PH10 PLUS motorised probe head range

PH10 PLUS

The range of PH10 PLUS motorised probe heads increases throughput by giving automated CMMs the added capability of program controlled probe reorientation. This enables the inspection of features at different angles without the need for frequent, time consuming stylus cluster changes.

PH10 PLUS heads are compatible with a range of both contact and non-contact scanning sensors and touch-trigger probes, allowing the size and form of critical features to be determined.

When used in conjunction with the PH10M PLUS or PH10MQ PLUS, Renishaw's autochange systems provide fast, repeatable probe and extension bar exchange, without the need for re-qualification of the stylus tip, helping to maximise productivity.

Since 1988 the PH10 heads have been installed on thousands of co-ordinate measuring machines and Renishaw has engaged on a continuous development program resulting in several important enhancements through the product's history including:

- Significant mechanical design improvements
- Improved repeatability and long term stability
- LED replaced with light guide (red when powered on and white when off)
- Ability to store usage history for subsequent analysis
- 2 year warranty as standard.

Key benefits

Accuracy
Repeatability specification is a market leading 0.4 µm at a 100 mm radius from the centre of rotation of the axis, providing accurate positioning even when using long extensions.

Increased throughput
The PH10's ability to index automatically reduces the number of stylus changes required, thereby increasing the throughput of your CMM. Indexing is faster than stylus changing.

Increased reach and flexibility
Extension bars up to 450 mm long, together with the full range of Renishaw autojoint and M8 probes, can be used with the appropriate head types.

Innovations

Repeatable kinematic location
The PH10 PLUS uses a six point kinematic location for each of its 720 indexable positions, making its locking mechanism the most repeatable on the market.

The Renishaw autojoint
This industry standard feature allows repeatable automated probe exchange without the need for stylus requalification.

UCC compatibility
The PH10 PLUS can be used in conjunction with Renishaw's UCC controller family, providing a comprehensive retrofit solution for all types of CMM.

Specification

Head type	PH10MQ PLUS	PH10M PLUS	PH10T PLUS
Weight	730 g (25.7 oz)	645 g (22.07 oz)	
CMM mounting	Direct to quill	Shank	
Probe mounting	Renishaw autojoint (multiwired) M8 threaded probes can be used with PH10MQ/M PLUS via PAA probe adaptor		M8 thread
Head controller	PHC10-3 PLUS, UCC T3 PLUS or UCC S3		
Repeatability of position	0.4 µm (0.00002 in) specified at a distance of 100 mm (3.94 in) from the A-axis centre of rotation		
Cycle time: 7.5° move 90° move	2.5 seconds 3.5 seconds		
Total angular movement: A axis B axis	0° to 105° in 7.5 steps 0° to ±180° in 7.5 steps		
Total number of positions	720		
Maximum drive output torque	0.45 Nm		
Maximum extension bar	300 mm (11.8 in) using PAA3 probe adaptor 450 mm (17.7 in) using PAACF special order only extension		300 mm (11.8 in) using PEL4 extension
Temperature range Operating Storage	10 °C to 40 °C (50 °F to 104 °F) -10 °C to 70 °C (14 °F to 158 °F)		
Joystick options	HCU1 or MCUlite-2, MCU5 or MCU W		
Warranty	2 years		

PH10M PLUS

62 mm (2.44 in)

B axis

117 mm (4.6 in)

A axis

38 mm (1.5 in)

PH10T PLUS

62 mm (2.44 in)

B axis

102 mm (4.0 in)

A axis

25 mm (0.98 in)

PH10MQ PLUS

34 mm (1.34 in)

10 mm (0.39 in)

70.5 mm (2.78 in) square

B axis

80 mm (3.12 in) square

73 mm (2.87 in)

A axis

38 mm (1.5 in)
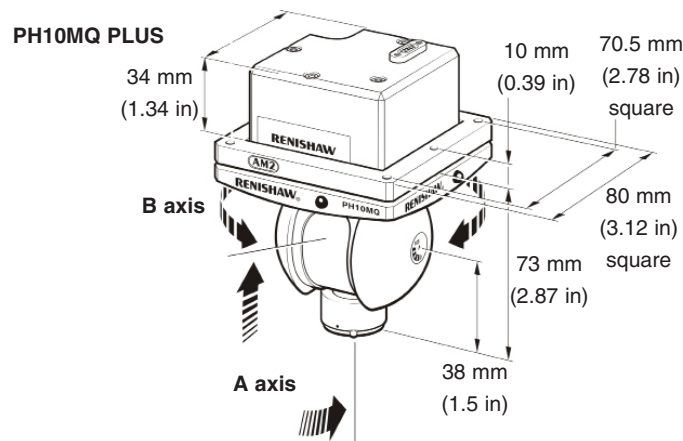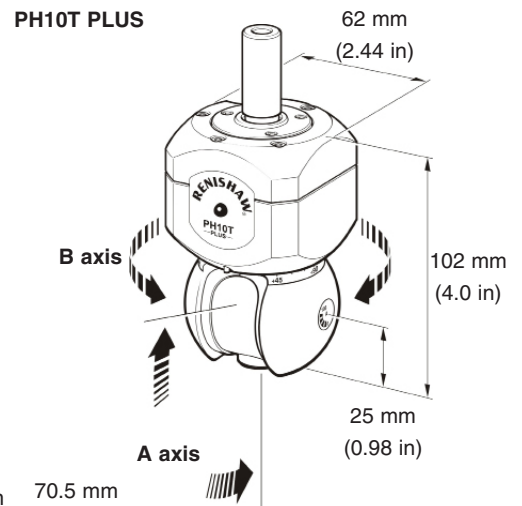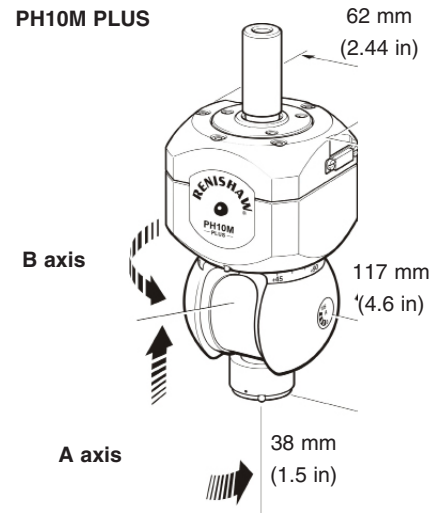
PH10M-iQ PLUS

Less time calibrating, more time measuring

PH10M-iQ PLUS offers all the benefits of a traditional PH10M PLUS but with the addition of inferred qualification. This further demonstrates Renishaw's commitment to continuous product development.

PH10M-iQ PLUS increases throughput by removing the need to qualify each head position that is used. This allows more time to be spent measuring.

Following an initial head localisation, a simple qualification procedure of as few as three positions allows the user to operate PH10M-iQ PLUS in every orientation possible without requalifying.

Innovations

Two heads in one

PH10M-iQ PLUS provides all the functionality of Renishaw's industry standard PH10M PLUS but with the addition of inferred qualification for touch-trigger probing routines.

Where an application or specific angle demands ultimate touch-trigger accuracy then PH10M-iQ PLUS can be qualified in the same way as a standard PH10M PLUS.

Fine tune your performance

PH10M-iQ PLUS must perform a simple qualification procedure before inferred mode can be used, after which any head position can be used for measurement without having to requalify.

Depending on your metrology requirements you can optimise the accuracy of your system by increasing the number of qualification positions during probe qualification.

Machine type	Mounting orientation	Qualification positions	P_{LTi} - Typical positional span*
		3	95 µm
		8	125 µm
		12	80 µm
		18	65 µm
		3	15 µm

Horizontal arm machine specification

Using a PAA3 300 mm extension bar, standard force TP20 module, 10 mm x 4 mm diameter stylus on a machine with the following specification;

MPEe = ± (9 + L / 100) µm (L in mm)
ISO 10360-2 (2009)

Bridge machine specification

Using a PAA1 adaptor, standard force TP20 module, 10 mm x 4 mm diameter stylus on a machine with the following specification;
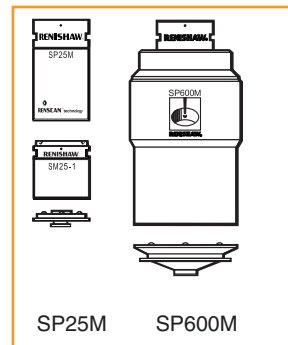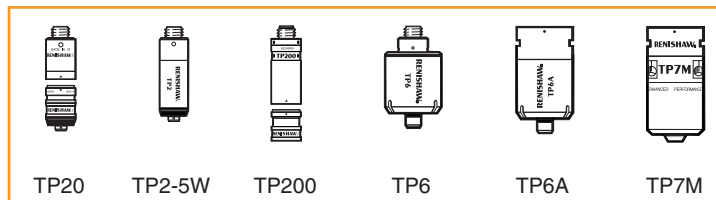
MPEe = ± (1 + L / 750) µm (L in mm)
ISO 10360-2 (2009)

*Positional span of sphere location (P_{LTi}) evaluated as per ISO 10360-5 (2010) but covering all 720 head positions

Compatibility

Renishaw's complete range of PH10M PLUS compatible probes are also compatible with PH10M-iQ PLUS. However, the added functionality of inferred qualification can only be used with touch-trigger probes.

TP20, TP2-5W, TP200, TP6, TP6A and TP7M touch-trigger probes can be used in traditional PH10 mode or can utilise inferred qualification; whereas SP25M and SP600M scanning probes can only be used in traditional PH10 mode and cannot utilise inferred qualification.

| TP20 | TP2-5W | TP200 | TP6 | TP6A | TP7M |

| SP25M | SP600M |

Specification

Head	PH10M-iQ PLUS
Length	117 mm (4.60 in)
Width	62 mm (2.44 in)
Weight	645 g (22.07 oz)
Mounting	Shank
Probe mount	Renishaw Autojoint (multiwire) M8 threaded probes can be used with a PAA probe adaptor
Controller	PHC10-3 PLUS
Repeatability	0.4 µm (2σ 0.00002 in) specified at a distance of 62 mm (2.44 in) from the A-axis centre of rotation
Angular movement	A-axis 0° to 105° in 7.5° steps B-axis -180° to 180° in 7.5° steps
Total number of positions	720 positions
Maximum drive output torque	0.45 Nm
Maximum extension bar	300 mm (11.8 in) using PAA3 probe adaptor	300 mm (11.8 in) using PEL4 extension
	450 mm (17.7 in) using PAACF special order only extension	
Temperature range Operating Storage	10 °C to 40 °C (50 °F to 104 °F) -10 °C to 70 °C (14 °F to 158 °F)
Head control unit	HCU1 or MCU*lite*-2, MCU5 or MCU W
Warranty	2 years

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AM2 adjustment module

The AM2 adjustment module is designed to provide quick and accurate angular alignment of the PH10MQ PLUS motorised probe head with the axes of the co-ordinate measuring machine and / or the autochange rack.

The AM2 consists of an adjuster plate, which is attached to the quill of the CMM, and a set of adjusters fitted to the flange of the head.

The head is fixed to the adjuster plate by a pair of captive screws.

The AM2 module provides a highly repeatable mounting, allowing a head to be removed and replaced without the need for further adjustment.

Because all adjustable parts remain with the head on removal, more than one head can be set up for use on the same machine. Therefore, the time taken to exchange heads is minimised.

This module does not provide overtravel protection.

Figure 1 - The AM2 fitted with a PH10MQ PLUS motorised probe head

Installation

The AM2 can be supplied already assembled on the head. Installation requires a 2.5 mm hexagon key and four suitable cap screws to attach the adjuster plate to the quill of the CMM. These will usually be M3 (refer to figures 2 and 3).

1. Unscrew the two securing screws (D) to release the adjuster plate from the head. Attach plate to the CMM quill using four suitable cap screws, ensuring correct orientation. Tighten screws.

2. Offer head up to quill and plug in head and multiwire cables as appropriate. While ensuring that balls of AM2 adjusters engage the seatings on the adjuster plate, tighten the securing screws.

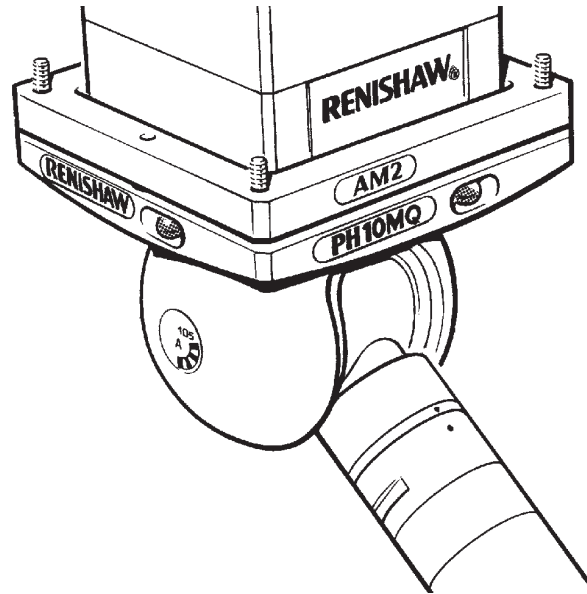**NOTE:** Springs under the heads of the screws allow a controlled load to be applied.

Adjustment

The three axes of adjustment are defined with the head mounted vertically, viewed from the front:

Roll - about an axis running front to back

Pitch - about an axis running left to right

Yaw - about the vertical axis

A special tool, consisting of a concentric hexagon key and socket spanner is supplied (A-1036-0010). This should be located on the adjusters and locknuts recessed into the face of the head mounting flange.

NOTE: Springs are fitted under the adjuster locknuts to provide some preload during setup.

The correct procedure is:

a. Slacken the locknut slightly using the outer part of the tool.

b. Set the adjuster using the inner part of the tool.

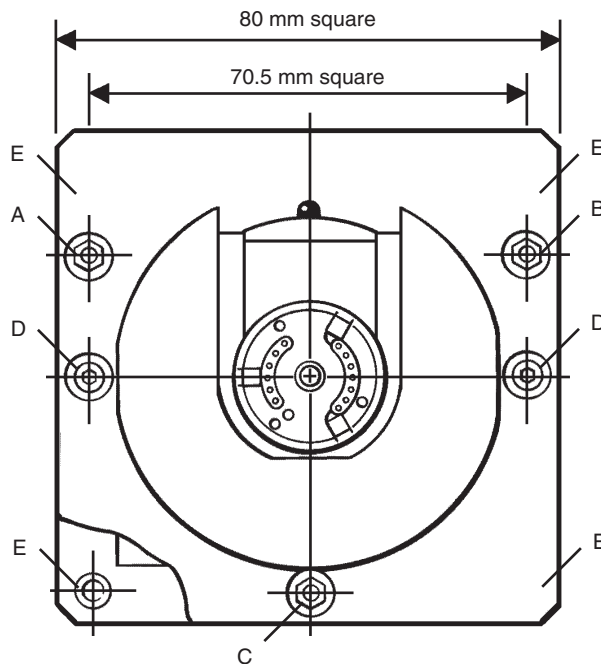c. While holding the adjuster stationary, tighten the locknut.

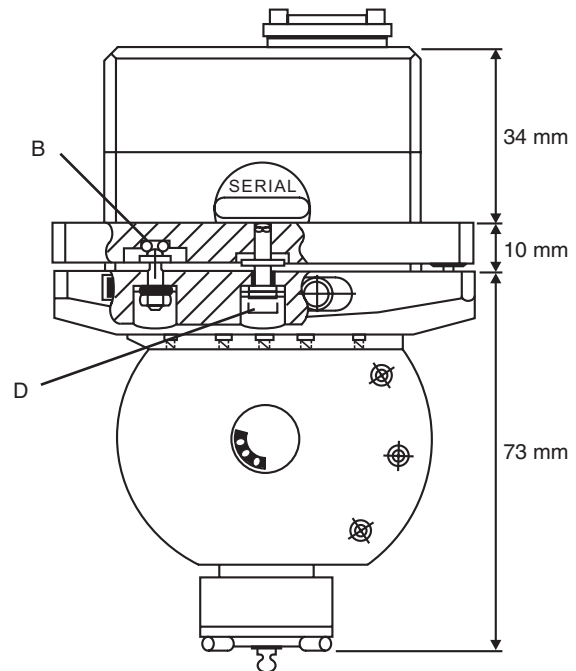**Figure 2 -** View from below the PH10MQ PLUS and AM2 attached to quill

Figure 3 - View from the side

The cut-away section shows the positions of the adjusting screws and the mounting screws.

NOTE: All dimensions are nominal.

A Yaw adjustment screw

B Roll adjustment screw

C Pitch adjustment screw

D Securing screw

E "AM2 to quill" mounting screws

NOTE: As settings are changed, the tension on the two securing screws may have to be altered. Always check that all three adjuster balls are in firm contact with their seatings.

The order of setting is as follows:

1. Roll - alterations of up to ±1° are possible using the right hand adjuster (this will introduce a small pitch error).

2. Pitch - alterations of up to ±1° are possible using the rear adjuster.

3. Yaw - alterations of up to ±1° are possible using the left had adjuster.

When all adjustments have been carried out, make sure all securing screws are tightened.

The head can now be removed at any time by releasing the securing screws and will not require further adjustment when replaced.

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Ярославль (4852)69-52-93

Россия +7(495)268-04-70   **Казахстан** +7(7172)727-132   **Киргизия** +996(312)96-26-47

https://renishaw.nt-rt.ru/ || rwe@nt-rt.ru