

PHC10-3 PLUS installation guide

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PHC10-3 PLUS installation guide

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

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To aid end user recycling and disposal the materials used in the different components of the packaging are stated here:

Packaging component	Material	94/62/EC code	94/62/EC number
Outer box	Corrugated fibreboard	PAP	20
Packing foam	Cross-linked Polyethylene	LDPE	4
Bag	Low density Polyethylene	LDPE	4

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EU declaration of conformity

Contact Renishaw plc or visit www.renishaw.com/productcompliance for the full EU declaration.

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FCC (USA only)

Information to user (47CFR 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 (47CFR 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.

Equipment label (47CFR section 15.19)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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Safety

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. There are no user serviceable parts inside the equipment.

The PHC10-3 head controller is to be used with the provided PSU - Emerson DP4024N3M. See manufacturer's datasheet at www.emerson.com.

PSU electrical ratings	
Supply voltage	100 V - 240 Vac +10% -10%
Frequency range	50 Hz to 60 Hz
Power consumption	49 W max
Transient voltages	Installation category II

PHC10-3 is isolated from ac power by disconnection of the IEC mains connector from the supplied PSU. If any additional means of isolation is required, it must be specified and fitted by the machine manufacturer or installer of the product. The isolator / disconnection device must be sited within easy reach of the operator and comply with any applicable national wiring regulations for the country of installation.

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Environmental conditions

The following environmental conditions comply with those defined in BS EN61010 - 1:2001:

Indoor use	IP30 (no protection against water)
Altitude	Up to 2000 m
Operating temperature	0 °C to +50 °C
Storage temperature	-10 °C to +70 °C
Relative humidity	80% maximum for temperatures up to +31 °C Linear decrease to 50% at +50 °C
Pollution degree	2

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References and associated documents

Title	Document number
User's guide: Touch-trigger probes	H-1000-5021
User's guide: SP25M	H-1000-5104
User's guide: HCU2	H-1000-5631
User's guide: AM1	H-1000-4010
Data sheet: AM2	H-1000-2051
Technical specification: Styli and accessories	H-1000-3200
Installation guide: PICS	H-1000-5000
Installation and user's guide: PH10 PLUS	H-1000-7592

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Introduction

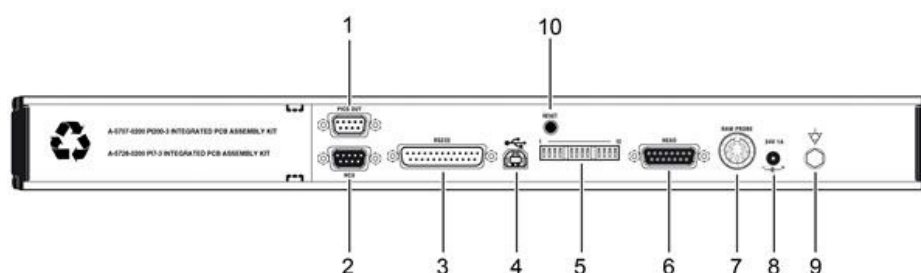
The guide gives information on physical installation, system connections, communications and interface settings, as well as assistance in fault-finding during the installation of PHC10-3 PLUS.

WARNING: The components of PH10 PLUS system are not compatible with PH9 or PH20 system components. No attempt should be made to connect PH10 PLUS system components to a PH9 or PH20 system, as this will result in damage to the product.

The guide should be read in conjunction with the PH10 PLUS series user's guide in order to fully understand the system's features, capabilities and operation.

The PH10 PLUS series of motorised probe heads can only be used in conjunction with the PHC10-3 PLUS when part of an OEM system installation. PHC10-3 PLUS has replaced the PHC10-2 and provides support for RS232 and USB communications (IEEE is no longer supported). PHC10-3 PLUS uses an external power supply for the PH10 PLUS series of heads, manages all the head functions and communicates via a suitable interface with the CMM's computer. PHC10-3 PLUS does not manage the probe functions but does have the provision for an interface to be fitted.

Rear panel layout



Key	Description
1	9-way D-type plug for PICS output
2	9-way D-type connector to HCU2
3	25-way D-type plug RS232 communications connector to CMM computer
4	USB type "B" socket
5	PHC10-3 PLUS configuration switches
6	15-way D-type connector to probe head
7	7-pin DIN raw probe connector to probe interface or multiwire input for internal interfaces
8	DC power jack
9	Equipment bond point
10	Controller reset button

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PHC10-3 PLUS configuration switches

PHC10-3 PLUS switch settings

PHC10-3 PLUS switch	Function	Up	Down
Communications			
1#	Baud rate		
2#	Baud rate		
3#	Baud rate		
4*#	Stop bit	2 stop bits	1 stop bit
5*#	CTS protocol	CTS on	CTS off
6*#	LF protocol	LF on	LF off
9	Command set	Extended	Basic
Interface			
7	PICS configuration	PPOFF - active during head index	PPOFF - inactive during head index
8	HCU1 PROBE/DAMP/RESET	Enabled	Disabled
10	Probe reset time	2 (extended)	1 (standard)
11	Interface connection	PICS / 7 pin DIN	5-pin DIN
12	Output configuration	PICS	DIN
13	Machine cable isolation	Machine cable	Multiwire

* Operational only when basic command set selected (switch 9 down).

Not required for USB operation default position = down.

NOTE: Press the reset button after making switch changes.

Conversion from PHC10-2 to PHC10-3 PLUS

PHC10-3 PLUS is designed to be a plug in functional replacement for PHC10-2. There are some differences which the user needs to be aware of, the connectors have been rearranged on the rear panel but are of the same type and are labelled in the same way. A USB connector has been added for those requiring USB communications. Unused switches have been removed and the remaining switches are now grouped in one row. See the next table for changes.

Changes in configuration switches

The table below is a summary of the differences between PHC10-3 PLUS and PHC10-2 configuration switch settings that allows you to correctly configure your PHC10-3 PLUS when replacing a PHC10-2.

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PHC10-2 switch	PHC10-3 PLUS switch equivalent	Function	Up	Down
Communications				
1	1#	Baud rate		
2	2#	Baud rate		
3	3#	Baud rate		
4 (not used)				
5 (not used)				
6	4*#	Stop bit	2 stop bits	1 stop bit
7	5*#	CTS protocol	CTS on	CTS off
8	6*#	LF protocol	LF on	LF off
9	9#	Command set	Extended	Basic
10	10	Probe reset time	2 (extended)	1 (standard)
Interface				
11	7	PPOFF	PPOFF - active during head index	PPOFF - inactive during head index
12	8	HCU1 probe, DAMP and probe reset buttons	Enabled	Disabled
13 (not used)				
14 (not used)				
15+16	12	Output configuration	PICS	DIN
17+18	11	Interface connection	PICS or 7-pin DIN operation	5-pin DIN operation only
	13	Probe wire isolation	Machine cable	Multiwire

* Operational only when basic command set selected (switch 9 down)

Not required for USB operation default position = down

NOTE: Switches 4, 5, 13 and 14 had no function in RS232 PHC10-2. Press the reset switch after making switch position changes.

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PICS connection

PICS interface configuration

If PHC10-3 PLUS is to be used in a PICS linked system, the PPOFF configuration is selected using switch 7.

Switch	Description	Position	Information
7	PPOFF	UP	PPOFF and PDAMP active during head index
7	PPOFF	DOWN	PDAMP only active during head index

PICS output

Renishaw's PICS (product inter-connection system) allows a standard method of connection for real-time signals used by current Renishaw products and gives access to probing system control features through the DIN 'raw probe' connection.

The following descriptions are specific to PHC10-3 PLUS PICS connections when an internal interface is not present. Please refer to the PICS installation guide (Renishaw part number H-1000-5000) for further information when interfaces are fitted.

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Pin	Signal	Function	
1	STOP	This signal is active when low and is responded to, and can be asserted by the PHC10-3 PLUS .	Read from PHC10-3 PLUS to indicate an error in the PH10 system. Pull down to 0 V to indicate a STOP condition external to the PH10 PLUS system.
2	PPOFF	PPOFF is an active low inhibit signal which can be set by the CMM computer or the PHC10-3 PLUS. PPOFF is overridden by the use of the STOP signal.	-
3	0 V	This the common reference and return path for all signals.	-
4	LED anode	This is a constant current input, normally from the interface to illuminate the head LED.	-
5	Probe signal	This pin and pin 9 transmit the probe output signals from the PHC10-3 PLUS when a multiwire cable is not in use. As these signals have not been interfaced, it is important that the PICS cable between the PHC10-3 PLUS and the interface is less than 0.5 m (1.6 ft) otherwise interference from other PICS signals can occur.	-
6	SPARE	-	-
7	PDAMP	PDAMP is an active low signal which can be set by the CMM computer, the PHC10-3 PLUS or by the optional HCU2. PDAMP can influence an interface by reducing electronically the sensitivity of a strain gauge based probe. It can inhibit a Renishaw interface, when standard touch trigger probes are in use, until the probe has been continuously triggered for at least 5 ms. The signal can be asserted by the CMM computer to reduce the sensitivity of the probe. This will reduce unwanted triggers during CMM acceleration, or vibration during position moves, whilst maintaining crash protection.	Pull down to 0 V to partially inhibit the probe during rapid moves.
8	LEDOFF	This signal is not asserted by the PHC10-3 PLUS, but it responds to LED OFF by switching the head LED off.	-
9	Probe return	See pin 5	-
-	Screen	-	-

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PHC10-3 PLUS front panel LEDs

PHC10-3 PLUS LED description



Name	Colour	Function
POWER	Green	Power on when lit
STOP	Red	PHC10-3 PLUS asserting PICS STOP when lit PI 200-3 asserting PICS STOP when flashing
HEAD READY	Green	Head ready for use when lit
HEAD ACTIVE	Yellow	Head indexing when lit
DATUM ERROR	Red	Head datum error when lit
OBSTRUCT ERROR	Red	Head obstruct error when lit, non PLUS interface fitted
OVERLOAD ERROR	Red	Head overload error when lit
TP7	Green	TP7 detected when lit
TP200	Green	TP200 detected when lit
STD	Green	TP2 / TP20 / TP6 detected when lit
SEATED	Green	Probe seated when lit
DAMPED	Yellow	Probe damped when lit

NOTE: The probe reset button on the front of PHC10-3 PLUS only functions if a probe interface card is installed within the unit.

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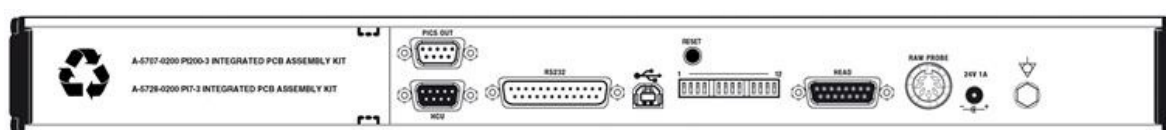
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PHC10-3 PLUS variants

PHC10-3 PLUS is available in three options:

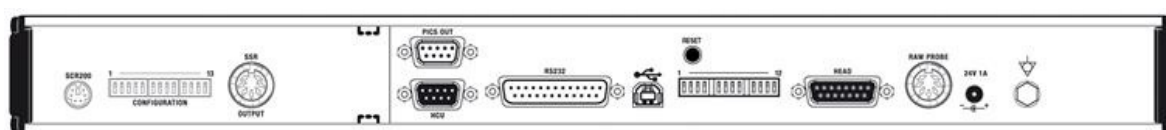
Standard PHC10-3 PLUS with provision for interface card to be inserted

(Renishaw part number A-5863-0100)



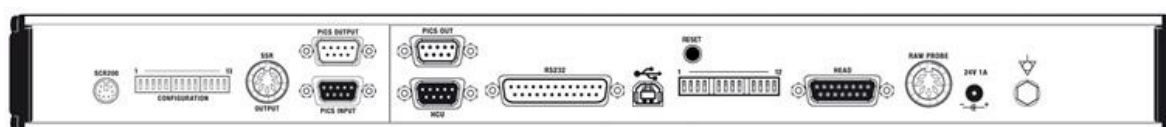
PHC10-3 PLUS with single rear panel and integrated PI 200-3 probe interface

(Renishaw part number A-5863-0200)



PHC10-3 PLUS with integrated PI 200-3 probe interface and additional PICS output

(Renishaw part number A-5863-0300)

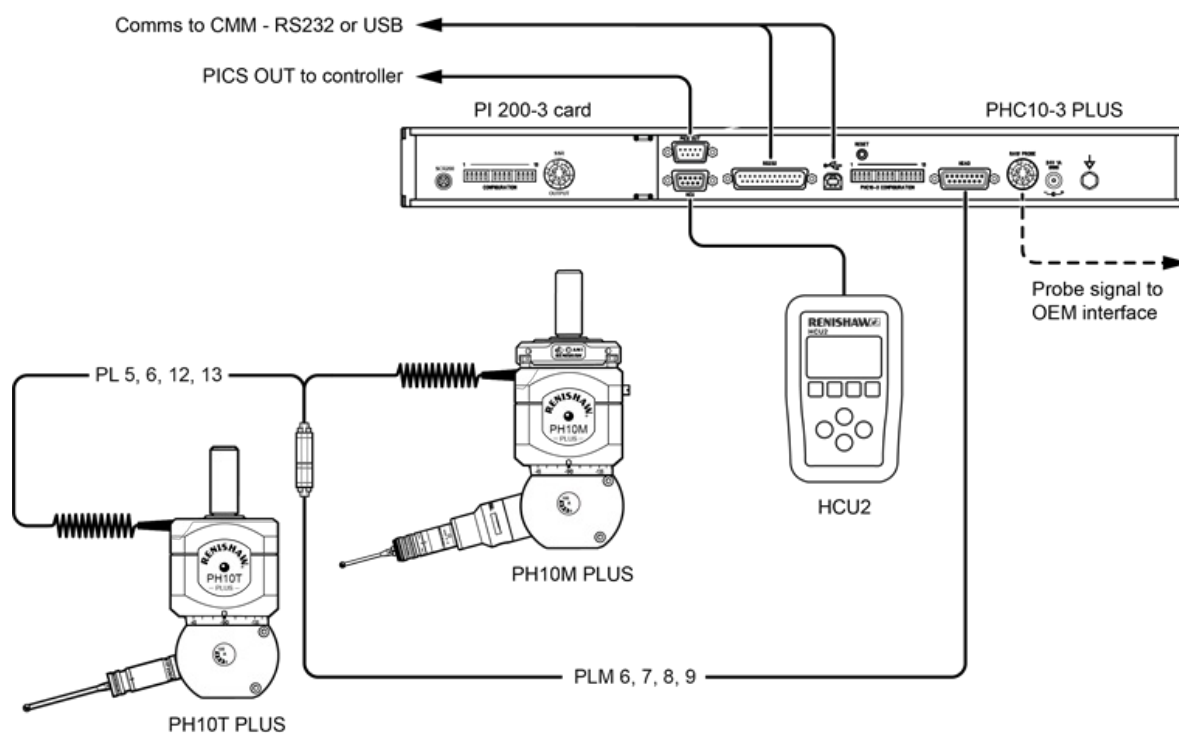


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System interconnection diagrams

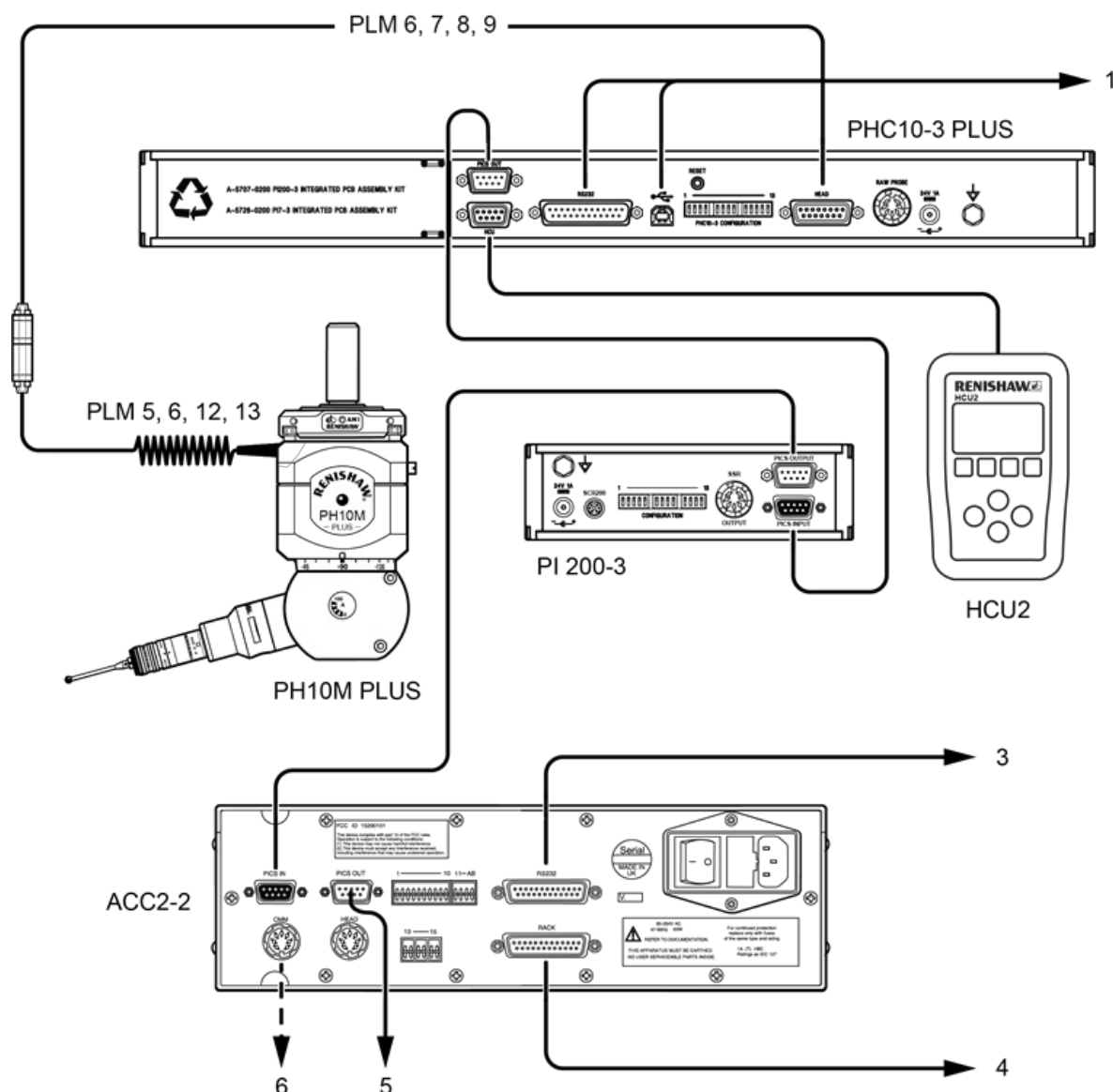
PH10 PLUS system with standard two wired touch-trigger probes



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PH10 PLUS system with standard two wire touch-trigger probe, PI 200-3 and autochange

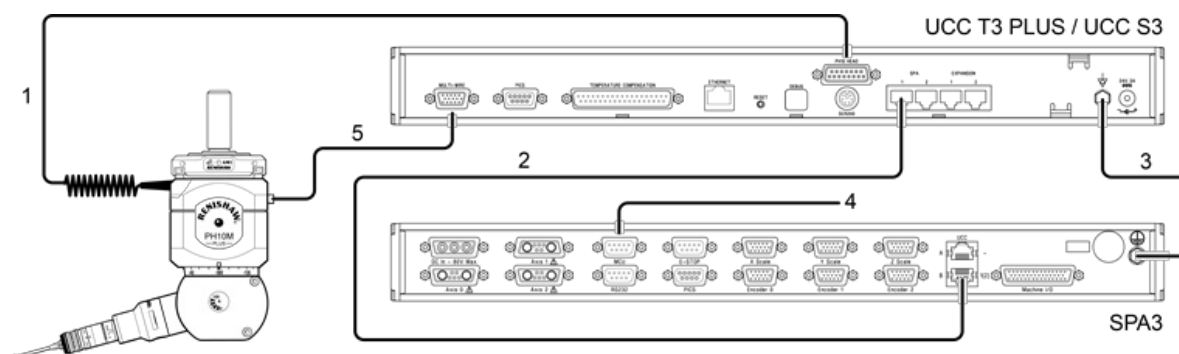


Key	Description
1	Communication connection to CMM controller - RS232 or USB
3	Communication to CMM controller
4	Communication to autochange rack
5	PICS output to CMM controller
6	Raw probe output to CMM controller

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PH10 PLUS system with multiwire scanning probes



Key	Description	Key	Description
1	Head cable(s)	4	MCU connection
2	RJ45 cable (supplied)	5	Multiwire cable
3	16 / 0.2 mm earth connection		

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RS232 setup

RS232 connector pinouts

The PHC10-3 PLUS communicates with the CMM computer via the RS232 cable as shown in the table below:

Pin	Signal
1	Screen
2	Transmitted data (Tx) to CMM computer
3	Received data (Rx) from CMM computer
4	RTS (request to send) to CMM computer +12 V after initialisation routing completed
5	CTS (clear to send) from CMM computer CMM computer disasserts CTS to halt PHC10-3 PLUS transmissions Connect pin 5 to pin 20 if CTS is not output from CMM computer
7	Signal ground (common)
20	DTR (data terminal ready) to CMM computer signifies PHC10-3 PLUS power ON condition

Baud rate selection

The baud rate is set using switches 1 to 3 as shown in the table below:

Baud rate	Switch 1	Switch 2	Switch 3
300	DOWN	DOWN	DOWN
600	UP	DOWN	DOWN
1200	DOWN	UP	DOWN
2400	UP	UP	DOWN
4800	DOWN	DOWN	UP
9600	UP	DOWN	UP
19200	DOWN	UP	UP

CAUTION: To implement any changes press the "reset" button on the rear panel. Failure to do so will be the changes do not take effect.

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Protocol selection

The PHC10-3 PLUS has two switch-settable command sets (basic command set and extended command set) offering different protocol options. The command set selection is made using switch 9 on the rear panel.

Switch	Position	Selection
9	UP	Extended command set mode (recs)
9	DOWN	Basic command set mode

Basic command set mode

In this mode the PHC10-3 PLUS is fully compatible with existing integration methods in terms of communications protocols, software command set and RS232 protocol options.

Basic command set protocol

Switch	Position	Selection
4	UP	2 stop bits
4	DOWN	1 stop bit
5	UP	CTS (clear to send) ON
5	DOWN	CTS (clear to send) OFF
6	UP	LF (line feed) ON
6	DOWN	LF (line feed) OFF

Data transmission format is as follows:

- 1 start bit
- 7 data bits
- 1 parity bit (ignored on Rx: always 0 on Tx)
- 1 or 2 stop bits (switch 4)

Protocols: PHC10-3 PLUS RTS is asserted before first transmission from the head and remains asserted. If switch 5 is UP, CTS must be asserted by the CMM computer to allow the head to transmit. If switch 6 is UP, the PHC10-3 will add an ASCII LF character to every transmitted message.

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Extended command set mode

In this mode the PHC10-3 PLUS uses the Renishaw extended command set. It is completely different from and incompatible with the basic command set. The RS232 protocol is fixed with no user selectable options other than baud rate. The extended command set offers the following advantages over the basic command set:

- Software control of the hand control unit (HCU2) functions such as jog and sweep
- Software control of selected PICS (product interconnection system) functions such as probe damping, Probe Power OFF and LED OFF
- Software control of selected probe functions (TP200 probe reset) Common communications protocol for products using the extended command set
- As probing systems become increasingly sophisticated and offer a wider range of functions and control options, they will be incorporated into the new command structure, reducing integration times and costs for CMM manufacturers
- The introduction of product identifiers and device numbers will enable control of multiple Renishaw interfaces in future implementations of the extended command set

Please contact Renishaw for further details of the extended command set.

NOTE: The functions of switches 4, 5 and 6 will have no effect on the system when switch 9 is UP

In extended command set mode, the data transmission and protocol formats are fixed in line with modem RS232 conventions. There are no user selectable options.

Data transmission format is as follows:

- 1 start bit
- 7 data bits
- 1 even parity bit
- 1 stop bit

Protocol:

- PHC10-3 PLUS RTS is normally asserted. It is unasserted when the PHC10-3 PLUS is unable to receive further transmissions.
- The PHC10-3 PLUS CTS must be asserted (by the CMM computer, or by linking DTR to CTS) to allow the PHC10-3 to transmit.

XON/XOFF:

- The extended command set supports the use of XON/XOFF flow control by the CMM computer.
- If the PHC10-3 PLUS receives an XOFF character, PHC10-3 PLUS transmissions will cease and be buffered until an XON character is received by the PHC10-3 PLUS or the output buffer overflows.
- It is possible to continue transmissions to the PHC10-3 PLUS while it is in the XOFF state, although this is not recommended as it may cause overflow of the output buffer, resulting in lost responses.

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USB communications

USB communication is via the USB type "B" socket on the rear panel. The PHC10-3 PLUS is self powered and therefore takes no power from the PC bus. The PHC10-3 PLUS will switch automatically from RS232 to communicate via the USB port if a powered up cable is connected.

NOTE: Only one type of communications cable is to be inserted at any time. If in USB mode and the cable is removed, the PHC10-3 PLUS will assert PICS STOP

Switches 1 to 6 have no function when operating via USB. They may be set to the default down position or left in the RS232 positions.

Switches 7, 8, 9, 11, 12 and 13 will operate as described in the interface switches section.

To operate via the USB port the CMM PC will require the correct USB drivers to be loaded. The signed drivers are available on the CD provided. To load the drivers power up a PHC10-3 and connect to the CMM PC via a USB cable. The CMM PC operating system should recognise the new hardware and the 'found new hardware' wizard will offer to search for the driver.

To conform to USB standards a maximum cable length of 5 m may be used. If a longer distance is required a hub may be used to extend another 5 m. The maximum length of hubs / cables is 30 m. It is suggested that the PHC10-3 should not share its USB port with any high data rate device which may slow down its response time. Devices such as video cameras and disc drives for example should be avoided if possible.

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Interface switch descriptions

HCU1 operation

When the system is used in conjunction with an HCU2 hand control unit, the probe damp and probe reset buttons on the HCU2 are active.

The probe reset button will pulse the PPOFF PICS line when pressed, but only while the system is in manual mode. The probe damp button will toggle the PDAMP PICS line when pressed, but only while the system is in manual mode. Both the probe reset and probe damp buttons on the HCU2 can be made inactive by use of a switch on the rear panel of the PHC10-3.

Switch	Description	Position	
8	Operation of HCU2 probe	UP	Enabled
8	Damping and probe reset	DOWN	Disabled

Probe reset time

The extended probe reset timer on the PHC10-3 PLUS unit is designed to be used where the touch probe fails to remain seated following a head index move. E.g, when using long extension bars.

Switch	Description	Position	
10	Time permitted for probe to reseat following a head index	UP	Level 2 (extended)
10	Time permitted for probe to reseat following a head index	DOWN	Level 1 (standard)

Interface connection

Switch	Description	Position	
11	Probe connection	UP	PICS or 7-pin DIN operation: the PHC10-3 PLUS internal inhibit relay disables the interface during a head index
11	Probe connection	DOWN	5-pin DIN operation only: the PHC10-3 internal inhibit relay disables the probe during a head index

Output configuration

The PHC10-3 PLUS can be connected to a probe interface via the PICS connection or via the raw probe connection (7-pin DIN connector).

Switch	Description	Position	
12	Probe output configuration	UP	PICS
12	Probe output configuration	DOWN	DIN

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Probe wire isolation

The probe wires need to be isolated from the machine cable wiring when used with multiwire systems. This is controlled by switch 13.

Switch	Description	Position	
13	For use with machine cable	UP	Machine cable
13	Multiwire option for use with PL172	DOWN	Multiwire

The PHC10-3 PLUS will assert STOP under the following conditions:

Condition	Notes
Overload error	Head has been overloaded when locked causing it to unlock.
Obstruct error	Head has been obstructed when moving to requested position or is unable to lock into it.
Head disconnect	STOP will be asserted for two seconds if head is disconnected.
Power failure	Stop signal will be permanently asserted if mains power is removed from PHC10-3 PLUS.
USB cable disconnected	PICS STOP will be asserted if USB cable is used and removed during operation.

The reaction to assertion of PICS STOP to the system and effect of the signal removal are detailed below:

System state	Reaction	Removal of external STOP
STOP asserted on power up - head locked.	Normal system start up - head will report its position.	Head movement commangs accepted.
System in manual mode - manual movement initiated by HCU2 after STOP asserted.	Single step manual movement only - continuous movement is disabled but head can be moved slowly as a safeguard movement. Head will lock up as normal when movement key is released.	Continuous movement enabled.
System in manual mode - STOP asserted during manual move by HCU2.	Continuous head movement is immediately disabled - head will continue to move in single steps. Head will lock up as normal when movement key is released.	Continuous movement enabled.
System in automatic mode - stop asserted before update command received.	PHC10-3 PLUS will not unlock or index the head.	Normal system operation resumed.
System in automatic mode - stop asserted during a head move.	Power immediately removed from axis motors - motors braked.	Update command will cause the head to complete its move.

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Head connector and cables

NOTE: For maximum immunity from electrical noise, Renishaw recommends that:

1. Mating connectors must be metal bodied.
2. The overall cable screen is continuous and connected to the system ground on the user's equipment through the bodies of the connectors.

CAUTION: For correct system function, the maximum overall single core resistance between the head and PHC10-3 PLUS should be 2.5 ohm.

Head connector cables

PHC: Probe head cable

MC: Machine cable

MC	MC	MC	MC	PHC	PHC	PHC
Signal name	15-way male D-type	Cable PLM 6 - 9	14-way LEMO	12 core	14-way	Max line
B-axis feedback	14	Black	(F) 1 (M)	Yellow	E	n/a
Ground sense	1	Brown	(F) 2 (M)	Red	D	n/a
DC reference 12 V	6	Violet	(F) 3 (M)	Brown	C	n/a
0 V	4	Green / red	(F) 4 (M)	Grey	M	1000 mA
Locking motor 8 V dc nominal	10	Green	(F) 5 (M)	White	H	350 mA
A-axis motor 12 V dc nominal	12	Red	(F) 6 (M)	Green	L	350 mA
Head present	2	Turquoise	(F) 7 (M)	Not connected	-----	-----
A-axis motor 12 V dc nominal	11	White	(F) 8 (M)	Dark blue	F	350 mA
B-axis motor / probe contact	7	Pink	(F) 9 (M)	Violet	A	350 mA
B-axis motor / probe contact	15	Orange	(F) 10 (M)	Black	B	350 mA
Screen	Body	Screen	(F) 11 (M)	Screen	N, O	-----
A-axis feedback	3	Yellow	(F) 12 (M)	Orange	G	n/a
LED and datum	8	Blue	(F) 13 (M)	Turquoise	J	15 mA
Motor probe switch	5	Grey	(F) 14 (M)	Pink	K	40 mA

NOTE: The male pins numbered 4 and 7 of the 14 way LEMO connector are linked together.

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Motorised head cables

The table below shows the standard range of motorised head cables available from Renishaw:

PHC: Probe head cable

MC: Machine cable

Cable	Name	Length	Type	Connector	Connects to	Connector	Connects to
PHC	PL5	0.1 m to 0.8 m	Coiled	PH10 style	Head	14-pin LEMO plug	MC
PHC	PL6	0.8 m to 1.8 m	Coiled	PH10 style	Head	14-pin LEMO plug	MC
PHC	PL12	0.1 m	Plain	PH10 style	Head	14-pin LEMO plug	MC
PHC	PL13	0.1 m to 0.2 m	Coiled	PH10 style	Head	14-pin LEMO plug	MC
MC	PLM6	6.0 m	Plain	15-pin D-plug	PHC10-3 PLUS	Chassis socket	PHC
MC	PLM7	4.0 m	Plain	15-pin D-plug	PHC10-3 PLUS	Chassis socket	PHC
MC	PLM8	6.0 m	Plain	15-pin D-plug	PHC10-3 PLUS	Line socket	PHC
MC	PLM9	4.0 m	Plain	15-pin D-plug	PHC10-3 PLUS	Line socket	PHC

Raw probe connector pinouts

Pin	Description
1	Head LED cathode probe present
2	Ground
3	Head LED cathode
4	Probe return
5	Probe signal
6	Probe inhibit
7	Probe inhibit

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Power supply

Powering the PHC10-3 PLUS

The PH10-3 PLUS head controller is to be used with the provided PSU - (Emerson DP4024N3M ac power adaptor). www.emerson.com

This is a 24 Vdc 49 W supply and is connected to the PHC10-3 PLUS via Ø5.5 mm dc jack plug.

PHC10-3 PLUS does not require a protective earth, however an equipotential bonding point is provided on the rear panel for connection to the rest of the installation.

- PHC10-3 PLUS controller is rated to operate at +24 Vdc 1 A max input current

If an internal interface is fitted with the PHC10-3 PLUS it will obtain its power internally from the PHC10-3 PLUS controller.

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Installation

Dimensions

Width	440 mm (17.3 in)
Height	44 mm (1.75 in)
Depth	180 mm (7.1 in)
Weight	1.5 kg (3 lb 3 oz)

The PHC10-3 PLUS controller can be used in a 19 inch rack system or as a stand-alone unit.

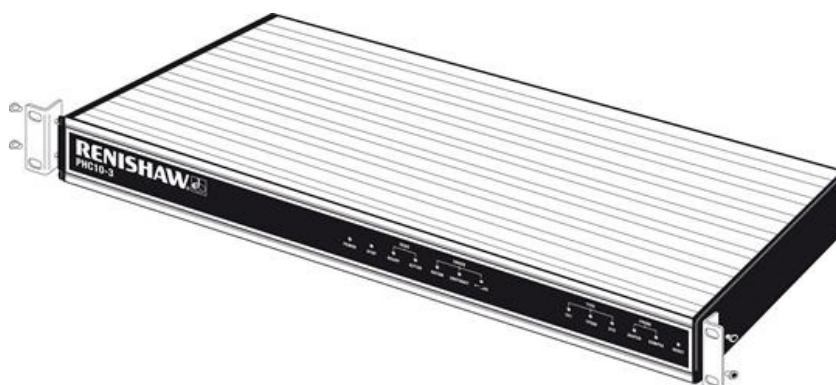
CAUTION: Ensure the controller is disconnected from the power supply during installation.

Stand-alone installation

Four self-adhesive rubber feet are supplied with the unit for stand-alone use.

Mounting in a 19 inch rack

The rack mounting kit A-1018-0189 contains two brackets and four M5 × 6 mm screws. Assemble the brackets to the PHC10-3 PLUS as shown below.



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Troubleshooting

This section on troubleshooting is a guide to problems associated with the installation and integration of the system only. Refer to the 'PH10 PLUS installation and user's guide' (Renishaw part number H-1000-5070) regarding problems associated with normal operation of the system.

The optional HCU2 can also be used to identify system faults. For full details of the use and fault finding capability of the unit see the 'HCU2 hand control unit user's guide' (Renishaw part number H-1000-5361).

Use the table below to identify problems you are experiencing with your system. If you experience problems which you are not able to identify or solve satisfactorily, please contact Renishaw for further advice.

Power on LED not lit

Possible cause	Solution
Power loss	Check mains cable connections and integrity. Check power block is supplying 24 V. Check CMM emergency stop condition - power may have been removed by CMM.

No head movement in automatic mode

Possible cause	Solution
Power loss	See above.
Cable / connection fault	Check connection and integrity of cabling between head and controller.
Communications failure	Check RS232 baud rate.
Incorrect command set selected	Check correct command set is selected.

No head movement in manual mode

Possible cause	Solution
Power loss	See above.
Cable / connection fault	Check connection and integrity of cabling between head and controller.

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No output signal received by the CMM computer

Possible cause	Solution
Cable / connection fault	Check connection and integrity of cabling between head and controller. Check connection and integrity of cabling between controller and interface. Check connection and integrity of cabling between interface and computer.
Multiwire bypass connector not fitted	Fit a multiwire bypass connector with will permit a standard touch-trigger probe signal to reach controller
Multiwired probe in use	Check that the multiwire cable is correctly fitted to the head. Check that the trigger output to the CMM computer is connected to the multiwired probe interface.

Poor measurement performance

Possible cause	Solution
Loose mounting of head	Ensure all mounting screws are tight and mounting to CMM is secure.
Probe damping enabled during measurement	Ensure probe damping is not enabled during measurement moves.

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Maintenance

There are no user serviceable parts inside any PH10 PLUS system units. Units requiring attention must be returned to an authorised Renishaw customer service centre. The probe head, controller and hand control unit should be cleaned with a soft, dry, lint-free cloth.

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