure 20):

1. Positional data for both the A and B axes is transmitted to the PHC9 controller from the CMM computer.

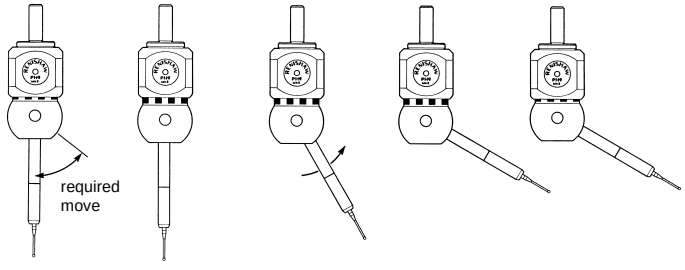
2. Positional update data is sent from the CMM computer to the PHC9 controller. This initiates a head move sequence. The Head Active LED is switched on and the Head Ready LED switched off.

3. The PH9/9A unlocks, rotates to the required position in both the A and B axes and locks in the required position.

4. A Status signal is sent to the CMM computer from the PHC9 controller indicating that the move sequence is complete.

5. The Head Ready LED is switched on and the Head Active LED is switched off.

Figure 20 - Automatic mode sequence

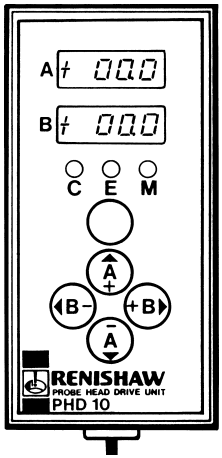


The Status signal sent will contain information indicating any error which occurred during the head move. The type of error is shown on the front panel of the PHC9 controller (i.e. Datum Error, Obstruct Error or Overload Error).

4.3 Manual mode

The PHD10 probe head drive unit (see Figure 21) is used to control the probe head manually. It is plugged into the back of the PHC9 controller. If a PHD10 is fitted, the system starts up in manual mode.

Figure 21 - PHD10 probe head drive unit



4.3.1 Displays

The two LED displays marked A and B show the angular position of the PH9/9A probe head in the A and B axes respectively.

The three LED indicators show the following when on:

C The probe head move sequence is **Complete**

E An **Error** has occurred during the probe head move sequence (errors are shown on the front of the PHC9 controller)

M The system is operating in **Manual** mode

4.3 Manual mode *continued*

4.3.2 Buttons

There are five buttons on the PHD10 probe head drive unit. The A and B buttons move the probe up (+A), down (-A), left (-B) and right (+B).

The T (Transmit) button is used to send a signal to the CMM computer. The response to this depends on the CMM computer program (e.g., when the operator is 'teaching' the CMM computer a sequence of positions to follow, the T button can be pressed to signal that a required position has been reached).

When the T button is pressed the display momentarily goes blank. This confirms that the instruction code has been successfully transmitted (see PH9 and PH9A Installation and Programming Guide, Part No. H-1000-5065, for details of instruction codes).

WARNING

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.

To move the probe head in single steps:

- Momentarily press the direction button (A or B) which corresponds to the 7.5° step required.
- The head unlocks, rotates 7.5° in the axis and direction chosen and locks up again.

To move the probe head rapidly:

- Press and hold the direction button (A or B) which corresponds to the axis and direction required.
- The head unlocks, moves one 7.5° step and after a short delay rotates at rapid speed in the direction required until either the button is released or the limit of rotation is reached.
- Once the button has been released and rotation has stopped, there is a short delay while the head locks up.

4.4 PHC9 probe head controller

4.4.1 PHC9 enclosure

The PHC9 controller is housed in a standard 19" rack mount enclosure, 2U high by 2/3 wide. Its dimensions are as shown in Table 1 below:

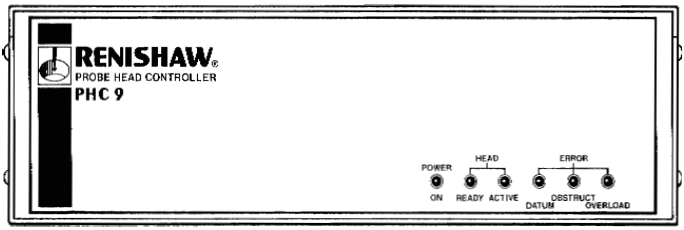
Table 1 - Probe controller dimensions	
Width	290mm (11.42")
Height	88mm (3.46")
Depth	220mm (8.66")

The PHC9 controller transmits move information between the CMM computer and the PH9/9A probe head. It also monitors error information from the head.

4.4.2 PHC9 front panel

The front panel appears as shown in Figure 22 below.

Figure 22 - PHC9 front panel



4.4 PHC9 probe head controller *continued*

The LEDs on the front panel comply with the current international standards and follow the scheme shown in Table 2 below:

Table 2 - PHC9 controller LEDs

Title	Colour	Function
POWER	Green	Power on when illuminated
HEAD READY	Green	PH9 head is correctly locked and is waiting for further instructions
HEAD ACTIVE	Yellow	PH9 head is moving
DATUM ERROR	Red	PH9 head has not locked up to the expected level of accuracy
OBSTRUCT ERROR	Red	The head has been obstructed while moving to the required position
OVERLOAD ERROR	Red	The head/probe configuration has been overloaded whilst locked

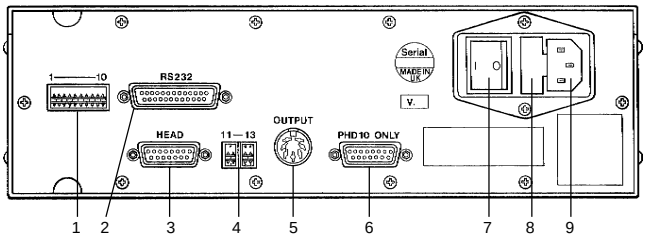
Under normal operating conditions, the HEAD READY LED will be on when the head is locked and there are no errors. When the PH9/9A moves, the HEAD READY LED is switched off and the HEAD ACTIVE LED will be on until the head is locked at the end of the cycle.

4.4 PHC9 probe head controller *continued*

4.4.3 PHC9 rear panel (RS232 serial communications)

The rear panel for RS232 serial communications appears as shown in Figure 23 below:

Figure 23 - PHC9 rear panel (RS232)



Key

1 DIL switch bank, switches 1 to 10
2 25-way D-type RS232 connector to CMM computer
3 15-way D-type socket to PH9/9A probe head
4 DIL switch bank, switches 11 and 12
5 7 pin DIN output connector to probe interface
6 15-way D-type connector to PHD10
7 Mains power on/off switch
8 Fuse holder
9 Mains power IEC socket

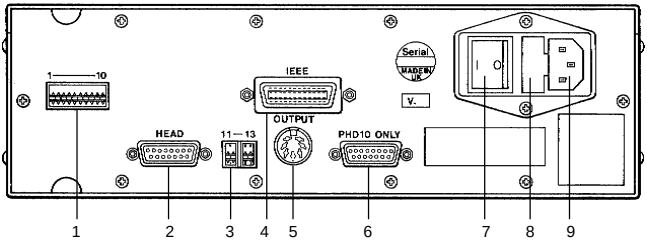
See the PH9 and PH9A Installation and Programmers Guide (Part No. H-1000-5065) for more details.

4.4 PHC9 probe head controller *continued*

4.4.4 PHC9 rear panel (IEEE parallel communications)

The rear panel for IEEE parallel communications appears as shown in Figure 24 below:

Figure 24 - PHC9 rear panel (IEEE)



Key

1 DIL switch bank, switches 1 to 10
2 15-way D-type socket to PH9/9A probe head
3 DIL switch bank, switches 11 and 12
4 24-way D-type IEEE interface connector to CMM computer
5 7 pin DIN output connector to probe interface
6 15-way D-type connector to PHD10
7 Mains power on/off switch
8 Fuse holder
9 Mains power IEC socket

See the PH9 and PH9A Installation and Programmers Guide (Part No. H-1000-5065) for more details.

4.4 PHC probe head controller *continued*

4.4.5 PHC9 physical installation

The PHC9 controller can be mounted either as a stand-alone unit or in a standard 19" rack in a number of combinations.

Stand alone

Four self-adhesive rubber feet are supplied with the PHC9 for stand alone mounting.

Rack mounting

Several connector bracket kits are available to mount the PHC9 in a 19" rack installation (see Table 3).

Table 3 - Mounting kits

Description	Connects		Part number
Rack mount bracket kit	PHC9, PI 200	Rack	A-1018-0124
1/3 blanking panel kit	PHC9, PI 200	Rack	A-1018-0123
Enclosure link bracket kit	PHC9	PI 200	A-1018-0126
Enclosure link bracket kit	PHC9 PI 200	PI 12 PHC10, ACC2	A-1018-0125

Each mounting kit includes screws to fix the brackets to the Renishaw units.

4.4 PHC9 probe head controller *continued*

Connectors

For EMC reasons, screw jacks are used instead of spring clips on all connectors. Table 4 shows the kits available from Renishaw to convert cable back shells with spring clip fastenings to screw jacks where necessary.

Table 4 - Connections

Connector type	Connection	Part number	Notes
15-way D-type	PH9 probe head	P-CX03-2002	Maximum cable diameter 6.5mm. Order bush P-BG12-0004 separately for cables up to 8mm diameter.
25-way D-type PHC9	RS232 CMM comms	P-CX03-2003	Maximum cable diameter 9mm. Included in RS232 kit.

Power supply and fuses

See SAFETY section.

4.4 PHC9 probe head controller *continued*

4.4.6 Upgrading from an old style PHC9

The following information is included for users wishing to exchange their old style PHC9 for a unit of the new standard.

Physical mounting

The new PHC9 has different dimensions and different means of mounting. This must be taken into account and will vary depending on the particular installation (see Sections 4.4.1 and 4.4.5 for further details).

Connections

All connections are compatible between the old and new PHC9 with the exception of the probe head drive unit. See Section 4.4.5 for further details.

Probe head drive unit

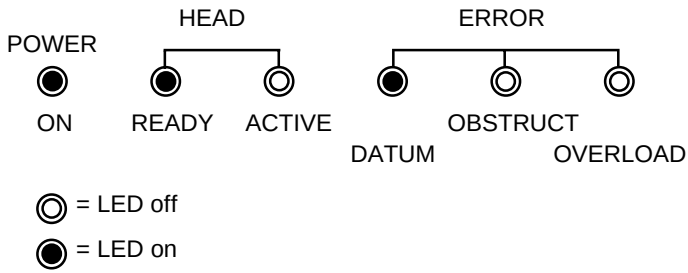
The PHD9 has been replaced by the PHD10 (see Section 4.3 for further details).

4.5 Operating errors

Errors are identified by the illuminated LEDs on the front panel of the PHC9 controller.

4.5.1 Datum error

Figure 25 - Datum error



Cause

The probe head has rotated to the required position and locked up but not to the usual, precise level of repeatability. (Note that the probe head will attempt to lock twice before showing an error condition).

Possible fault

1 The probe head, probe or stylus have been partially obstructed.
2 The extension bar is too long.
3 There is an internal head fault.

Recovery

1 Remove any obstruction and then press a PHD10 axis move button briefly (if in manual mode) to update the PHC9 controller.
2 Use a shorter extension bar.
3 If there appears to be a fault within the probe head, contact your Renishaw dealer or distributor.

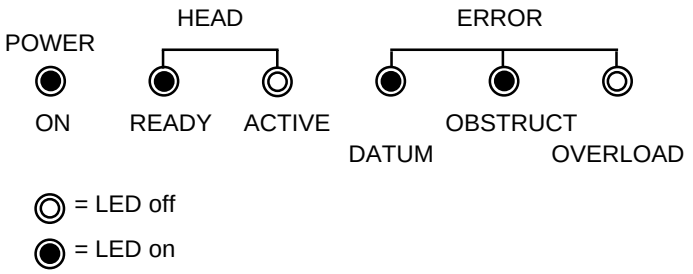
System action

The probe head locks in its original position and the error LED is cleared.

4.5 Operating errors *continued*

4.5.2 Obstruct error

Figure 26 - Obstruct error



Cause

The head is unable to rotate to the requested position OR is unable to lock up into position.

Possible fault

1 Probe collision with workpiece.
2 Extension bar is too long.
3 Internal head fault.

Recovery

1 Remove any obstruction and then press a PHD10 axis move button briefly (if in manual mode) to update the PHC9 controller. Inspect the probe head for damage.
2 Use a shorter extension bar.
3 If there appears to be a fault within the probe head, contact your Renishaw dealer or distributor.

System action

The head rotates to the requested position, locks up and clears the error LED.

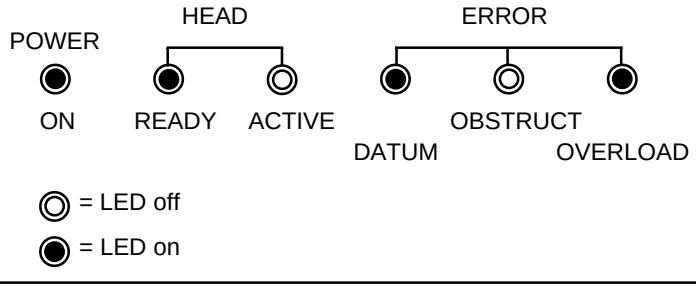
Notes

This type of error only occurs while the head is rotating into position OR attempting to lock into its target position.

4.5 Operating errors *continued*

4.5.3 Overload error

Figure 27 - Overload error



Cause

Excessive force has been applied to either the extension bar, or the probe or the lower half of the PH9/9A probe head, when in a locked position.

Possible fault

1 Excessive measuring machine acceleration.
2 Extension bar is too long.
3 Collision while machine is moving.

Recovery

1 Reduce acceleration of machine.
2 Use a shorter extension bar.
3 Remove any obstruction and then press a PHD10 axis move button briefly (if in manual mode) to update the PHC9 controller. Check head operates correctly.

System action

The head returns to the last requested position, locks up and clears the error LED.

Notes

This type of error only occurs when the head is locked.

4.6 Trouble-shooting

Tables 5 and 6 will help with identification of system problems.

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

Table 5 - Error diagnosis

HEAD STATUS	PHC9 LEDs: POWER	HEAD READY	HEAD ACTIVE	DATUM ERROR	OBSTRUCT ERROR	OVERLOAD	CAUSE	ACTION
No head movement	○	○	○	○	○	○	No mains power	Apply power
							PHC9 not switched on	Switch PHC9 on
							Mains fuse faulty	Check fuse and replace if necessary (see SAFETY)
							CMM EMERGENCY STOP condition	Clear EMERGENCY STOP on CMM (power should return)
	●	○	○	○	○	○	Internal PHC9 fault	Return PHC9 to Renishaw
	●	○	○	●	○	○	PH9 not connected	Check that the Tuchel connector is plugged into the PHC9. Check that the Lemo connector (if fitted) is secure to the quill. Check that the 15-way D connector is secure to the PHC9.
							Internal PHC9 fault	Return PHC9 to Renishaw
No head movement Head unlocked	●	○	○	○	●	○	External obstruction	Remove obstruction and update PH9 position
							Machine wiring faulty	Contact machine supplier
	●	○	○	●	○	○	Continual head datum fault (normal after a collision)	Check that the Tuchel connector is plugged into the PHC9. Check that the Lemo connector (if fitted) is secure to the quill. Check that the 15 way D connector is secure to the PHC9.
							Internal PH9 fault	Update PH9 position. If fault persists return PH9 to Renishaw.

○ = LED OFF
● = LED ON

Table 6 - Error diagnosis *continued*

INSTRUCTION	PHC9 LEDs						HEAD ACTIONS						FAULT	ACTION
	POWER	HEAD READY	HEAD ACTIVE	DATUM ERROR	OBSTRUCT ERROR	OVERLOAD	UNLOCK	MOVE	REACH POSITION	LOCK	REPEAT LOCK	IMMEDIATE UNLOCK		
Instruct move	●	○	○	●	○	○	✓	✓	✓	✓	✓		PH9 datum error	If fault persists return PH9 to Renishaw
	●	○	○	●	●	○	✓	✓	✓				PH9 lock circuit fault PH9 mis-calibration PHC9 mis-calibration	Return PH9 to Renishaw Return PH9 to Renishaw Return PHC9 to Renishaw
													Machine wiring loom fault	Contact machine supplier
	●	○	○	●	○	●	✓	✓	✓	✓	✓		PH9 datum circuit fault PHC9 datum circuit fault	Return PH9 to Renishaw Return PHC9 to Renishaw
													Machine wiring loom fault	Contact machine supplier
Instruct single axis move A0° to A105°	●	○	○	●	○	○	✓	✓					PH9 clutch slipping	Check that correct extension bar is fitted (see Section 3.2)
	●	○	○	●	●	○	✓						Internal PH9 failure	Return PH9 to Renishaw
Instruct two axes move	●	○	○	●	●	○	✓ ONE AXIS						PH9 motor drive fault	Return PH9 to Renishaw
													PH9 axis motor fault Machine wiring loom fault	Return PH9 to Renishaw Contact machine supplier

○ = LED OFF

● = LED ON

5.0 MAINTENANCE

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

Remove power before performing any maintenance operations.

Refer to the machine supplier's operating instructions.

5.1 Fuses

One fuse is fitted to the PHC9. Use only a 2A (T) HBC 20mm x 5mm, rating as IEC 127 as replacement (see SAFETY).

5.2 Cleaning

The PH9/9A and the PHC9 may be cleaned with a dry cloth.

6.0 PROBE HEAD SPECIFICATIONS

6.1 PH9 specification

Figure 28 - PH9 dimensions

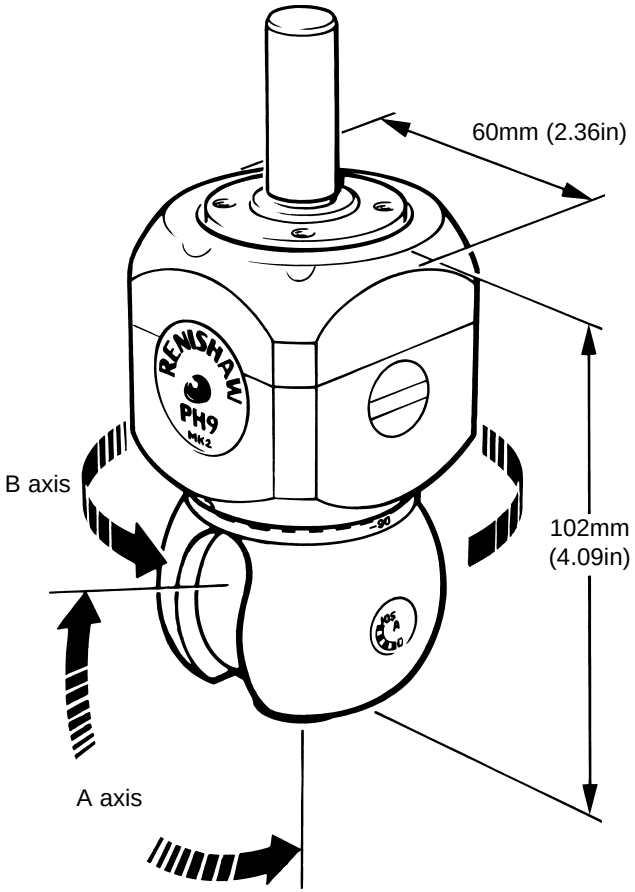


Table 7 - PH9 probe head specification		
Probe mounting	M8 thread, 18mm (0.709in) diameter bush face	
Probe Status Indicator	LED	
Repeatability of position	±0.5µm (±0.00002in)	using TP2 probe and PS1R stylus
Accuracy of step spacing from theoretical position	±0.3mm (±0.012in)	
Maximum cycle time: 7.5° step 90° step 360° step	 2.5 seconds 3.5 seconds 5.5 seconds	
Total angular movement: A Axis B Axis	 105° to 0° in 7.5° steps = 15 positions ±180° in 7.5° steps = 48 positions	
Total number of positions	720	
Mechanical stops: A Axis B Axis	 +108°, -10° ±190°	
Maximum extension length: TP2/TP20 TP6	 200mm (7.9in) using PEL3 extension 100mm (3.9in) using PEL2 extension	
Maximum recommended drive torque	0.14Nm	
Electrical connection	Dedicated 14-pin plug	
Weight	645gms (22.7oz) maximum	
Operating temperature	+10°C to +40°C	
Storage temperature $_{\text{locked}}$	-10°C to +70°C	

6.2 PH9A specification

Figure 29 - PH9A dimensions

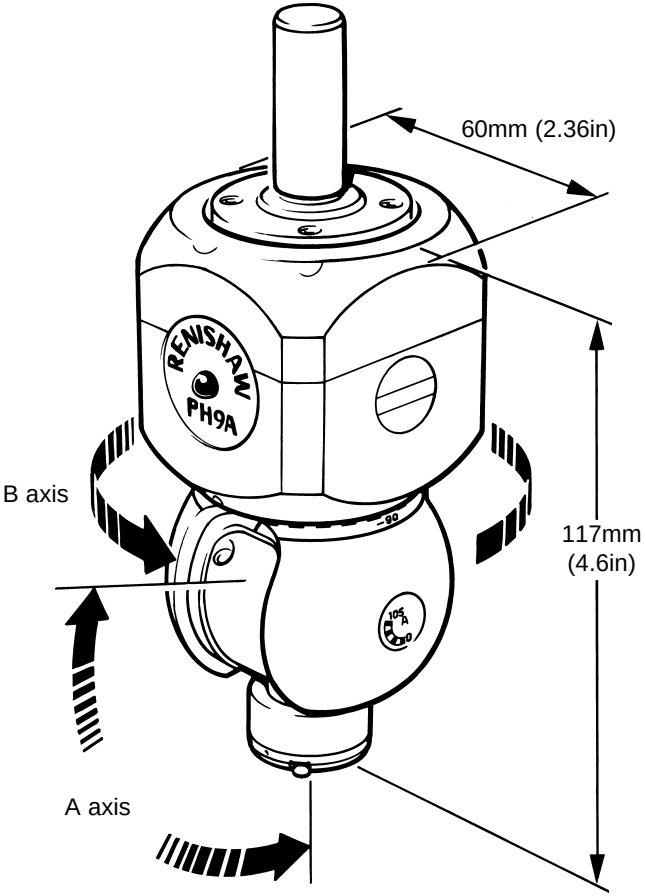


Table 8 - PH9A probe head specification		
Probe mounting	25mm diameter autojoint	
Probe Status Indicator	LED	
Repeatability of position	±0.5µm (±0.00002in)	using TP6A probe and PS1-11R stylus
Accuracy of step spacing from theoretical position	±0.3mm (±0.012in)	
Maximum cycle time: 7.5° step 90° step 360° step	 2.5 seconds 3.5 seconds 5.5 seconds	
Total angular movement: A Axis B Axis	 105° to 0° in 7.5° steps = 15 positions ±180° in 7.5° steps = 48 positions	
Total number of positions	720	
Mechanical stops: A Axis B Axis	 +108°, -10° ±190°	
Maximum extension length (TP2)	140mm (5.51in) using PAA2 extension	
Maximum recommended drive torque	0.14Nm	
Electrical connection	Dedicated 14-pin plug	
Weight	660gms (23.2oz) maximum	
Operating temperature	+10°C to +40°C	
Storage temperature	-10°C to +70°C	

Renishaw plc, New Mills, Wotton-under-Edge,
Gloucestershire GL12 8JR, **United Kingdom**.

International	**Tel**	+44 1453 524524	**Fax**	+44 1453 524901
National	**Tel**	01453 524524		[07000 RENISHAW]
	Fax	01453 524901	**Telex**	437120 RENMET G

email genenq@renishaw.co.uk **Internet** http://www.renishaw.com

Renishaw Inc,
623 Cooper Court, Schaumburg,
Illinois 60173, **U.S.A.**
Tel +1 847 843 3666
Fax +1 847 843 1744

Renishaw GmbH,
Karl-Benz Strasse 12,
72124 Pliezhausen, **Germany.**
Tel +49 712 797960
Fax +49 712 788237

Renishaw S.p.A.,
Via dei Prati 5,
10044 Pianezza, Torino,
Italy.
Tel +39 011 9 66 10 52
Fax +39 011 9 66 40 83

Renishaw S.A.,
15 rue Albert Einstein,
Champs sur Marne,
77437 Marne la Vallée,
Cedex 2, **France.**
Tel +33 1 64 61 84 84
Fax +33 1 64 61 65 26

Renishaw A.G.,
Poststrasse 5,
CH 8808 Pfäffikon,
Switzerland.
Tel +41 55 410 66 66
Fax +41 55 410 66 69

Renishaw KK, 6F & 7F Anzai Building,
1 - 12, Hatagaya, 1-chome
Shibuya-ku, Tokyo 151-0072, **Japan.**
Tel +81 3 5350 2201
Fax +81 3 5350 2207

Renishaw Iberica S.A. Edificio Océano,
Calle Garrotxa 10-12, Parque Más Blau,
08820 Prat de LLobregat, Barcelona, **Spain.**
Tel +34 93 478 21 31
Fax +34 93 478 16 08

Renishaw Latino Americana Ltda.,
Calçada dos Crisântemos 22, C.C. Alphaville,
Ce.p. 06453-000, Barueri SP, **Brazil.**
Tel +55 11 7295 2866
Fax +55 11 7295 1641

Renishaw (Hong Kong) Ltd., Unit 4A, 3/F,
New Bright Building, 11 Sheung Yuet Road,
Kowloon Bay, **Hong Kong.**
Tel +852 2753 0638
Fax +852 2756 8786

Renishaw's Representative Offices:

The People's Republic of China
Beijing. **Tel** +86 10 6410 7993
Fax +86 10 6410 7992

Singapore **Tel** +65 897 5466
Fax +65 897 5467

Indonesia **Tel** +62 21 428 70153
Jakarta. **Fax** +62 21 424 3934

Renishaw's Liaison Office:

India **Tel** +91 80 509 5419
Bangalore **Fax** +91 80 509 5421

Part No. H-1000-5062-05-A
Ref. UG PH9/PH9A (E) 5c 299

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