

Coordinate measuring machine probes



Coordinate measuring machine probes

Fixed and manual probe heads

PH1

A small swivel head, adjustable in both the A and B axes, with limited overtravel protection. The probe is offset from the mounting shank Z axis.

Number of probe sockets:	1
Probe status indication:	1 LED
Cable connection:	5 pin DIN 180° socket
Overtravel break load:	Adjustable from 20 gf (0.7 ozf) to locked solid
A-axis indexing:	Swivel of 115° locked with hexagonal key (3 mm A/F)
B-axis indexing:	15° steps through 360°
Weight:	125 g (4.5 oz)
Mounting options:	Shank to suit your CMM

Part number: A-1049-1795

Price: \$1,764



PH5

A 5-way fixed head, which accommodates up to five probes simultaneously.

Number of probe sockets:	5
Probe status indication:	2 LEDs
Cable connection:	5 pin DIN 180° socket
Mounting options:	Shank to suit your CMM

Part number: A-1045-1883

Price: \$1,899



PH5/1

The PH5/1 incorporates positive B-axis indexing and limited overtravel protection.

Number of probe sockets:	5
Probe status indication:	2 LEDs
Cable connection:	5 pin DIN 180° socket
Overtravel break load:	Adjustable from 20 gf (0.7 ozf) to locked solid
A-axis indexing:	N/A
B-axis indexing:	15° steps through 360°
Mounting options:	Shank to suit your CMM

Consists of:

Part number: A-1045-1883

Price: \$1,899

Part number: A-1045-1893

Price: \$433



PH6

A compact, vertical probe head for a single probe, with a choice of integral cables (see below).

Number of probe sockets: 1
Probe status indication: 1 LED
Cable connection: Integral cable
Mounting options: Shank to suit your CMM

Part number: A-1046-5097 (coiled 12-28 in, 5 pin DIN) **Price:** \$477
Part number: A-1046-5098 (coiled 18-50 in, 5 pin DIN) **Price:** \$477
Part number: A-1046-5099 (coiled 30-95 in, 5 pin DIN) **Price:** \$477
Part number: A-1046-5094 (plain 177 in, 5 pin DIN) **Price:** \$477
Part number: A-1046-5096 (coiled 23-72 in, 7 pin amph) **Price:** \$477

PH6A

The PH6A is designed for use with autojoint probes and allows you to change probes or add extensions without having to requalify the probe. **Special order only.**

Number of probe sockets: 1
Probe status indication: 1 LED
Cable connection: 5 pin DIN 180° socket
Mounting options: Shank to suit your CMM

Part number: A-1051-0012 **Price:** \$718

PH6M

A fixed head with autojoint connection for probes and adaptors. For use with TP7M, SP600M, and SP25M.

Number of probe sockets: 1 autojoint
Probe status indication: 1 LED
Cable connection: Micro 'D' connector
Mounting options: Shank to suit your CMM

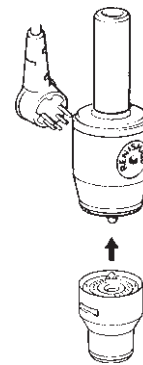
Part number: A-1074-0020 **Price:** \$1,695

MH8

A manually indexable probe head with repeatable indexing, eliminating the need to requalify the stylus tip position after orientation. The MH8 can be used with the TP6 probe directly or with the TP20 probe with up to 50 mm extension. An easy upgrade, as there is no need for special software, cabling, or electronics.

2 σ positional repeatability: 1.5 μ m
Probe status indication: 1 LED
Cable connection: 5 pin DIN type connector
A-axis indexing: 0° to 90° in 15° steps = 7 positions
B-axis indexing: \pm 180° in 15° steps = 24 positions
Total number of positions: 168
Maximum support capability: TP6 mounted directly
TP20 with PEL1 50 mm extension
Probe mounting: M8 bush
Mounting options: Shank to suit your CMM

Part number: A-1332-0002 **Price:** \$3,385



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MIH

A manually indexable head, repeatable in 720 positions over two axes with LCD display, the MIH is designed for use with the autojoint TP6A touch probe and long extensions for large components. TP2, TP6, TP20 touch probes can be used with the addition of the PAA1 or PAA2 extensions.

2 σ positional repeatability:	1 μ m
Probe status indication:	1 LED
Cable connection:	5 pin DIN 180° socket
A-axis indexing:	105° to 0° in 7.5° steps = 15 positions
B-axis indexing:	$\pm 180^\circ$ in 7.5° steps = 48 positions
Probe mounting:	Autojoint
Mounting options:	Shank to suit your CMM

Part number: A-1070-0003

Price: \$6,776



MIH-S

The MIH-S is a derivative of the well-established MIH design with enhanced functionality to provide feedback of status and lock position over an RS232 serial communications link.

2 σ positional repeatability:	1 μ m
Probe status indication:	1 LED
Cable connection:	12 pin Hirose connector
A-axis indexing:	105° to 0° in 7.5° steps = 15 positions
B-axis indexing:	$\pm 180^\circ$ in 7.5° steps = 48 positions
Probe mounting:	Autojoint
Mounting options:	Shank to suit your CMM

Part number: A-1373-0001

Price: \$7,793



MH20

The MH20 is an ultra-compact manually adjustable probe head offering maximum flexibility in probe orientation. The full range of TP20 probe modules can be used via its integral probe mounting. The MH20 is incompatible with the MCR20.

Probe mounting:	TP20 kinematic mount
Head mounting:	MS/T range of shanks
Suitable interfaces:	PI4-2, PI200-3 or PI7-3
Number of probe sockets:	1
Probe status indication:	1 LED
Cable connection:	5 pin DIN 180° socket
A-axis indexing:	Non-indexing swivel $\pm 93^\circ$
B-axis indexing:	Non-indexing swivel $\pm 300^\circ$
Maximum extension bar:	EM2 extension module – 75 mm (2.95 in)

MH20 head with low force module

Part number: A-4043-0000 **Price:** \$4,090

MH20 head with standard force module

Part number: A-4043-0100 **Price:** \$4,090

MH20 head with medium force module

Part number: A-4043-0200 **Price:** \$4,090

MH20 head with extended force module

Part number: A-4043-0300 **Price:** \$4,090



Coordinate measuring machine probes

MH20i

The MH20i offers the significant advantage of repeatable indexing positions, vastly improving productivity for multi-orientation measurement applications. The MH20i is incompatible with the MCR20.

Probe mounting:	TP20 kinematic mount
Head mounting:	MS range of shanks
Suitable interfaces:	PI4-2, PI200-3 or PI7-3
Number of probe sockets:	1
Probe status indication:	1 LED
Cable connection:	5 pin DIN 180° socket
A-axis indexing:	0° to 90° in 15° repeatable steps
B-axis indexing:	180° in 15° repeatable steps
Repeatability of position:	1.5 µm (0.00006 in) with TP20 and 10 mm stylus 2.5 µm (0.0001 in) with EM2 extension module and 10 mm stylus
Maximum extension bar:	EM2 extension module – 75 mm (2.95 in)



MH20i head with low force module

Part number: A-4099-0000 **Price:** \$4,760

MH20i head with standard force module

Part number: A-4099-0100 **Price:** \$4,760

MH20i head with medium force module

Part number: A-4099-0200 **Price:** \$4,760

MH20i head with extended force module

Part number: A-4099-0300 **Price:** \$4,760

RTP20

Renishaw's new RTP20 compact head for DCC coordinate measuring machines (CMMs) offers low-cost 'motorized' head functionality and integral TP20 touch-trigger probe.

The new RTP probe head allows the integral probe to be moved to 168 repeatable positions in 15° increments using both A and B axes, allowing a one-time qualification for a stylus tip position. This eliminates the need for costly time-consuming requalification routines, ensuring fast throughput for part inspection. Users can therefore easily access features to be measured and optimize system performance by ensuring the probe is applied to the surface at the best angle to achieve accurate measurements.

Probe mounting:	TP20 kinematic mount
Head mounting:	MS range of shanks
Suitable interfaces:	PI4-2, PI200-3 or PI7-3
Number of probe sockets:	1
Probe status indication:	1 LED
Cable connection:	5 pin DIN 180° socket
A-axis indexing:	0° to 90° in 15° repeatable steps
B-axis indexing:	180° in 15° repeatable steps
Repeatability of position:	1.5 µm (0.00006 in) with TP20 and 10 mm stylus 2.5 µm (0.0001 in) with EM2 extension module and 10 mm stylus
Maximum extension bar:	EM2 extension module – 75 mm (2.95 in)

RTP20 rack kit

Includes: RTP20 head
Shank (various types)
Pole
Pole adaptor (various types)
MCR20 rack
2 × TP20 modules (standard, medium, extended or low)
2 × M2 stylus spanners
2 × M4 stylus spanners
Cleaning kit

Part number: A-5400-#### (see overleaf) **Price:** \$7,200

(Additional charge for 6-way module \$78 per module)

RTP20 non-rack kit

Includes: RTP20 head
Shank (various types)
Pole
Pole adaptor (various types)
1 × TP20 module (standard, medium, extended or low)
2 × M2 stylus spanners
2 × M4 stylus spanners
Cleaning kit

Part number: A-5400-8### (see overleaf) **Price:** \$6,300

(Additional charge for 6-way module \$78 per module)



Coordinate measuring machine probes

RTP20 part numbers

Non-rack kit

A-5400-8###

This number represents the TP20 module required:

- 1 = Low force module
- 2 = Standard force module
- 3 = Medium force module
- 4 = Extended force module
- 5 = 6-way module
- 6 = EM1 module
- 7 = EM2 module

These numbers represent the shank required:

- 01 = MS1 shank
- 02 = MS2 shank
- 03 = MS3 shank
- 04 = MS4 shank
- 05 = MS5 shank
- 06 = MS6 shank
- 07 = MS7 shank
- 08 = MS8 shank
- 09 = MS9 shank
- 10 = MS10 shank
- 11 = MS11 shank
- 12 = MS12 shank
- 13 = MS13 shank
- 14 = MS14 shank
- 15 = MS15 shank
- 16 = MS7(S) shank
- 17 = MS17 shank
- 18 = MS1(S) shank
- 19 = no shank

PLUS the pole adaptor required:

- +0 = M8 pole adaptor
- +20 = M6 pole adaptor
- +40 = 5/16 pole adaptor
- +60 = 3/8 pole adaptor
- +80 = M10 pole adaptor

Example

RTP20 with:

- No rack (8)
- Standard force module (2)
- MS3 shank + M6 pole adaptor (03 + 20 = 23)

= **A-5400-8223**

Rack kit

A-5400-####

This number represents the first TP20 module required:

- 1 = Low force module
- 2 = Standard force module
- 3 = Medium force module
- 4 = Extended force module
- 5 = 6-way module
- 6 = EM1 module
- 7 = EM2 module

This number represents the second TP20 module required:

- 1 = Low force module
- 2 = Standard force module
- 3 = Medium force module
- 4 = Extended force module
- 5 = 6-way module
- 6 = EM1 module
- 7 = EM2 module

These numbers represent the shank required:

- 01 = MS1 shank
- 02 = MS2 shank
- 03 = MS3 shank
- 04 = MS4 shank
- 05 = MS5 shank
- 06 = MS6 shank
- 07 = MS7 shank
- 08 = MS8 shank
- 09 = MS9 shank
- 10 = MS10 shank
- 11 = MS11 shank
- 12 = MS12 shank
- 13 = MS13 shank
- 14 = MS14 shank
- 15 = MS15 shank
- 16 = MS7(S) shank
- 17 = MS17 shank
- 18 = MS1(S) shank
- 19 = no shank

PLUS the pole adaptor required:

- +0 = M8 pole adaptor
- +20 = M6 pole adaptor
- +40 = 5/16 pole adaptor
- +60 = 3/8 pole adaptor
- +80 = M10 pole adaptor

Example

RTP20 with:

- Rack
- Low force module (1)
- Standard force module (2)
- MS1(S) shank + M10 pole adaptor (18 + 80 = 98)

= **A-5400-1298**

See pages 1-40 to 1-42 for information on the shank type for your machine.

Please call Customer Service on 847-286-9953 for part number assistance.

Motorized probe heads

PH10T PLUS

The new PH10T PLUS motorized probe head allows complete, rapid, and repeatable inspection of most complex components with minimum human intervention. Full orientation of your TP2, TP6, TP20 or TP200 probe between any of 720 positions, under manual or program control, turns your 3 axis CMM into a 5 axis machine.

2 σ positional repeatability:	0.4 μ m
Cycle time (90° move):	3.5 seconds
Total angular movement:	A axis 105° to 0° in 7.5° steps = 15 positions B axis \pm 180° in 7.5° steps = 48 positions
Total number of positions :	720
Maximum extension bar length:	300 mm using PEL4 extension*
Head mounting:	Shank to suit your CMM
Probe mounting facility:	M8 thread
Probe head control:	PHC10-3 PLUS (purchased separately)
Dimensions:	Length 102 mm excluding AM1, width 62 mm
Weight:	645 g

Part number: A-5863-2000

Price: \$19,293

PH10M PLUS

The PH10M PLUS motorized probe head has been developed for the new generation of contact and non-contact scanning probes. It has three times the torque of PH10 PLUS, allowing probe extension bars up to 300 mm long to be used.

The PH10M PLUS has an autojoint mounting.

2 σ positional repeatability:	0.4 μ m
Cycle time (90° move):	3.5 seconds
Total angular movement:	A axis: 105° to 0° in 7.5° steps = 15 positions B axis: \pm 180° in 7.5° steps = 48 positions
Total number of positions:	720
Maximum extension bar length:	300 mm using PAA3 extension*
Head mounting:	Shank to suit your CMM
Probe mounting facility:	Autojoint
Probe head control:	PHC10-3 PLUS (purchased separately)
Dimensions:	Length 102 mm excluding AM1, width 62 mm
Weight:	645 g

Part number: A-5863-1000

Price: \$21,881

* On all the PH10 PLUS series of probe heads, it is possible to extend beyond 300 mm using our range of CF extensions.



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PH10MQ PLUS

The PH10MQ PLUS can be mounted vertically inside the CMM's quill for a greater working envelope by increasing the Z axis travel. The specification of the PH10MQ PLUS is identical to that of the PH10M PLUS, with the following exceptions:

Head mounting: Direct to quill
Dimensions: Length 73 mm, width 80 mm
Weight: 730 g

Part number: A-5863-3000

Price: \$21,881

PH10M-iQ PLUS

PH10M-iQ PLUS functions identically to a traditional PH10M PLUS but with the addition of inferred qualification technology. Inferred qualification increases throughput by removing the need to qualify each head position that is used in a measurement program.

PH10M-iQ PLUS works with all PH10M compatible probes, but only touch-trigger probe configurations can utilize inferred qualification. Scanning probes can be used in traditional PH10M qualification mode but cannot use inferred qualification.

Part Number: A-1025-1800

Price: \$24,723



Motorized probe head accessories

AM1/AM2

The AM1 adjustment module is designed for use with the PH10T and PH10M probe heads. The AM2 is designed for the PH10MQ probe heads. Each module provides quick and accurate angular alignment of the motorized probe head with the CMM's axes and/or the autochange rack. The quick release mechanism allows the head to be removed for storage and replaced without further alignment.

	AM1	AM2
Size:	60 mm × 15.5 mm	80 mm × 10 mm
Adjustment:	±2° in pitch and roll* ±4.5° in yaw	±1° in pitch and roll ±1° in yaw
Overtravel:	±3.5° in pitch and roll	0
Mounting:	Mounts to quill using shank	Mounts direct to quill

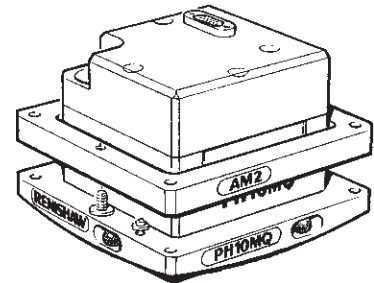
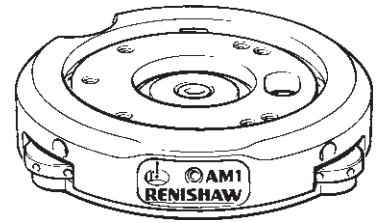
* Up to ±5.5° in pitch and roll is possible, but at the expense of overtravel.

Part number: A-1026-0320 (AM1)

Price: \$780

Part number: A-1036-0080 (AM2)

Price: \$780



PHC10-3 PLUS

The PHC10-3 PLUS head control receives instructions and processes signals to rotate the angles of the PH10 PLUS series probe heads. The PHC10-3 PLUS is compatible with all PH10 PLUS heads. It has its own internal power supply.

Data transmission:	RS232 or USB
Input connectors:	15 way 'D' probe
Output connectors:	7 pin DIN or 9 pin D type
Maximum cable length:	50 m (164 ft)
Hand control:	HCU1 (purchased separately)



Part number: A-5863-0100

Price: \$2,966

PHC10-3 PLUS with internal PI200-3

This variant of the PHC10-3 PLUS controller includes a prefitted PI200-3 interface card in a single 1U case.

Part number: A-5863-0200

Price: \$2,966

HCU1

The HCU1 hand control unit enables the probe head to be used in a manual mode or during a teach cycle. An LCD dot matrix display provides information and status of the PHC10-3 system.

Part number: A-1345-0220

Price: \$766



Coordinate measuring machine probes

MCUlite-2 joystick

Part number: A-5331-0015 Price: \$691



MCU5 joystick kit

Part number: A-5121-0003 Price: \$2,073

MCU-W wireless joystick

Includes MCU-W, charging cradle and power supply. Does not include batteries.

Part number: A-5121-0077 Price: \$3,579



NOTE: MCU joysticks are for use with UCC products only.

MCU-W battery (2 pack)

Part number: A-5121-0079 Price: \$368

PL163

5 meter cable for MCU.

Part number: A-1016-8098 Price: \$178

PL164

10 meter cable for MCU.

Part number: A-1016-8099 Price: \$274

PL171

20 meter cable for MCU.

Part number: A-1016-8100 Price: \$461

12U retrofit cabinet

Part number: A-5567-1000 Price: \$2,501



PH20

PH20 is another innovative measurement product from Renishaw that transforms coordinate measuring machine (CMM) performance. For the first time, 5-axis technology developed for the multi-award winning REVO® measurement system is available for touch-trigger applications on all sizes of CMM.

PH20's unique 'head touches' allow measurement points to be taken by moving only the head rather than the CMM structure. Using only the rapid rotary motion of the head, points can be taken faster, and with improved accuracy and repeatability. Furthermore, 5-axis motion eliminates time spent indexing the head. Together these speed increases typically result in a three-fold improvement in throughput over conventional systems.

PH20's infinite positioning capability guarantees optimal feature access, minimizing stylus changes. Five-axis simultaneous motion allows larger parts to be measured on the CMM by minimizing the space required around the part for head rotation.

Users of the PH20 probe head will immediately have access to the range of proven TP20 probe modules, providing a wide selection of trigger forces, directional sensing options and extensions to meet application requirements*. The detachable modules provide crash protection and can be automatically changed using the MCR20 change rack.

* Excepting the extended force module

PH20 features and benefits

- Incorporates 5-axis measurement technology, minimizing CMM motion and the associated CMM dynamic errors.
- Infinite positioning and 5-axis motion reduces non-productive transitions between features.
- Infinite positioning and 5-axis motion aid access to difficult features.
- Rapid calibration with all positions inferred means more time measuring.
- Maximum reach up to 200 mm with maintained effective working length.
- Standard M2 styli for convenience.

Hardware integration

- The UCC controller is fundamental to the PH20 system.
- The UCC controller features routines particular to 5-axis motion and head-touch measurement.
- MCUIite-2 is the multi-function hand control unit required for the system.
- PH20 can fit to any machine, either directly to the quill or via a shank using a range of mounting adaptors.
- The PH20 is compatible with the existing range of TP20 modules, excepting the extended force module.
- MCR20NI is the recommended rack for stylus changing, but it is possible to use an MCR20.
- No air supply is needed.

Software integration

- The Renishaw UCCserver™ software application will provide the interface for PH20 control.
- UCCserver is based on I++DME command protocol.
- PH20 is fully integrated with Renishaw's MODUS™ application software.



Coordinate measuring machine probes

Specification summary		PH20		
Weight (excluding module and cables)		810 g (28.6 oz)		
Temperature range	Operating	15 °C to 35 °C (59 °F to 95 °F)		
	Storage	-25 °C to 70 °C (-13 °F to 158 °F)		
Maximum movement speed		3 revs/s (1281 mm/s with standard module and 10 mm stylus)		
Maximum head touch speed		50 mm/s		
Rotation angles	A axis	-115° to 115°		
	B axis	∞		
Angular resolution		0.4 μRadians		
Bearings		Mechanical		
Change rack system		TCR20 or MCR20 with TDA block		
Joystick		MCUlite-2, MCU5 or MCU-W		
ISO 10360-5 (2001) typical performance standard force module with 12 x 4 mm stylus on a CMM with ISO 10360-2 (2002) specification of 0.48+ L/1000*			CMM TOUCH	HEAD TOUCH
		Size	0.0006 mm (0.00002 in)	0.0002 mm (0.00001 in)
		Form	0.0026 mm (0.00010 in)	0.0024 mm (0.00009 in)
		Location	0.0013 mm (0.00005 in)	0.0009 mm (0.00003 in)

* specified with a TP7

PH20 installation kit 1 **

Includes: PH20 head with standard force module
Renishaw's most advanced CMM controller
15 m cables and connectors
Labor, installation and travel expenses
MODUST™ touch trigger software
MCUlite-2 joystick

Part number: A-5669-2311 **Price:** \$35,200

PH20 installation kit 2 **

Includes: PH20 head with standard force module
Renishaw's most advanced CMM controller
15 m cables and connectors
Labor, installation and travel expenses
MODUST™ touch trigger software
MCU5 joystick

Part number: A-5669-2321 **Price:** \$36,142

PH20 installation kit 3 **

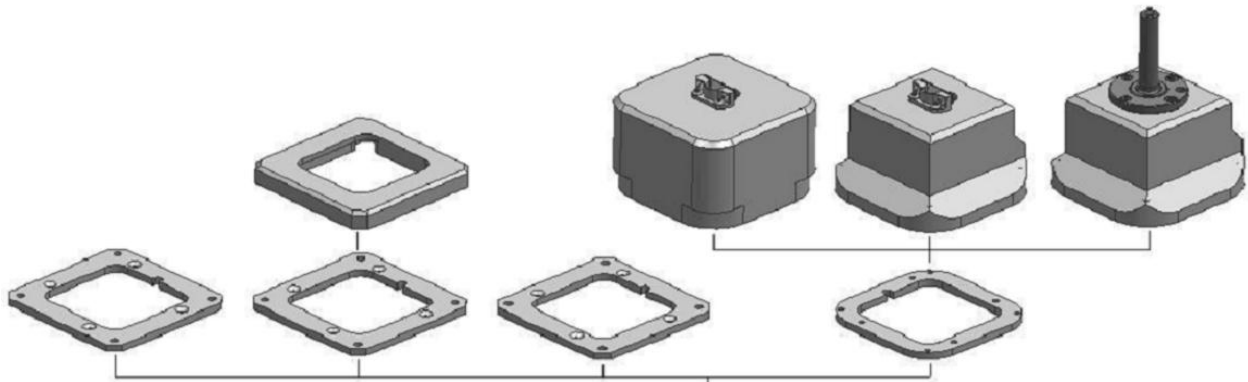
Includes: PH20 head with standard force module
Renishaw's most advanced CMM controller
15 m cables and connectors
Labor, installation and travel expenses
MODUST™ touch trigger software
MCU-W wireless joystick with two batteries

Part number: A-5669-2331 **Price:** \$38,195



**** NOTE:** This equipment requires installation by a Renishaw-certified technician. Prices quoted do not include a controller cabinet, replacement of scales or encoders, adaptor cables, thermal effect compensation or any repair work to the machine.

PH20 shanks



PH20 shank adaptor

Part number: A-3007-1715

Price: \$192

PH20 small quill adaptor

60 mm × 60 mm.

Part number: A-3007-1716

Price: \$192

PH20 large quill adaptor

80 mm × 80 mm.

Part number: A-3007-1717

Price: \$192

PH20 PH10MQ quill adaptor

Part number: A-3007-1720

Price: \$33

PH20 calibration stylus

Part number: A-5004-2182

Price: \$43

PH20 calibration sphere

Part number: A-1034-0026

Price: \$545

Rack for PH20

TCR20

Part number: A-1371-1001

Price: \$2,136



NOTE: See CMM probe shanks starting on page 1-40.

Coordinate measuring machine probes

REVO®

The REVO® measuring head features spherical air bearing technology in each of its two axes, driven by brushless motors linked to high-resolution encoders to provide fast, ultra-high accuracy positioning.

REVO® system overview

The system comprises the following elements:

- REVO® head
- RSP2 2D tip sensing probe and associated stylus holders and accessories
- RSP3 3D probe and associated accessories
- **UCC2** universal CMM controller
- REVO® PCI interface card (for **UCC2**)
- **SPA2** servo power amplifier
- Air filter unit



REVO® – ‘tip sensing’ probe technology

- Enclosed laser directed onto a reflector at the stylus tip.
- The stylus touches the part and bends.
- The reflector is displaced.
- The altered return path of the laser is sensed by a PSD.
- The exact tip position is known because the reflector and the stylus ball are close together.
- Stylus wear is minimized by using a low scanning force.

REVO® features and benefits:

- Incorporates **Renscan5™** five axis scanning technology minimizing CMM motion and the associated CMM dynamic errors
- Increased measuring speed, up to 500 mm/s resulting in increased measurement throughput
- Data collection rates up to 6,000 points per second
- Infinite positioning and five axis motion reduces non-productive transitions between features
- Stylus wear minimized by extremely low scanning forces
- Infinite positioning and five axis motion aid access to difficult features
- Rapid calibration with all positions inferred means more time measuring
- Maximum reach up to 500 mm with maintained effective working length
- Standard M2 styli for convenience
- Probe and stylus changing capability allowing flexibility and future probing technology compatibility

Hardware integration

- The **UCC2** is fundamental to the REVO® system
- The **UCC2** controller features **Renscan5™** scanning routines particular to five-axis motion and scanning
- **SPA2** is a servo power amplifier used to drive the head and CMM
- MCU1 or MCU5 is the multi-function hand control unit required for the system

Software integration

- The Renishaw **UCCserver™** software application will provide the interface for REVO® control
- **UCCserver™** is based on I++DME command protocol

Specification summary		REVO®			
Operating temperature		14 °C to 30 °C (57 °F to 86 °F)			
Storage temperature		-10 °C to 70 °C (14 °F to 158 °F)			
Weight (excluding probe and cables)		1.75 kg			
Dimensions	Height (overall)	239 mm (9.41 in)			
	B axis	86 mm (3.40 in) square			
	A axis swept diameter	118 mm (4.65 in)			
Air specification	Incoming supply to filter specification (ref: ISO8537.1)	Particle size	Class 4	15 µm	Line pressure of 6 bar to 6.5 bar
		Dirt concentration	Class 4	8 mg/m³	
		Dewpoint	Class 4	3 °C	
		Oil	Class 4	5 mg/m³	
	After filtration air specification (ref: ISO8537.1)	Particle size	Class 2	1 µm	Pressure 5 bar
		Dirt concentration	Class 2	1 mg/m³	
		Dewpoint	Class 3	-20 °C	
		Oil	Class 2	0.1 mg/m³	
Movement speed		3 revolutions per second			
Rotation angles	A axis	-5° to 120°			
	B axis	Continuous			
Angular resolution		0.08 arc second			
Bearings		Air			
Change rack system		Allowing both probe changing and stylus holder changing			

REVO® entry level kit 1

Includes: REVO® head kit
RSP2 kit
RSH250 kit
45 mm diameter datum ball kit

Part number: A-3060-0003 **Price:** \$46,993

REVO® entry level kit 2

Includes: REVO® head kit
RSP2 kit
RSH250 kit
RSH350 kit
REVO® rack kit #4
45 mm diameter datum ball kit

Part number: A-3060-0004 **Price:** \$51,239

REVO® standard kit 1

Includes: REVO® head kit
RSP2 kit
RSP3 kit
RSH250 kit
RSH350 kit
REVO® rack kit #1
45 mm diameter datum ball kit

Part number: A-3060-0002 **Price:** \$61,047

REVO® standard kit 2

Includes: REVO® head kit
RSP2 kit
RSP3 kit
RSH250 kit
RSH350 kit
REVO® rack kit #2
45 mm diameter datum ball kit

Part number: A-3060-0008 **Price:** \$61,144

Coordinate measuring machine probes

REVO® head kit

Part number: A-3060-0040 **Price:** \$44,892

RSP2 REVO® probe kit

Part number: A-3060-0028 **Price:** \$4,838

RSP3-1 REVO® probe kit

RSP3-1 and SH25-1.

Part number: A-3060-0031 **Price:** \$6,773

RSP3-3 REVO® probe kit

RSP3-3 and SH25-3A.

Part number: A-3060-0030 **Price:** \$6,773

RSP3-4 REVO® probe kit

RSP3-4 and SH25-4A.

Part number: A-3060-0034 **Price:** \$7,934

REVO® rack kit #1

Includes: 600 mm MRS kit
FCR25 flexible change rack unit
FCR adaptor kit
REVO® RCP kit (2 ports)
Additional 62.5 mm MRS legs
REVO® PRCP kit (2 ports)

Part number: A-3060-0011 **Price:** \$11,426

REVO® rack kit #2

Includes: 1000 mm MRS kit
FCR25 flexible change rack unit
REVO® RCP kit (2 ports)
Additional 62.5 mm MRS legs
REVO® PRCP kit (2 ports)

Part number: A-3060-0013 **Price:** \$9,492

REVO® rack kit #3

Includes: 1000 mm MRS kit
FCR25 flexible change rack unit
REVO® RCP2 rack changing port
REVO® TDA tip correction block
Additional 62.5 mm MRS leg
REVO® PRCP powered rack port
MRS adjustable foot plate kit
MRS heavy duty leg

Part number: A-3060-0012 **Price:** \$12,394

REVO® rack kit #4

Includes: 600 mm MRS kit
REVO® RCP kit (2 ports)
Additional 62.5 mm legs

Part number: A-3060-0014 **Price:** \$3,251

RSH250 kit

Part number: A-3060-0021 **Price:** \$1,162

RSH350 kit

Part number: A-3060-0022 **Price:** \$1,258

RSH450 kit

Part number: A-3060-0026 **Price:** \$1,306

RSH500 kit

Part number: A-3060-0023 **Price:** \$1,354

45 mm diameter datum ball kit

Part number: A-3060-0310 **Price:** \$1,258

RCP TC kit 1

REVO® rack changing port – thermally controlled

Includes: RCP TC port × 2
REVO® RCP TC PSU

Part number: A-3061-0300 **Price:** \$3,918

REVO® TDA tip correction block

Part number: A-3060-0085 **Price:** \$114

REVO® RCP2 rack changing port

Part number: A-3060-0090 **Price:** \$968

REVO® SFP1 surface finish probe

Surface finish is traditionally measured with hand-held sensors or on a dedicated measuring machine. The REVO® SFP1 probe makes surface finish inspection an integral part of your CMM measurement procedure. Surface finish analysis can form part of a single measurement report.

SFP1 system benefits

- Automatic changing of the SFP1 probe and stylus holders is possible using the standard MRS rack and RCP ports. This enables surface finish measurement to be fully integrated with the standard CMM inspection program.
- The SFP1 probe takes advantage of the infinite positioning capability of the REVO® head.
- Sensor calibration involves measuring the surface finish of the surface finish calibration artifact (SFA) that is mounted on the MRS rack. The calibration software adjusts parameters within the probe in accordance with the calibrated value for the artifact.
- The SFP1 includes a passive C axis that enables surface finish measurements to be made at all required orientations around a part. The process of changing the C axis angle is fully automatic, utilizing the B axis positioning of the REVO® head to rotate the SFP1.
- The SFCP (C axis port) is mounted on the MRS rack and features spring-loaded pins to facilitate rotation of the C axis using the REVO® head's B axis motion.

Probe characteristics

- SFP1 is a skidded probe type with a 2 µm radius diamond stylus tip. The skid is held against the surface with a controlled force of approximately 0.2 N whilst the stylus tip force is 0.001 N.
- The SFS-1 straight and SFS-2 cranked stylus holders have been designed to facilitate access to a wide range of features.
- The probe size with a straight stylus holder allows measurement within a 10 mm diameter bore to a depth of 100 mm.
- Surface measurement capability: 6.3 to 0.05 Ra.
- Output: Ra, RMS and raw data are returned from UCCServer to the metrology application client software using the I++ DME protocol. The raw data can subsequently be presented to specialist surface analysis software packages for further detailed reporting.



SFP1 combination kit

Includes: SFP1 probe
SFS-1 straight stylus holder
SFS-2 cranked stylus holder
SFA calibration artifact
SFCP C-axis change port

Part number: A-5453-3000

Price: \$19,834

Coordinate measuring machine probes

Touch probes

TP1S/TP1SM

A robust and reliable probe which is especially suited for manual CMMs. It is available in two versions with differing plug socket orientations:

TP1S cable connects vertically

TP1SM cable connects horizontally

Sense directions:	$\pm X, \pm Y, +Z$
2σ unidirectional repeatability:	$0.5 \mu\text{m}$
Pre-travel variation:	$\pm 2.0 \mu\text{m}$
Stylus force range:	10 g to 50 g
Stylus overtravel:	XY plane $\pm 19.5^\circ$ +Z axis 8.5 mm @ 15 g 5.0 mm @ 50 g
Suitable interfaces:	PI4-2, PI7-3, or PI200-3
Stylus thread size:	M3
Mounting option:	Shank to suit your CMM
Test conditions:	31 mm stylus @ 8 mm/s with trigger force of 15 g

Part number: A-1041-7540 (TP1S)

Price: \$3,316

Part number: A-1041-7541 (TP1SM)

Price: \$3,316



TP20/TP20 NI modular probes

The TP20 is a 5-way or 6-way kinematic touch-trigger probe. Its two piece design comprises a probe body and detachable stylus module(s) which gives the ability to change stylus configurations either manually or automatically without requalification of the stylus tips. It affords significant time savings in inspection routines.

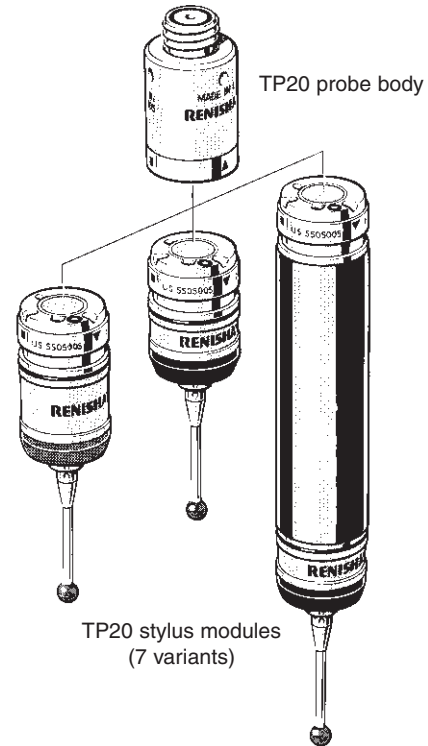
A direct replacement for the industry standard Renishaw TP2 probe, the TP20 probe system brings a range of new benefits to manual and DCC CMM applications, and can easily be retrofitted to existing TP2 installations.

The TP20 can be used on a wide range of Renishaw's manual or motorized probe heads, either by direct mounting using the standard M8 thread or, alternatively, by using a PAA# adaptor to connect to an autojoint.

The system components are:

- TP20/TP20 NI probe body
- TP20 stylus module – seven module variants allow for optimization of performance to suit the application
- MCR20 module changing rack – automatic operation

The TP20 probe system may be used with Renishaw's PI 4-2, PI 7-2 or PI 200 probe interfaces.



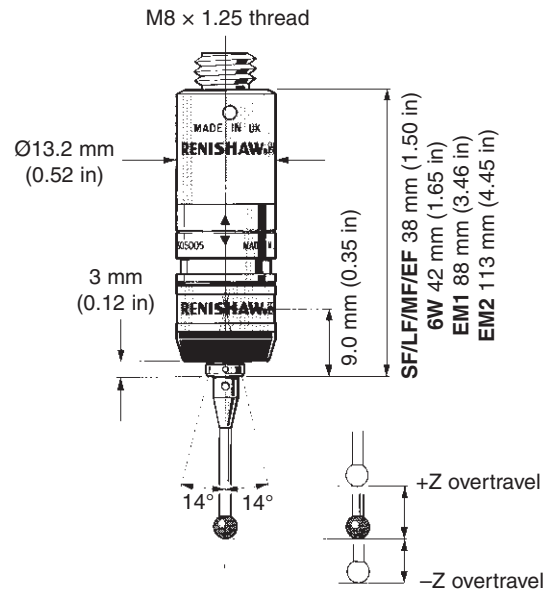
TP20 probe body

The TP20 probe body houses one half of the highly repeatable magnetic kinematic coupling that attaches the stylus module and body. The body also contains a magnetic proximity switch to inhibit triggering of the probe during automatic module changing with MCR20.

Note: If the probe is operated close to magnetized parts/clamping etc, the probe trigger may become inhibited. Countermeasures include the use of long styli, stylus extensions or body orientation to increase the distance to the magnetic source. Alternatively, use the TP20 NI probe body.

TP20 NI probe body

The TP20 NI probe differs from the TP20 body in that it is not affected by magnetic fields. However the probe trigger must be inhibited through software during change cycles using the MCR20.



+Z overtravel

SF/EM1/EM2	4.0 mm (0.16 in)
LF	3.1 mm (0.12 in)
MF	3.7 mm (0.15 in)
EF	2.4 mm (0.09 in)
6W	4.5 mm (0.177 in)

-Z overtravel

6W	1.5 mm (0.06 in)
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Coordinate measuring machine probes

Specification summary		TP20	TP20 NI
Principal application		DCC and manual CMMs suitable for most applications	DCC and manual CMMs where operation is within a magnetic field
Sense directions	All modules except 6W 6W	$\pm X, \pm Y, +Z$ $\pm X, \pm Y, \pm Z$	$\pm X, \pm Y, +Z$ $\pm X, \pm Y, \pm Z$
Pre-travel variation	LF SF/EM1/EM2 MF EF 6W	$\pm 0.6 \mu\text{m}$ (± 0.000023 in) $\pm 0.8 \mu\text{m}$ (± 0.000032 in) $\pm 1.0 \mu\text{m}$ (± 0.000039 in) $\pm 2.0 \mu\text{m}$ (± 0.000079 in) $\pm 1.5 \mu\text{m}$ (± 0.000058 in)	$\pm 0.6 \mu\text{m}$ (± 0.000023 in) $\pm 0.8 \mu\text{m}$ (± 0.000032 in) $\pm 1.0 \mu\text{m}$ (± 0.000039 in) $\pm 2.0 \mu\text{m}$ (± 0.000079 in) $\pm 1.5 \mu\text{m}$ (± 0.000058 in)
Repeatability of stylus change (max)	With SCR200 Manual	$\pm 0.5 \mu\text{m}$ (± 0.000020 in) $\pm 1.0 \mu\text{m}$ (± 0.000040 in)	$\pm 0.5 \mu\text{m}$ (± 0.000020 in) $\pm 1.0 \mu\text{m}$ (± 0.000040 in)
Stylus range		M2	M2
Probe mounting method		M8 thread	M8 thread
Suitable interface		PI 4-2, PI 7-2, PI 200	PI 4-2, PI 7-2, PI 200
Stylus module changing rack (automatic)		MCR20	MCR20
Stylus module storage rack (manual)		MSR1	MSR1

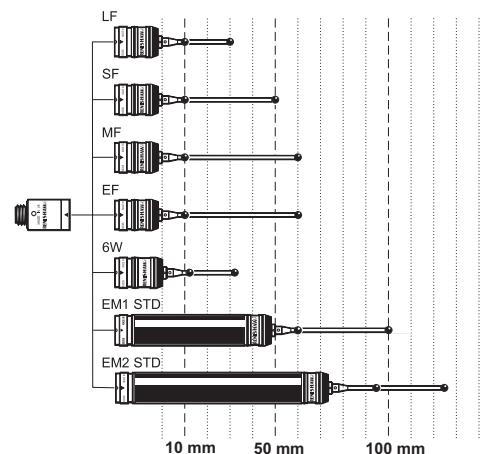


Module type and test stylus length	Trigger force		Overtravel force			Overtravel displacement			Unidirectional repeatability 2σ at stylus tip	2D (XY) form error
	XY	Z	XY	+Z	-Z	XY	+Z	-Z		
SF (black cap) 10 mm	0.08 N	0.75 N	0.2-0.3 N	3.5 N	-	$\pm 14^\circ$	4.0 mm (0.16 in)	-	0.35 μm (0.000014 in)	$\pm 0.8 \mu\text{m}$ (± 0.000032 in)
LF (green cap) 10 mm	0.055 N	0.65 N	0.09 N	1.15 N	-	$\pm 14^\circ$	3.1 mm (0.12 in)	-	0.35 μm (0.000014 in)	$\pm 0.6 \mu\text{m}$ (± 0.000024 in)
MF (grey cap) 25 mm	0.1 N	1.9 N	0.2-0.4 N	7.0 N	-	$\pm 14^\circ$	3.7 mm (0.15 in)	-	0.50 μm (0.000020 in)	$\pm 1.0 \mu\text{m}$ (± 0.000039 in)
EF (brown cap) 50 mm	0.1 N	3.2 N	0.2-0.5 N	10.0 N	-	$\pm 14^\circ$	2.4 mm (0.09 in)	-	0.65 μm (0.000026 in)	$\pm 2.0 \mu\text{m}$ (± 0.000079 in)
6W (blue cap) 10 mm	0.14 N	1.6 N	0.25 N	2.5 N	9.0 N	$\pm 14^\circ$	4.5 mm (0.18 in)	1.5 mm (0.059 in)	0.80 μm (0.000032 in)	$\pm 1.5 \mu\text{m}$ (± 0.000059 in)
EM1 10 mm	0.08 N	0.75 N	0.2-0.3 N	3.5 N	-	$\pm 14^\circ$	4.0 mm (0.16 in)	-	0.35 μm (0.000014 in)	$\pm 0.8 \mu\text{m}$ (± 0.000032 in)
EM2 10 mm	0.08 N	0.75 N	0.2-0.3 N	3.5 N	-	$\pm 14^\circ$	4.0 mm (0.16 in)	-	0.35 μm (0.000014 in)	$\pm 0.8 \mu\text{m}$ (± 0.000032 in)

The above data applies for test conditions as follows:

Stylus length as stated above.

Stylus velocity 480 mm/min (1.57 ft/min)



TP20 probe kits

TP20 probe kit 1

Includes two standard force modules.

Part number: A-1371-0290 **Price:** \$3,875

TP20 probe kit 2

Includes one standard force and one medium force module.

Part number: A-1371-0291 **Price:** \$3,875

TP20 probe kit 3

Includes one standard force and one extended force module.

Part number: A-1371-0292 **Price:** \$3,875

TP20 probe kit 4

Includes two medium force modules.

Part number: A-1371-0293 **Price:** \$3,875

TP20 probe kit 5

Includes one medium force and one extended force module.

Part number: A-1371-0294 **Price:** \$3,875

TP20 probe kit 6

Includes two extended force modules.

Part number: A-1371-0295 **Price:** \$3,875

TP20 probe kit 7

Includes one standard force and one 6-way module.

Part number: A-1371-0418 **Price:** \$4,198

TP20 non-inhibit (NI) probe kits

TP20 non-inhibit probe kit 1

Includes two standard force modules.

Part number: A-1371-0640 **Price:** \$3,875

TP20 non-inhibit probe kit 2

Includes one standard force and one medium force module.

Part number: A-1371-0641 **Price:** \$3,875

TP20 non-inhibit probe kit 3

Includes one standard force and one extended force module.

Part number: A-1371-0642 **Price:** \$3,875

TP20 non-inhibit probe kit 4

Includes two medium force modules.

Part number: A-1371-0643 **Price:** \$3,875

TP20 non-inhibit probe kit 5

Includes one medium force and one extended force module.

Part number: A-1371-0644 **Price:** \$3,875

TP20 non-inhibit probe kit 6

Includes two extended force modules.

Part number: A-1371-0645 **Price:** \$3,875

Coordinate measuring machine probes

TP20 accessories

TP20 probe modules

Standard force probe module

Part number: A-1371-0270 **Price:** \$969

Medium force probe module

Part number: A-1371-0271 **Price:** \$969

Extended force probe module

Part number: A-1371-0272 **Price:** \$969

Low force module

This module has a lower trigger force for use on components where a low probing force is needed.

Part number: A-1371-0392 **Price:** \$969

6-way probe module

Part number: A-1371-0419 **Price:** \$1,292

EM1 module only kit

This module is based on the standard force module with an integral 50 mm carbon fiber extension piece.

Part number: A-1371-0430 **Price:** \$1,173

EM2 module only kit

This module is based on the standard force module with an integral 75 mm carbon fiber extension piece.

Part number: A-1371-0431 **Price:** \$1,211

EM1/EM2 kit

Includes: TP20 EM1 standard module assembly
TP20 EM2 standard module assembly
Test certificate
EM1/EM2 user's information

Part number: A-1371-0432 **Price:** \$2,153

Cleaning kit

Part number: A-1085-0016 **Price:** \$18

MCR20

The MCR20 module changing rack provides rapid automatic changing of probe modules without the need to requalify. Rack function is completely passive and does not require any electrical connections.

Installation and set-up of the system is achieved with minimal operator skill as no special software or communications are required. The rack base and docking port assembly incorporate hinged overtravel mechanisms to assist crash protection. The kits include two probe modules, a mounting kit, a location plate, and a PS2R stylus.

Mounting fixture:	Single stud
Number of ports:	6
Repeatability of module change:	Automatic $\leq 1 \mu\text{m}$ Manual $\leq 2 \mu\text{m}$



MCR20 probe module change rack kits

MCR20 module change rack kit 1

Includes two standard force modules.

Part number: A-1371-0261 **Price:** \$5,263

MCR20 probe module change rack kit 2

Includes one standard force and one medium force module.

Part number: A-1371-0262 **Price:** \$5,263

MCR20 probe module change rack kit 3

Includes one standard force and one extended force module.

Part number: A-1371-0263 **Price:** \$5,263

MCR20 probe module change rack kit 4

Includes two medium force modules.

Part number: A-1371-0264 **Price:** \$5,263

MCR20 probe module change rack kit 5

Includes one medium force and one extended force module.

Part number: A-1371-0265 **Price:** \$5,263

MCR20 probe module change rack kit 6

Includes two extended force modules.

Part number: A-1371-0266 **Price:** \$5,263

MCR20 location plate

Part number: M-1085-0301 **Price:** \$10

Coordinate measuring machine probes

TP2 5-way

TP2 5-way is the industry-standard probe for most CMM applications. Its compact dimensions are ideal for probing into restricted component features.

Sense directions:	5-way ($\pm X$, $\pm Y$, $+Z$)
2σ unidirectional repeatability:	0.35 μm
Pre-travel variation:	$\pm 0.80 \mu\text{m}$
Stylus force range:	7 g to 15 g
Stylus overtravel:	XY plane $\pm 14^\circ$ $+Z$ axis 4.5 mm @ 7 g 3.0 mm @ 15 g
Mounting options:	M8 thread
Stylus thread size:	M2
Suitable interface:	PI4-2, PI7-3 or PI200-3
Test conditions:	10 mm stylus @ 8 mm/s with trigger force of 7 g to 8 g

Part number: A-1042-1890

Price: \$3,641



TP6/TP6A

The TP6 combines the robust characteristics of the TP1(S) with the repeatability of the TP2. It can be used on manual or DCC CMMs along with Renishaw's vast range of heads and extensions. The TP6A incorporates an autojoint for use with the Renishaw autochange system, or for manual probe changing. The TP6A allows for fast probe exchange without redatuming.

Sense directions:	$\pm X$, $\pm Y$, $+Z$
2σ unidirectional repeatability:	0.35 μm
Pre-travel variation:	$\pm 1.0 \mu\text{m}$
Stylus force range:	10 g to 30 g
Stylus overtravel:	XY plane $\pm 22^\circ$ $+Z$ axis 6.5 mm @ 12 g 3.0 mm @ 30 g
Mounting options:	TP6 M8 thread TP6A Autojoint
Stylus thread size:	M3
Test stylus length:	21 mm
Suitable interface:	PI4-2, PI7-3, PI200-3
Test conditions:	21 mm stylus @ 8 mm/s with trigger force of 11 g to 13 g

Part number: A-1039-0001 (TP6)

Price: \$3,522

Part number: A-1039-0028 (TP6A)

Price: \$3,641



TP7M

The TP7M is designed to maintain a high level of accurate and reliable performance across a wide range of conditions. The TP7M must be used with either the PH10M probe head or a PH6M fixed head.

Sense directions:	$\pm X, \pm Y, \pm Z$	
2 σ unidirectional repeatability:	High sensitivity	0.25 μm
	Mid sensitivity	0.25 μm
Pre-travel variation:	High sensitivity	$\pm 0.25 \mu\text{m}$
	Mid sensitivity	$\pm 0.50 \mu\text{m}$
Trigger force:	XY plane	2 g
	Z axis	15 g
Overtravel force:	XY plane	50 g
	Z axis	300 g
Stylus overtravel:	XY plane	16°
	+Z axis	5 mm
	-Z axis	5 mm
Max. extension on PH10M:	200 mm	
Mounting options:	Autojoint	
Stylus thread size:	M4	
Test stylus length:	50 mm	
Suitable interface:	PI7-3 only	
Test conditions:	50 mm stylus @ 8 mm/s	



TP7M probe kit

Part number: A-1073-0121

Price: \$5,370

TP7M EP

The TP7M EP (enhanced performance) is capable of achieving a 3D accuracy of $<0.6 \mu\text{m}$ tested to ISO 10360 Pt 2.

TP7M EP probe kit

Part number: A-1073-0261

Price: \$6,657

Coordinate measuring machine probes

TP200/TP200B modular probes

The TP200 and TP200B are electronic probes using strain gauge technology which gives higher accuracy than kinematic touch-trigger probes. They combine outstanding metrology performance with superior functionality to produce a highly versatile DCC CMM probing system with excellent productivity.

The TP200 system components are:

- TP200 probe body – the standard model
- TP200B probe body – a variant model with increased vibration tolerance
- TP200 stylus module – choice of fixed overtravel forces: 'SF' (standard force) or 'LF' (low force)
- PI 200 probe interface
- SCR200 stylus changing rack



TP200 probe body

The TP200 probe incorporates micro strain gauge transducers delivering excellent repeatability and accurate 3D form measurement even with long styli. The sensor technology gives sub-micron triggering performance and eliminates the lobing characteristics encountered with standard probes. The solid state ASIC electronics within the probe ensure reliable operation over millions of trigger points.

TP200B probe body

The TP200B probe uses the same technology as TP200 but has been designed to have a higher tolerance to vibration. This helps to overcome the problem of 'air' trigger generation which can arise from vibrations transmitted through the CMM or when using longer styli with faster positioning speeds. Please note that we do not recommend the use of TP200B with the LF module or cranked/star styli.

Measuring performance			TP200		TP200B	
Principal application			DCC CMM where high accuracy measurement is required		As TP200 but where 'air' * trigger events occur	
Sense directions			6-way:	±X, ±Y, ±Z	6 way:	±X, ±Y, ±Z
Unidirectional repeatability (2σ μm)	Trigger level 1	0.4 μm	(0.000016 in)	0.4 μm	(0.000016 in)	
	Trigger level 2	0.5 μm	(0.000020 in)	0.5 μm	(0.000020 in)	
XY (2D) form measurement deviation	Trigger level 1	±0.8 μm	(0.000032 in)	±1.0 μm	(0.000040 in)	
	Trigger level 2	±0.9 μm	(0.000036 in)	±1.2 μm	(0.000047 in)	
XYZ (3D) form measurement deviation	Trigger level 1	±1.0 μm	(0.000040 in)	±2.5 μm	(0.000100 in)	
	Trigger level 2	±1.4 μm	(0.000056 in)	±4.0 μm	(0.000160 in)	
Repeatability of stylus change	With SCR200 Manual	±0.5 μm ±1.0 μm	(0.000020 in) max (0.000040 in) max	±0.5 μm ±1.0 μm	(0.000020 in) max (0.000040 in) max	
Trigger force	XY plane	All modules	0.02 N	0.02 N		
	Z axis	All modules	0.07 N	0.07 N		
Overtravel force (@ 0.5 mm displacement)	XY plane	SF/EO module	0.2 N - 0.4 N	0.2 N - 0.4 N		
		LF module	0.1 N - 0.15 N	0.1 N - 0.15 N		
	Z axis	SF/EO module	4.9 N	4.9 N		
		LF module	1.6 N	1.6 N		
Weight (probe sensor + module)			22 g (0.8 oz)		22 g (0.8 oz)	
Max. extension (if on PH10 series head)			300 g (11.8 oz)		300 g (11.8 oz)	
Max. recommended stylus length (M2 stylus range)	SF/EO module LF module	50 mm (1.97 in) steel - 100 mm (3.94 in GF)			50 mm (1.97 in) steel - 100 mm (3.94 in GF)	
		20 mm (0.79 in) steel - 50 mm (1.97 in GF)			20 mm (0.79 in) steel - 50 mm (1.97 in GF)	
Probe mounting method			M8 thread		M8 thread	
Suitable interface			PI 200		PI 200	
Stylus module changing rack (automatic)			SCR200		SCR200	
Stylus module storage rack (manual)			MSR1		MSR1	

The above data applies for test conditions as follows:

Stylus length 50 mm (1.97 in)
Stylus velocity 480 mm/min (1.57 ft/min)

* Air trigger (or false trigger). The TP200B reduces triggers that may be caused by vibrations.

TP200/TP200B probe kits

TP200 probe with standard force module

Part number: A-1207-0001 **Price:** \$4,516

TP200 probe with low force module

Part number: A-1207-0002 **Price:** \$4,516

TP200B probe with standard force module

Part number: A-1207-0055 **Price:** \$4,516

TP200 accessories

Standard force stylus module

Part number: A-1207-0010 **Price:** \$678

Low force stylus module

Part number: A-1207-0011 **Price:** \$678

TP200 probe cleaning kit

Part number: A-1085-0016 **Price:** \$18

GF stylus kit *

Part number: A-5003-2310 **Price:** \$710

*See Stylus section for kit contents.

Coordinate measuring machine probes

SCR200

The SCR200 stylus changing rack provides rapid, automatic changing of styli without the need to requalify probe tips. Installation and set-up of the system are achieved with minimal operator skill, as no special CMM cabling, software or communications are required. The SCR200 is powered and serviced entirely by the PI200-3 interface and is fully crashed protected.

Mounting:	Horizontal or vertical		
Mounting fixture:	Single stud		
Number of ports:	6		
Module location and retention:	Magnetic		
Repeatability of stylus change (2σ) at 50 mm:	Automatic:	1 μm	
	Manual:	2 μm	
Change cycle:	<2 seconds		

SCR200 kit

Includes: 3 stylus changing modules
Mounting kit
PS2R stylus
Location plate

Part number: A-1207-0030 (standard force modules)	Price: \$8,692
Part number: A-1207-0070 (low force modules)	Price: \$8,692

SCR200 stylus changing rack only

Part number: A-1085-0370	Price: \$6,855
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SCR200 datum stylus (PS35R)

Part number: A-5000-7812	Price: \$147
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SCR200 cables

Part number: A-1016-7630 (PL63S – 5 m)	Price: \$104
Part number: A-1016-7631 (PL64S – 10 m)	Price: \$119
Part number: A-1016-7632 (PL65S – 20 m)	Price: \$156

SCR200 mounting kit

Part number: A-1085-0005	Price: \$19
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SCR200 location plate

Part number: M-1085-0301	Price: \$10
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Special probing systems

SP25

The SP25M is actually two sensors in one! – enabling the user to SCAN for form measurement or reverse engineering and TOUCH-TRIGGER PROBE (TTP) for geometry.

Highly accurate scanning performance with (M3) stylus lengths from 20 mm to 200 mm together with the ability to carry Renishaw's TP20 range of touch-trigger probe modules mean that the SP25M system provides unmatched flexibility to optimize a measurement solution to suit the application.

The probe is just 25 mm in diameter, compatible with Renishaw's PH10M/MQ, PH6M and PHS1 probe heads, and can also be mounted using a multiwired extension bar. Together these combinations permit excellent reach and access to part features.

Physical measurement range:	±0.5 mm deflection in all directions in all orientations
Physical overtravel range:	X,Y ±2.0 mm +Z 1.7 mm -Z 1.2 mm
Resolution:	Capable of <0.1 µm
Spring rate:	0.6 N/mm to 0.2 N/mm – dependent on stylus length
Dimensions:	Ø25 mm × length dependent on module used
Mass:	SP25M body 65 g
	SM25-1 scan module 35 g (includes SH25-1, but excludes stylus)
	SM25-2 scan module 40 g (includes SH25-2, but excludes stylus)
	SM25-3 scan module 49 g (includes SH25-3, but excludes stylus)
	TM25-20 TTP module 40 g (includes TP20 standard module, but excludes stylus)
Mounting:	Multiwired autojoint connection <ul style="list-style-type: none"> • compatible with PH10M PLUS, PH10MQ PLUS, and PH6M • may be mounted to autojoint extension bars
Signal outputs:	Non-linear and non-orthogonal analog outputs – rate, gain and resolution are not fixed
Interface:	AC3 card



SP25M special SCAN/TTP full combination kit

The full scanning system plus the capability to use TP20 modules – this kit includes all the equipment in these separate kits and is supplied as one complete kit:

1 × A-2237-1001	SP25M scanning probe kit #1 (includes SM25-1 kit)
1 × A-2237-1102	SM25-2 scanning module kit
1 × A-2237-1103	SM25-3 scanning module kit
1 × A-2237-1200	TM25-20 TTP module adaptor ONLY (to directly carry any TP20 module)

Part number: A-2237-1015

Price: \$17,934

Coordinate measuring machine probes

SP25M scanning probe kit #1 (entry level kit)

Includes: 1 × SP25M probe body
1 × SM25-1 scanning module kit (see below)

Part number: A-2237-1001

Price: \$10,362

SP25M scanning probe kit #2 (entry level kit)

Includes: 1 × SP25M probe body
1 × SM25-2 scanning module kit (see below)

Part number: A-2237-1002

Price: \$10,362

SP25M scanning probe kit #3 (entry level kit)

Includes: 1 × SP25M probe body
1 × SM25-3 scanning module kit (see below)

Part number: A-2237-1003

Price: \$10,362

SP25M scanning probe kit #4 (entry level kit)

Includes: 1 × SP25M probe body
1 × SM25-4 scanning module kit (see below)

Part number: A-2237-1004

Price: \$12,189

SM25-1 scanning module kit

Includes: 1 × SM25-1
2 × SH25-1

Part number: A-2237-1101

Price: \$4,765

SM25-2 scanning module kit

Includes: 1 × SM25-2
2 × SH25-2

Part number: A-2237-1102

Price: \$4,765

SM25-3 scanning module kit

Includes: 1 × SM25-3
2 × SH25-3

Part number: A-2237-1103

Price: \$4,765



SM25-4 full module kit

Includes: 1 × SM25-4
2 × SH25-4
full stylus kit containing:
1 × M3 stylus D5R L21 EWL21 d2.5SS
1 × M3 stylus D5R L50 EWL50 d2.5CE
1 × M3 stylus D10R L200 EWL200 d4C/F
1 × M3 stylus D10R L150 EWL150 d4C/F
1 × M3 stylus D10R L100 EWL100 d4C/F
1 × M3 stylus D10R L75 EWL75 d4C/F
2 × M2-M3 stylus tools

Part number: A-2237-1104 **Price:** \$7,756

SM25-4 entry level module kit

Includes: 1 × SM25-4
1 × SH25-4
basic stylus kit containing:
1 × M3 stylus D5R L21 EWL21 d2.5SS
1 × M3 stylus D10R L100 EWL100 d4C/F
2 × M2-M3 stylus tools

Part number: A-2237-1108 **Price:** \$6,084

SM25-4 basic module kit

Includes: 1 × SM25-4
2 × SH25-4
basic stylus kit containing:
1 × M3 stylus D5R L21 EWL21 d2.5SS
1 × M3 stylus D10R L100 EWL100 d4C/F
2 × M2-M3 stylus tools

Part number: A-2237-1109 **Price:** \$6,582

SM25-5 scanning module kit

Includes: 1 × SM25-5
2 × SH25-5

Part number: A-2237-1105 **Price:** \$6,016

TM25-20 TTP module adaptor only

Part number: A-2237-1200 **Price:** \$3,392

TM25-20 TTP module adaptor kit #1

Includes: 1 × TM25-20
2 × TP20 standard modules

Part number: A-2237-1201 **Price:** \$4,765

SM25-1 scanning module only

Part number: A-2237-1111 **Price:** \$4,432

SM25-2 scanning module only

Part number: A-2237-1112 **Price:** \$4,432

SM25-3 scanning module only

Part number: A-2237-1113 **Price:** \$4,432

SM25-4 scanning module only

Part number: A-2237-1114 **Price:** \$5,185

SM25-5 scanning module only

Part number: A-2237-1115 **Price:** \$5,730

SH25-1 stylus holder only

Part number: A-2237-1301 **Price:** \$199

SH25-2 stylus holder only

Part number: A-2237-1302 **Price:** \$300

SH25-3 stylus holder only

Part number: A-2237-1303 **Price:** \$366

SH25-4 stylus holder only

Part number: A-2237-1304 **Price:** \$484

SH25-5 stylus holder only

Part number: A-2237-1305 **Price:** \$258

AC3 interface card

Part number: A-2237-1601 **Price:** \$3,325

Coordinate measuring machine probes

FCR25

The full potential of the SP25M system may be realized when the flexible change rack option is incorporated. Based on the versatile FCR25 triple-port rack unit, which allows any of the SP25M system elements to be rapidly exchanged in any of the ports, this is undoubtedly the most adaptable rack system yet from Renishaw. The FCR25 mounts directly to Renishaw's MRS modular rack system. Alternatively, compact 3-port and 6-port 'standalone' racks are available which incorporate FCR25.



FCR25 flexible change rack unit

Triple-port unit for MRS system.

Includes: 1 × FCR25
3 × PA25-SH
3 × PA25-20

Note: Requires an MRS kit for CMM mounting.

Part number: A-2237-1401

Price: \$2,549



FCR25 TC

Thermally controlled FCR25 for use with SM25 modules only.

Part number: A-2237-1408

Price: \$2,893

FCR25-L3 3-port standalone change rack unit

Includes: 1 × FCR25 with integral leg for table mounting
3 × PA25-SH
3 × PA25-20

Part number: A-2237-1403

Price: \$3,768



FCR25-L6 6-port standalone change rack unit

Includes: 2 × FCR25 with integral leg for table mounting
3 × PA25-SH
3 × PA25-20

Part number: A-2237-1406

Price: \$6,316



FCR25 port adaptor insert kit

Includes: 3 × PA25-SH
3 × PA25-20

Part number: A-2237-1415

Price: \$366

SP80

The SP80 is a quill-mounted scanning probe that uses digital scale and readhead technology, plus Renishaw's innovative isolated optical metrology principles, to provide exceptional scanning performance, even with long styli.

It is able to reach deep into parts by carrying styli up to 500 mm long and 500 g mass, including star configurations which do not require counterbalancing. Renishaw's M5 styli products are designed to complement SP80 and ensure maximum performance.

Detachable stylus holders (SH80) permit rapid and repeatable interchange between stylus configurations, thus eliminating recalibration, maximizing productivity and permitting optimum solutions to match the application.

A simple and robust passive design, with no internal motors to generate heat or reliability issues, avoids unnecessary system complexity.

The SP80 probe body houses the sensor mechanism comprising a 'box' spring motion system and the isolated metrology system featuring high accuracy digital scale and readheads.

Longer stylus lengths may be carried subject to operating conditions (consult Renishaw for application assistance).



SP80 probe kit 1

Includes: SP80 probe body
SH80 stylus holder
KM80 quill mount plate
PL157 probe cable
60 mm long stylus
Tools

Part number: A-2238-0700

Price: \$16,844

SP80 probe kit 2

Includes: SP80 probe kit 1
SCP80 stylus change port (3 off)
MRS kit 2 (600 mm rail length – see page 1-51)

Part number: A-2238-0732

Price: \$20,752

SP80 probe kit 3

Includes: SP80 probe kit 1
SCP80 stylus change port (4 off)
MRS kit 2 (600 mm rail length – see page 1-51)

Part number: A-2238-0733

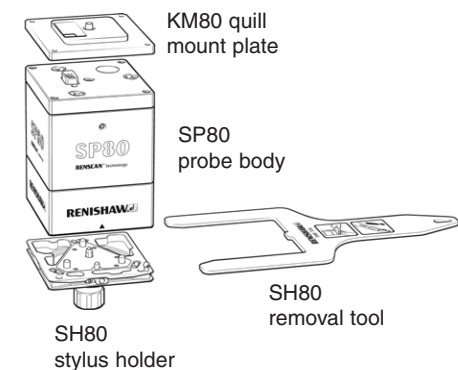
Price: \$21,101

SP80 probe kit 4

Includes: SP80 probe kit 1
SCP80 stylus change port (5 off)
MRS kit 3 (1000 mm rail length – see page 1-51)

Part number: A-2238-0734

Price: \$21,515



SP80 probe kit 5

Includes: SP80 probe kit 2
SH80 stylus holder (3 off)

Part number: A-2238-0735

Price: \$22,051

SP80 probe kit 6

Includes: SP80 probe kit 3
SH80 stylus holder (4 off)

Part number: A-2238-0736

Price: \$22,926

SP80 probe kit 7

Includes: SP80 probe kit 4
SH80 stylus holder (5 off)

Part number: A-2238-0737

Price: \$23,820

Coordinate measuring machine probes

SP80H

The SP80H is a horizontal quill-mounted version of the SP80 probe that uses the same digital scale and readhead technology as the SP80 probe.

The SP80H is intended for use on horizontal arm machines and uses the standard SH80 stylus holder and KM80 quill mount. It uses the SCP80V for automated stylus changing.

It is able to carry Renishaw's range of M5 threaded styli up to 500 mm long. Stylus configurations up to 300 g unbalanced are possible.



SP80H probe kit 1

Includes:

- SP80H probe body
- SH80 stylus holder
- SH80K stylus holder
- KM80 quill mount plate
- SH80 removal tool
- PL157 probe cable
- 60 mm long stylus
- Tools

Part number: A-2238-0419 **Price:** \$16,844

Other probe kits similarly configured to the SP80 probe kits are available upon request. Please contact Renishaw for details.

SCP80 stylus change port

Individual ports for rapid interchange between SH80s. The SCP80 mounts to Renishaw's modular rack system (MRS) – see page 1-51.

Part number: A-2238-0706 **Price:** \$1,076

SCP80V rack port

The SCP80V is a rack port designed for use with SP80H to allow automatic changing of the SCP80 stylus holders on horizontal arm machines. It may also be used for changing stylus holders that have long styli protruding from the rear of a horizontally mounted port.

Part number: A-2238-0726 **Price:** \$1,157

SH80 stylus holder

Rapidly interchangeable onto the probe body via a magnetic kinematic joint, the SH80 features a 5-way stylus cube which can be rotated to align styli as desired.

Part number: A-2238-0705 **Price:** \$541

SH80K stylus holder

The SH80K is a stylus holder that allows you to power off the SP80 and SP80H probes and turn them back on without needing to re-home the probe.

Part number: A-2238-0430 **Price:** \$581

SH80 removal tool

The SH80 removal tool is used to manually remove the SH80 or SH80K stylus holder from the SP80 or SP80H.

Part number: M-2238-0443 **Price:** \$58

KM80 quill mount plate

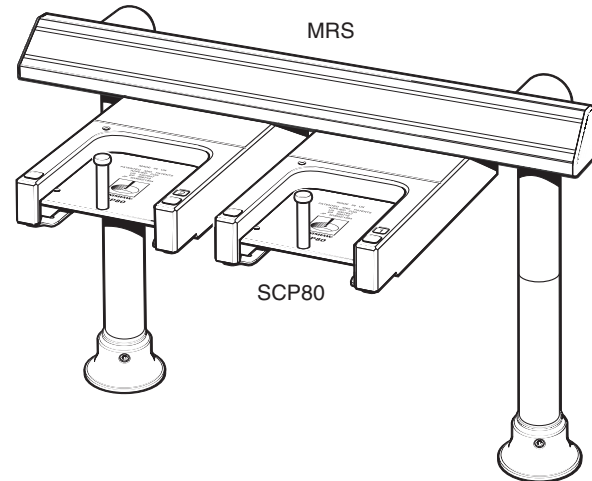
The standard mounting plate between the CMM quill (80 mm square) and the SP80 probe body. Provides easy and repeatable removal/replacement of the probe. Alternative CMM quill mountings are available (see KM6080 and SM80 below).

Part number: A-2238-0703 **Price:** \$180

KM6080 quill mount plate

As KM80 but used to mount SP80 onto a 60 mm square CMM quill.

Part number: A-2238-0020 **Price:** \$180



SM80 shank mount plate

As KM80 but with a shank mount to the CMM (non-preferred method).

Part number: A-2238-0704 **Price:** \$901

IU80 interpolator unit

Required for all OEM controller installations (as opposed to Renishaw's UCC controller installations which require use of the UCC/SP80 daughter card).

Part number: A-2238-0720 **Price:** \$866

CC6 counter card

Required where this function is not performed by the CMM controller/PC.

Part number: A-4068-0400 **Price:** \$1,560

Cables

PL156

IU80 to OEM controller (supplied unterminated).

Part number: A-1016-7129 **Price:** \$99

PL157

SP80 probe cable (included with all SP80 kits).

Part number: A-1016-7132 **Price:** \$119

PL158

IU80 to CC6.

Part number: A-1016-7133 **Price:** \$252

Coordinate measuring machine probes

SP600M

The SP600M is an autojointed, multiwired analog scanning probe which enables a CMM to gather large amounts of data very rapidly for inspection or digitizing purposes. Low spring forces allow scanning of finely detailed parts. The probe can be used with a PH10M or PH6M probe head and is compatible with the Renishaw autochange system.

Measurement range:	±1 mm (0.04 in) X, Y, and Z
Return to zero:	<5 µm (0.0002 in) from 0.5 mm deflection
Resolution:	0.1 µm (0.000004 in) with optional AC2 interface 0.5 µm (0.00002 in) with optional AC1 interface
Spring rate:	120 gf/mm nominal
Outputs (X,Y,Z):	Analog proportional voltage output scaling: 4 V to 8.5 V/mm
Interface:	AC1 or AC2 analog converter PC card (optional)
Mounting:	Multi-wired autojoint
Dimension:	Length 107.5 mm, diameter 50 mm
Weight:	216 g

Part number: A-2098-0105 **Price:** \$11,020

AC1 analog converter PC card

Part number: A-2098-1000 **Price:** \$2,315

AC2 analog converter PC card

Part number: A-2172-0001 **Price:** \$2,692

Stylus module - SH600 standard

Part number: A-2098-0284 **Price:** \$458

Stylus module - SH600 extended

Part number: A-2098-1036 **Price:** \$623

SP600Q

The SP600Q is a quill-mounted version of the SP600M probe. It can therefore be connected directly to the quill of a CMM and an external cable carries the probe signal to the interface card. The specification for the SP600Q is identical to the SP600M, with the following exceptions:

Mounting:	Direct in quill
Dimensions:	Length 99 mm, diameter 60 mm
Weight:	299 g

SP600Q kit

Part number: A-2098-0890 **Price:** \$11,020

SCR600 stylus changing rack

The SCR600 is a passive stylus change rack for use with the SP600M and requires no electrical connections. It houses up to four stylus modules per rack. The rack kit includes two stylus changing modules and additional modules can be purchased separately.

Part number: A-2098-0255 **Price:** \$5,113



Gram gage

The gram gage allows you to adjust, reset and check probe trigger force settings on all standard Renishaw CMM touch-trigger probes. Setting the optimum trigger force using the gram gage maximizes probe performance. It can be used to set trigger force settings over a range of 3 to 30 grams.

Overall length: 95 mm
Needle length: 41 mm
Depth: 27 mm
Width: 43 mm
Range: 4 to 35 gram range with 1 gram graduations

Probe	Stylus length (mm)	Optimum trigger force (grams) *
TP1	31	15
TP2-5W	10	7 to 8
TP2-6W	10	7 to 8
TP6	21	11 to 13
TP6A	21	11 to 13

* This is the optimum trigger force recommended by Renishaw. Higher trigger forces may be required for longer styli.

Part number: P-GA01-0001

Price: \$146



Coordinate measuring machine probes

CMM probe shanks

Shanks are used to mount the probe head to the quill of the CMM. The shanks listed below are suitable for all Renishaw manual and motorized heads, as well as the TP1 and MIP probes.

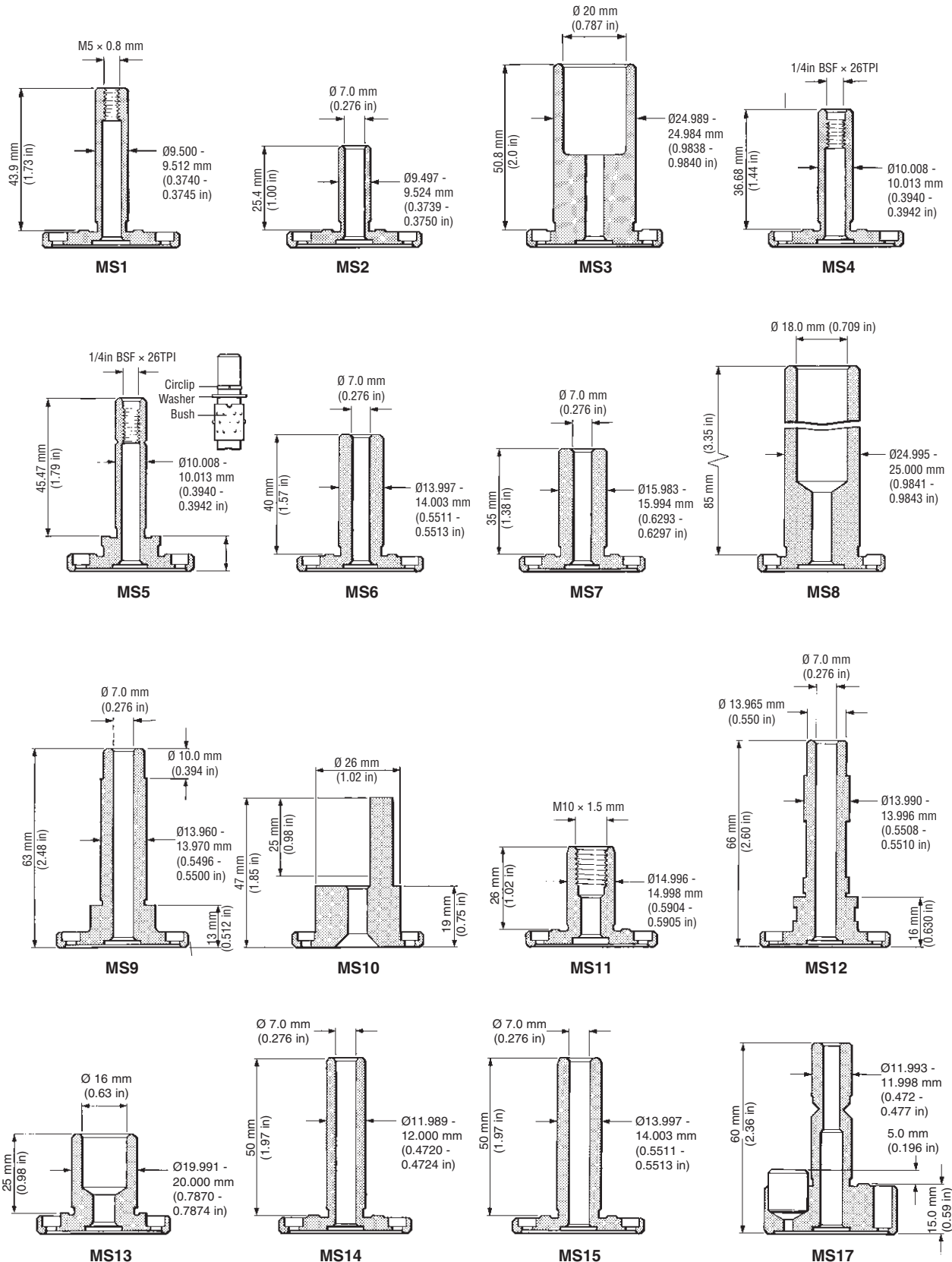
Note: The PH6 requires a different shank and has a separate listing (see overleaf).

The correct shank must be chosen to suit the mounting facility of your coordinate measuring machine.

Shanks are included in the price of Renishaw heads and TP1 and MIP probes, but must be specified when placing an order. See the drawings on the following pages for the exact dimensions of each shank.

Shank	Used on the following machines	Part number	Price
MS1	Brown & Sharpe, Bridgeport, Elm Systems, Fanamation, Giddings & Lewis, I.T.P., Poli, Portage Machine, Tesa, Zett-Mess	M-1041-2146	\$151
MS1(S)	New Carl Zeiss	A-1041-7114	\$151
MS2	Boice, Carl Zeiss, Federal Products, Helmelt, Kemco, Metrologic, MFO, Mora, Numerex, Real Meca, Starrett, Tokyo-Boeki, Tri-mesures, TSK, and Wenzel	M-1041-1650	\$151
MS3	LK Tool (meter 4), Ferranti, Tarus, W & A, Eley & Warren	M-1041-1656	\$151
MS5	Ferranti	M-1041-1652	\$151
MS6	C.E. Johansson (old specification)	M-1041-1653	\$151
MS7	Renault (Seiv), Tri-Measures	M-1041-1654	\$151
MS7(S)	Starrett (new specification)	M-1041-7132	\$193
MS8	Olivetti	M-1041-1657	\$151
MS9	MTI Corporation (UK)	M-1041-4843	\$151
MS10	MTI Corporation	M-1041-7507	\$151
MS11	Crown Windley	M-1041-1088	\$151
MS12	MTI Corporation (new specification)	M-1041-7068	\$151
MS13	DEA Corp	M-1041-5348	\$151
MS14	CTA, Real Meca	M-1041-5981	\$151
MS15	C.E. Johansson (new specification)	M-1041-2153	\$151
MS17	Stiefelmayer	A-1041-7113	\$215

Standard base diameter 41.35 - 41.45 mm (1.630 - 1.632 in)



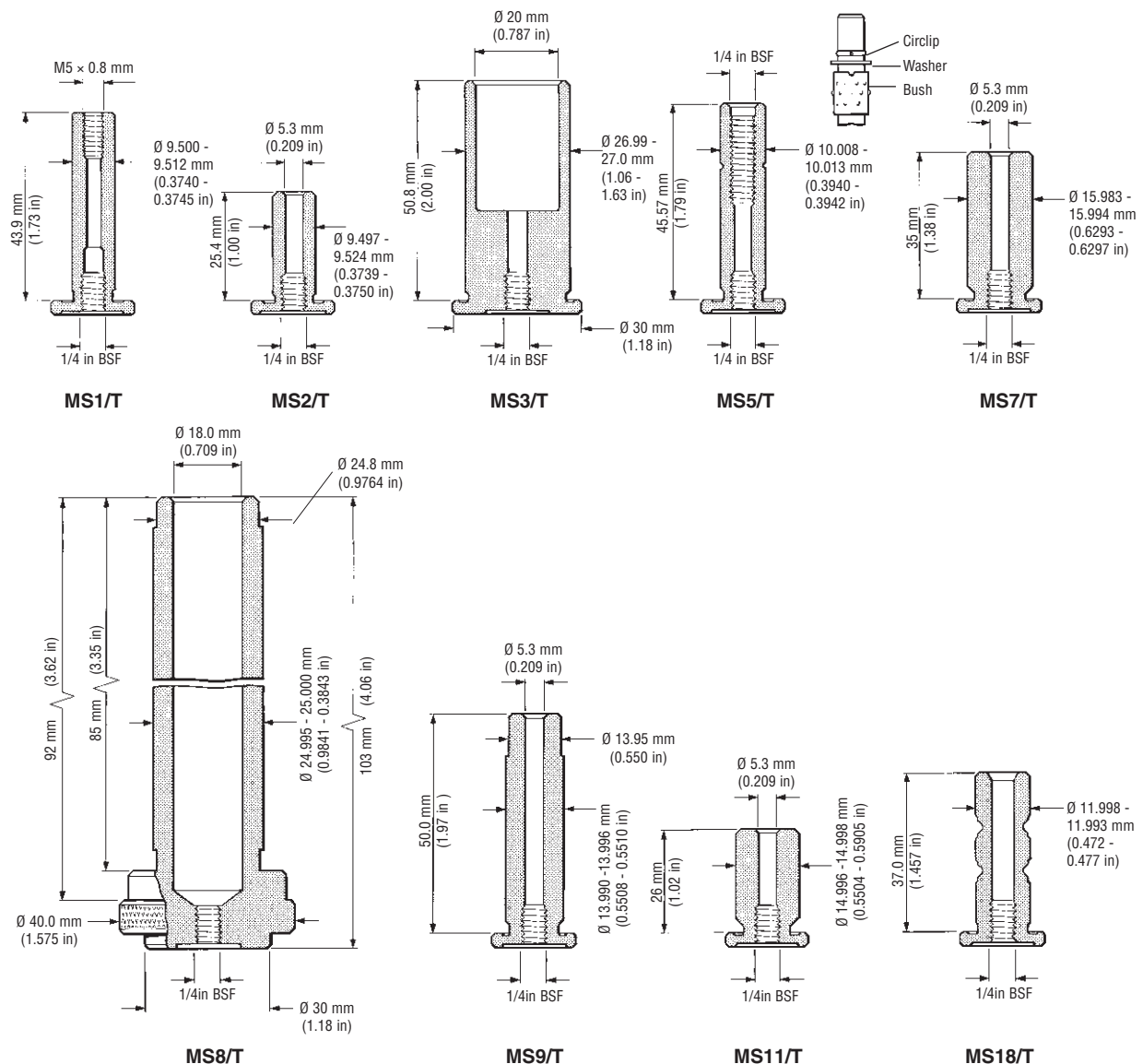
Coordinate measuring machine probes

PH6 shanks

Shank Used on the following machines

Shank	Used on the following machines	Part number	Price
MS1/T	Brown & Sharpe, Bridgeport, Elm Systems, Fanamation, Giddings & Lewis, Poli, & Portage Machine	M-1046-1121	\$215
MS2/T	Federal Products, Helmel, Kemco, Mora, Numerex, Starrett, Tokyo-Boeki, & Wenzel	M-1046-1120	\$151
MS3/T	Eley, Ferranti, LK Tool (meter 4), Tarus, W & A, & Warren	M-1046-1126	\$151
MS4/T	LK Tool (micro)	M-1046-1128	\$151
MS5/T	Ferranti	M-1046-1122	\$151
MS6/T	C.E. Johansson	M-1046-1123	\$151
MS7/T	Renault	M-1046-1124	\$151
MS8/T	Olivetti	M-1046-1802	\$151
MS9/T	MTI Corporation (UK)	M-1046-4545	\$151
MS11/T	Crown & Windley	M-1046-2661	\$151
MS18/T	Mora	M-1046-7107	\$151

Standard base diameter 18.9 - 19.1 mm (0.74 - 0.75 in) unless stated



CMM cables

Manual probe head cables

Cable	Type	Overall length	Machine connector	Part number	Price
PL1(T)	Coiled	315 mm – 730 mm (12.4 in – 28.7 in)	5 pin mold – 5 pin DIN	A-1016-0004	\$97
PL2(T)	Coiled	465 mm – 1290 mm (18.3 in – 50.8 in)	5 pin mold – 5 pin DIN	A-1016-0006	\$97
PL3(T)	Coiled	765 mm – 2415 mm (30.1 in – 95.1 in)	5 pin mold – 5 pin DIN	A-1016-0012	\$97
PL4(T)	Plain	4510 mm (177.6 in)	5 pin mold – 5 pin DIN	A-1016-0001	\$97
PL14	Coiled	595 mm – 1830 mm (23.4 in – 72 in)	5 pin mold – 7 pin AMPHENOL	A-1016-0003	\$108
PL17(T)	Coiled	200 mm – 400 mm (7.9 in – 15.8 in)	5 pin mold – 14 pin LEMO	A-1023-7024	\$243
PL18(T)	Coiled	500 mm – 1300 mm (19.7 in – 51.2 in)	5 pin mold – 14 pin LEMO	A-1023-7025	\$243
PL27(T)	Coiled	203 mm (8 in)	5 pin mold – 5 pin mold	A-1016-6370	\$57
PL27(T)	Plain	152 mm (6 in)	5 pin mold – 5 pin mold	A-1016-6440	\$57

Motorized probe head cables

Cable	Type	Overall length	Machine connector	Part number	Price
PL5(U)	Coiled	0.4 m – 0.8 m (16 in – 31 in)	PH9/10 to machine cable	A-1016-7672	\$271
PL6(U)	Coiled	0.8 m – 1.6 m (31 in – 63 in)	PH9/10 to machine cable	A-1016-7673	\$271
PL12(U)	Plain	0.1 m (4 in)	PH9/10 to machine cable	A-1016-7674	\$238
PL13(U)	Coiled	0.1 m – 0.2 m (4 in – 8 in)	PH9/10 to machine cable	A-1016-7675	\$238
PL33(U)	Plain	3 m (118 in)	PH9/10 to machine cable	A-1023-7056	\$311
PL93(U)	Plain	0.1 m (4 in)	PH10MQ to PLM6/7/8/9S	A-1016-7676	\$271

Machine cables

Cable	Type	Overall length	Machine connector	Part number	Price
PLM6(T)	Plain	6 m (19 ft)	PH10 cable to PHC10-3 controller (chassis)	A-1016-7564	\$156
PLM7(T)	Plain	4 m (13 ft)	PH10 cable to PHC10-3 controller (chassis)	A-1016-7563	\$156
PLM8(U)	Plain	6 m (19 ft)	PH10 cable to PHC10-3 controller (socket)	A-1016-7677	\$156
PLM9(U)	Plain	4 m (13 ft)	PH10 cable to PHC10-3 controller (socket)	A-1016-7678	\$156

Output cables

Cable	Type	Overall length	Machine connector	Part number	Price
PL7	Plain	3 m (118 in)	5 pin DIN to 5 pin DIN	A-1029-0166	\$57
PL15	Plain	4.5 m (177 in)	5 pin DIN, interface to CMM	A-1004-0110	\$68
PL26(T)	Plain	0.6 m (23 in)	PI200-3 to PHC9 (7 pin)	A-1057-0132	\$97
PL37	Plain	0.5 m (19 in)	7 pin DIN to 7 pin DIN	A-1054-0003	\$57

Multiwired cables

Cable	Type	Overall length	Description	Part number	Price
PL38V	Plain	25 m (82 ft)	Multiwired cable	A-1016-7625	\$859
PL42V	Plain	15 m (49 ft)	Multiwired cable	A-1016-7624	\$690
PL44V	Plain	8 m (26 ft)	Multiwired cable	A-1016-7627	\$554
PL45V	Plain	1.8 m (5.9 ft)	Multiwired cable	A-1016-7629	\$373
PL46V	Plain	3.7 m (12 ft)	Multiwired cable	A-1016-7628	\$441
PL56V	Plain	12 m (39.3 ft)	Multiwired cable	A-1016-7626	\$622
PL75V	Plain	1 m (3.2 ft)	IS1-2 extension cable	A-1016-7644	\$171

Coordinate measuring machine probes

Adaptor/extension cables

Cable	Type	Overall length	Description	Part number	Price
PL9	Plain	0.6 m (23 in)	Machine cable to probe interface cable	A-1029-0182	\$57
PL10	Plain	0.1 m (4 in)	Machine cable to probe/head cable (5 pin)	A-1029-0111	\$85
PL22	Plain	0.3 m (12 in)	Probe head cable adaptor (PL1S, 2S, 3S, 4S to PI4-2, PI200-3 input)	A-1057-0131	\$57
PL23(T)		0.5 m (19 in)	PI4-2, PI200-3 adaptor cable (machine cable to PHC9 extension cable PL82V to video interface)	A-1057-0133	\$85
PL97(S)	Plain	0.1 m (4 in)	SCR200 Y adaptor cable	A-1016-7660	\$226

PICS interconnection cables

Cable	Overall length	Description	Part number	Price
PL24	5 m (16 in)	PI200-3 or PI7-3 to CMM	A-1016-0121	\$151
PL25(T)	0.3 m (11 in)	PI200-3 or PI7-3 to PHC10-3/ACC2-2	A-1016-0120	\$151
PL70(V)	0.5 m (19 in)	PI200-3 and PI7-3 interfaces	A-1016-7634	\$362
PL72	2 m (6.5 in)	PI200-3 or PI7-3 to PHC10-3/ACC2-2	A-1016-7637	\$151
PL76(S)	0.7 m (2.25 in)	T cable	A-1016-7643	\$171

Extensions

The extensions and knuckle joint are the primary means of adding flexibility to fixed heads. Extensions provide penetration into deep features, while the knuckle joint allows inspection of angular features. The knuckle joint allows 360° in the B axis and ±100° in the A axis.

Extension bars

Number	Description	Material	Length	Diameter	Part number	Price
PEL1	M8 thread to M8 thread	Aluminum	50 mm (1.97 in)	13 mm	A-1047-3484	\$284
PEL2	M8 thread to M8 thread	Aluminum	100 mm (3.94 in)	18 mm – 13 mm	A-1047-3485	\$346
PEL3	M8 thread to M8 thread	Aluminum	200 mm (7.87 in)	18 mm – 13 mm	A-1047-3486	\$363
PEL4	M8 thread to M8 thread	Aluminum	300 mm (11.81 in)	13 mm	A-1047-3487	\$458
PECF1*	M8 thread to M8 thread	Carbon fiber	50 mm (1.97 in)	13 mm	A-1047-7065	\$571
PECF2*	M8 thread to M8 thread	Carbon fiber	100 mm (3.94 in)	13 mm	A-1047-7064	\$616
PECF3*	M8 thread to M8 thread	Carbon fiber	200 mm (7.87 in)	13 mm	A-1047-7066	\$683

* These products are special order only. Please call Customer Service for details.

Knuckle joint

Number	Description	Part number	Price
PK1	Knuckle joint	A-1014-1720	\$604

Autojoint extension bars

Number	Description	Material	Length	Diameter	Part number	Price
PAA1	Autojoint to M8 thread	Steel	30 mm (1.18 in)	25 mm – 18 mm	A-1051-0417	\$353
PAA2	Autojoint to M8 thread	Aluminum	140 mm (5.51 in)	25 mm – 13 mm	A-1051-0418	\$451
PAA3	Autojoint to M8 thread	Aluminum	300 mm (11.81 in)	25 mm – 13 mm	A-1051-0419	\$548
PAACF2*	Autojoint to M8 thread	Carbon fiber	140 mm (5.51 in)	25 mm – 13 mm	A-1051-0488	\$981
PAACF3*	Autojoint to M8 thread	Carbon fiber	300 mm (11.81 in)	25 mm – 13 mm	A-1051-0493	\$1,029
PAACF*	Autojoint to M8 thread	Carbon fiber	400 mm (15.74 in)	25 mm – 14 mm	A-1051-0513	\$1,644
PAACF*	Autojoint to M8 thread	Carbon fiber	450 mm (17.72 in)	25 mm – 14 mm	A-1051-0394	\$1,713
PEM1	Autojoint to autojoint	Steel/aluminum	50 mm (1.97 in)	25 mm	A-1076-0070	\$972
PEM2	Autojoint to autojoint	Steel/aluminum	100 mm (3.94 in)	25 mm	A-1076-0071	\$1,198
PEM3	Autojoint to autojoint	Steel/aluminum	200 mm (7.87 in)	25 mm	A-1076-0072	\$1,424
PEM4	Autojoint to autojoint	Steel/aluminum	150 mm (5.91 in)	25 mm (90°)	A-1076-0073	\$1,481
PEMCF1*	Autojoint to autojoint	Carbon fiber	50 mm (1.97 in)	25 mm	A-1051-0490	\$765
PEMCF2*	Autojoint to autojoint	Carbon fiber	100 mm (3.94 in)	25 mm	A-1051-0443	\$1,210
PEMCF3*	Autojoint to autojoint	Carbon fiber	200 mm (7.87 in)	25 mm	A-1051-0491	\$1,438
PEMCF*	Autojoint to autojoint	Carbon fiber	150 mm (5.91 in)	25 mm	A-1051-1132	\$1,375

* These products are special order only. Please call Customer Service for details.

Coordinate measuring machine probes

Interfaces

PI6

The PI6 interface is used on the Brown & Sharpe Microval only. Connectors are 25 pin 'D' socket and plug. Please contact Renishaw for details.

Part number: A-1033-0001

Price: \$264

PI7-3

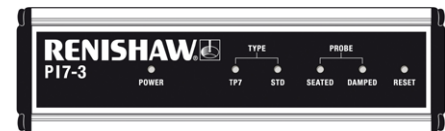
The PI7-3 interface is a dual-purpose probe interface designed to process signals from the TP7M high-accuracy probe and standard touch-trigger probes (TP2, TP20, TP6, and TP6A). Special auto-selecting electronics within the interface allow the automatic use and exchange of all of these probes without any setting changes to the interface.

The PI7-3 performs all the functions of the PI4 and PI9 interfaces, but has additional features such as probe damping, probe inhibit, and emergency stop. This interface can be either free-standing or rack-mounted.

Application:	TP7, TP2, TP6, TP6A, TP20, MH20, and MH20i
Power supply:	85 V – 135 V, 50/60 Hz 170 V – 270 V, 50/60 Hz
Dimensions:	Height 88 mm (3.46 in) Width 146 mm (5.75 in) Depth 208.5 mm (8.21 in)
Input:	9 way 'D' type socket
TP7M input:	15 way double density 'D' type socket or 9 pin 'D' type socket
Compatibility:	Output TTL(PICS)/SSR 5 pin DIN socket (PICS-9 pin 'D' type plug)
Cables	Contact Renishaw

Part number: A-5726-0100

Price: \$1,117



PI200-3

The PI200-3 interface can be interconnected within the majority of Renishaw's manual and motorized probing installations with no additional CMM communications or control signalling required. Optimum performance will be obtained on installations utilizing probe damping or halt signal facilities. Probe signalling between TP200 and PI200-3 must be direct and uninterrupted. Probe signal interfacing may be present within some CMM cabling arrangements. Call Renishaw for further details.

Application: TP1, MIP, TP2, TP20, TP6, TP6A, TP200, MH20, and MH20i
 Power supply: 85 V – 264 V, 47 Hz – 66 Hz
 Dimensions: Height 88 mm (3.46 in)
 Width 146 mm (5.75 in)
 Depth 183 mm (7.19 in)
 Input: 9 way 'D' type socket
 Compatibility: Output PICS/SSR

Part number: A-5707-0100

Price: \$780



IS1-2

The IS1-2 interface selector is a fully-automatic system for use on CMM installations requiring multiple sensor types (i.e. video, laser, analog, etc.). The unit functions by identifying which probe has been fitted to the probe head and switches the probe signal/power lines to the appropriate interface. The unit is configurable by inserting different programming modules.

Applications: TP7M, SP600M, TP2, TP20, TP6, TP200, SP25M, TP800
 Power supply: 85 V – 264 V, 47 Hz – 66 Hz
 Dimensions: Height 88 mm (3.46 in)
 Width 164 mm (5.75 in)
 Depth 208 mm (8.21 in)
 Input: 15 way double density 'D' type socket
 Output: 15 way double density 'D' type plug and
 9 way 'D' type plug (PICS)
 Cables: Contact Renishaw

Part number: A-1327-0100

Price: \$2,826

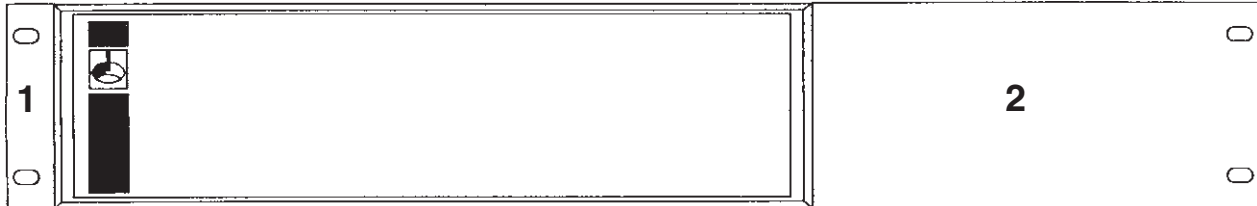


Coordinate measuring machine probes

Mounting brackets

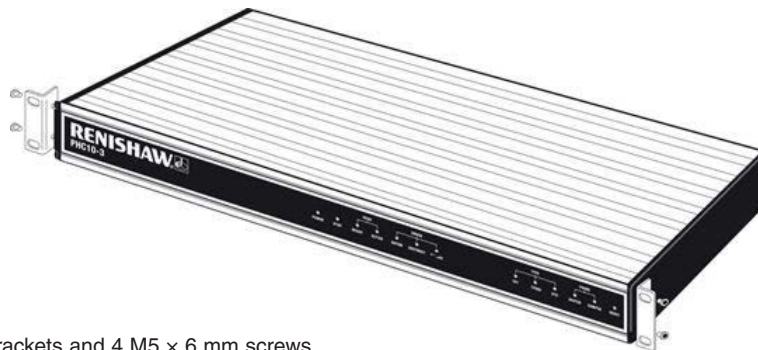
Renishaw controllers and interfaces are supplied in various different types of enclosures. Consult the drawings below to determine your bracket requirements based upon the combination of products you are installing.

PHC9 / PHC50 / PHC10-2 / ACC2-2



- | | | |
|---------------------------|---------------------------------|--------------------|
| 1. Rack mount bracket kit | Part number: A-1018-0124 | Price: \$23 |
| 2. 1/3 blanking panel kit | Part number: A-1018-0123 | Price: \$30 |

PHC10-3 PLUS cabinet mounting



Mounting kit containing 2 brackets and 4 M5 x 6 mm screws

Part number: A-1018-0189 **Price:** \$33

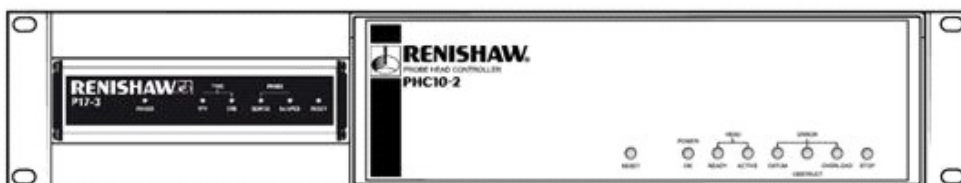
PI7-3 alone / PI200-3



1/3 mounting panel kit containing 1U x 1/3 blanking plate and 2 M6 x 5 mm screws (2 kits required)

Part number: A-1018-0179 **Price:** \$22

PI7-3 next to PHC10-2



Mounting kit containing PI7-3 to PHC10-2 conversion bracket

Part number: A-1018-0173 **Price:** \$46

Autochange system

Renishaw's autochange equipment is the world's first integrated CMM probe exchange system. Mounted within the CMM's working envelope, autochange facilitates fast, automatic probe exchange without the need for redatuming. In addition, it provides covered storage for probes and extension bars.

ACR1 autochange rack with adjustable base

The ACR1 is designed to accept the SP600 and SP25M as well as all other Renishaw autojoint probes and extension bars (must be used in conjunction with the horizontal mounting kit – see below). The rack is supplied with eight long ports for maximum support. Where a probe greater than Ø25 mm is required, the rack can be configured by the user by swapping a long port for a short port (see below).

Number of stations: 8
Dimensions: 460 mm × 109 mm × 81 mm

This system can be mounted either horizontally or vertically.

Part number: A-1051-1300 **Price:** \$19,027

Note: Adjustable base, legs and cable sold separately (see page 1-50).

Horizontal mounting kit

Includes: 1 × adjustable rack base
2 × 200 mm legs
2 × screws

Part number: A-1051-0441 **Price:** \$368

Vertical mounting kit

Includes: 1 × support plate
8 × support pins (short)
8 × support pins (long)

Part number: A-1051-1308 **Price:** \$87

ACC2-2 autochange controller

Data transmission: Serial (RS232)
User-definable parameters: Baud rate 300–19200
Voltage range: 85 V–135 V, 170 V–275 V, 50/60 Hz automatic selection
Dimensions: Height 88 mm (3.46 in)
Width 290 mm (11.42 in)
Depth 220 mm (8.66 in)

Part number: A-1520-0101 **Price:** \$2,959



Coordinate measuring machine probes

ACR1 autochange system accessories

Adjustable rack base

Part number: A-1051-0440 **Price:** \$315

Leg (100 mm)

Part number: M-1051-0147 **Price:** \$13

Leg (200 mm)

Part number: M-1051-0148 **Price:** \$24

Port replacement kits

All kits contain four ports.

Short port replacement kit

Part number: A-5036-0049 **Price:** \$273

Long port replacement kit

Part number: A-1051-7077 **Price:** \$263

Mixed port replacement kit

Contains two short and two long ports.

Part number: A-1051-7076 **Price:** \$263

ACR1 autochange system cables

PL19 5 m cable

Part number: A-1051-0199 **Price:** \$212

PL20 10 m cable

Part number: A-1051-0045 **Price:** \$352

PL21 15 m cable

Part number: A-1051-0102 **Price:** \$461

PL40 30 m cable

Part number: A-1054-0002 **Price:** \$899

ACR3 autochange rack

The ACR3 forms part of the modular rack system (MRS) and is an autochange rack for probes and extension bars that incorporate the Renishaw autojoint. The ACR3 is a four-port mechanical design that traverses the MRS rail. Driven by the motion of the CMM, it locks and unlocks the autojoint between the probe and the probe head.

ACR3 4-port rack

Part number: A-5036-0005

Price: \$9,589

Note: For 8-port applications, two 4-port racks can be connected together. The 8-port configuration requires the use of either the MRS kit 2 or MRS kit 3 (see below).

MRS kits

Include: MRS rail (see below)
MRS feet (2)
125 mm legs (4)
Step back adaptors (2)

The MRS rail is available in 400 mm, 600 mm and 1000 mm lengths.

MRS kit 1

400 mm long rail.

Part number: A-4192-0001

Price: \$1,205

MRS kit 2

600 mm long rail.

Part number: A-4192-0002

Price: \$1,292

MRS kit 3

1000 mm long rail.

Part number: A-4192-0003

Price: \$1,400

Note: The MRS kits are compatible with FCR25, SCP600 and ACR3.

MRS rails

Part number: A-4192-0050 (400 mm)

Price: \$205

Part number: A-4192-0051 (600 mm)

Price: \$269

Part number: A-4192-0052 (1000 mm)

Price: \$376

ACR3 components

SCP600

Stylus change port for SP600.

Part number: A-2098-0933

Price: \$1,400



Coordinate measuring machine probes

MRS legs

One per kit.

Part number: A-4192-0061 (62.5 mm) **Price:** \$86

Part number: A-4192-0053 (62.5 mm) **Price:** \$102

MRS heavy duty leg kit

Ø60 mm × 350 mm long. One per kit.

Part number: A-4192-0020 **Price:** \$364

MRS adjustable foot plate

Two per kit.

Part number: A-4192-0702 **Price:** \$376

MRS leg and foot adaptor

One per kit.

Part number: A-4192-0055 **Price:** \$151

MRS fixed foot

One per kit.

Part number: A-4192-0056 **Price:** \$151

MRS step back adaptor

One per kit.

Part number: A-4192-0058 **Price:** \$151

M8 T nut *

Part number: P-NU18-0005 **Price:** \$13

* no discounts

MRS spacer kit

Two per kit.

Part number: A-4192-0014 **Price:** \$77

Manual autojoint probe stand

Renishaw's manual autojoint probe stand (MAPS) is a low-cost storage rack capable of holding up to six combinations of probes, extension bars, and accessories. The stand can be mounted directly on the table of a CMM using the appropriate socket head bolt (maximum size M10, 3/8 in) which is passed through the center of the base.

Standard autochange rack legs (100 mm and 200 mm long) are compatible with this stand and can be stacked to accommodate longer probe extensions with longer stylus extensions. As an alternative to the support pillar, a wall mounting bracket is available to enable the stand to be mounted to a cabinet, wall or any other vertical surface.

Height: 285 mm
Depth: 80 mm
Width: 235 mm

Part number: A-1071-0001

Price: \$222

MSR1 rack

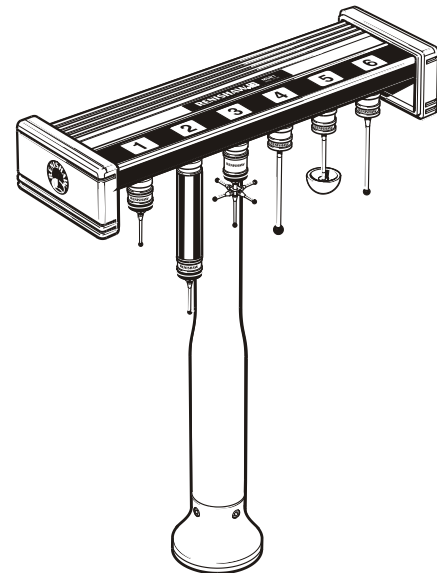
The MSR1 rack is intended for use on either manual or DCC CMMs to hold pre-qualified stylus assemblies fitted to TP20 or TP200 probe modules. The rack provides convenient storage and protects the kinematic coupling mechanism from contamination.

Overall height: 285 mm
Depth (inc wall bracket): 86 mm
Width: 236 mm

MSR1 with leg and base (wall mount kit included)

Part number: A-1371-0347

Price: \$404



Coordinate measuring machine probes

Datum sphere

The Renishaw universal datum sphere enhances the performance of manual and fully automated CMMs. It allows for quick and easy adjustment to set ball stem over a wide range of probe datuming angles. This enables datuming above, centrally and below the ball. Each datum sphere is supplied with its own certificate, giving ball diameter and roundness. All sphere measurements are performed on equipment traceable to UK (NPL) standards.

Specifications:	Hard-wearing tungsten carbide sphere (ball) available in five sizes
Metric:	Ø12 mm, Ø19 mm and Ø25 mm
Inch:	Ø3/4 in and Ø1 in
Sphericity:	to within 0.1 µm (0.000004 in)
Diametric tolerance:	±1 µm (0.00004 in)

Datum sphere kit

Includes:	1 datum ball (selected by size)
	Pivot pillar
	Base
	C spanner
	Ball certificate
	Storage box

Description	Part number	Price
Ø12 mm ball	A-1034-0028	\$545
Ø19 mm ball	A-1034-0027	\$545
Ø25 mm ball	A-1034-0026	\$545
Ø¾ in ball	A-1034-0031	\$545
Ø1 in ball	A-1034-0035	\$545

Datum sphere fixing studs

A fixing stud is required with each kit to attach the pillar to the table surface. Select one from the list below.

Description	Manufacturer	Part number	Price
M6 × 1		M-1034-0016	\$27
M8 × 1.25	MTI	M-1034-0015	\$27
M10 × 1.5	B&S, LK Tool & Sheffield	M-1034-0014	\$27
5/16–18 UNC		M-1034-0018	\$27
3/8–16 UNC	Carl Zeiss, Fanamation, LK Tool, & L.S. Starrett	M-1034-0017	\$27

Datum sphere accessories (M6 thread – stem is attached to the ball)

Description	Part number	Price
Ø12 mm datum ball	A-1034-0005	\$335
Ø19 mm datum ball	A-1034-0023	\$335
Ø25 mm datum ball	A-1034-0002	\$335
Ø¾ in datum ball	A-1034-0032	\$335
Ø1 in datum ball	A-1034-0036	\$335
2 way adaptor	M-1034-0042	\$82
3 way adaptor *	M-1034-0052	\$186
Pillar extension 75 mm (2.96 in) long	M-1034-0019	\$82

* Special order



Mahogany boxes

Probe head boxes

Description	Part number	Price
PH1 probe head, cable, TK6 box	A-1015-7725	\$100
PH6 probe head, TP2 probe, stylus, TK6 box	A-1015-7731	\$100
PH5 or PH5-1 probe head, cable, TK6 box	A-1015-7727	\$100
PH10M probe head kit box	A-1015-7698	\$108
PH6A probe head kit box	A-1015-7674	\$198
TP1 probe and stylus box (PC10)	A-1015-7686	\$136
MIH and accessories box	A-1015-7765	\$113
TP200 probe and stylus box	A-1015-7869	\$135

Extension bar boxes

Description	Part number	Price
PEL extension bars (PC19)	A-1015-7694	\$113
PEM extension bars	A-1015-7761	\$131

Probe extension kits

Kit EKL **Part number:** A-1047-7005 **Price:** \$994

Description	Quantity	Part number
Lightweight extension bar (50 mm) PEL1	1	A-1047-3484
Lightweight extension bar (100 mm) PEL2	1	A-1047-3485
Lightweight extension bar (200 mm) PEL3	1	A-1047-3486
Double-ended spanner	1	A-1047-3932
Box	1	A-1015-7694

PEM Kit **Part number:** A-1076-0100 **Price:** \$3,305

Description	Quantity	Part number
Multiwire extension bar (50 mm) PEM1	1	A-1076-0070
Multiwire extension bar (100 mm) PEM2	1	A-1076-0071
Multiwire extension bar (200 mm) PEM3	1	A-1076-0072
Joint key	1	A-1051-0040
Box	1	A-1015-7761

Coordinate measuring machine probes

Stylus tools

S1 C spanner (for use with TP20 probe body)

Part number: A-1042-1486

Price: \$20

S3 hex key 1.5 mm A/F

Part number: P-TL01-0150

Price: \$4

S4 hex key 3.0 mm straight arm

Part number: P-TL01-0300

Price: \$4

S5 wrench 2 mm A/F

Part number: P-TL01-0200

Price: \$4

S6 hex key 2.5 mm A/F

Part number: P-TL01-0250

Price: \$4

S7 stylus tool (for use with M2 and M3 styli)

Part number: M-5000-3540

Price: \$9



S9 double-ended spanner

Part number: A-1047-3932

Price: \$14

S10 joint key (for use with autojoint)

Part number: A-1051-0040

Price: \$17

S12 hex key 0.9 mm A/F

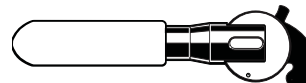
Part number: P-TL01-0089

Price: \$4

S20 torque tool (for use with M2 carbon fiber stylus)

Part number: A-5003-2300

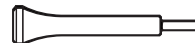
Price: \$48



M4 stylus tool (for use with M4 and M5 styli)

Part number: M-5000-3707

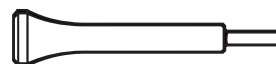
Price: \$12



Stylus tool (for use with adaptor M-5000-9301)

Part number: M-5000-9304

Price: \$15



Tool kits

TK1 tool kit

The TK1 tool kit is included with the MP1, MP3, MP4, MP7, MP8, MP9, MP10, MP11, MP12, MP14, MP700, and LP2 probes.

Includes: Stylus tool Ø1.98 mm
Hex key 1.5 mm A/F
Hex key 2.0 mm A/F
Hex key 2.5 mm A/F
Hex key 3.0 mm A/F
Hex key 4.0 mm A/F

Part number: A-2053-7531

Price: \$36

TK3 tool kit

The TK3 tool kit is included with the M6-3 probe.

Includes: Stylus tool Ø1.98 mm
Hex key 1.5 mm A/F
Hex key 2.0 mm A/F
Hex key 2.5 mm A/F
Hex key 3.0 mm A/F
Hex key 4.0 mm A/F
Hex key 5.0 mm A/F

Part number: A-2027-7046

Price: \$36

TK4 tool kit

Includes: S7 stylus tool (2)
Hex key 1.5 mm A/F
Hex key 2.5 mm A/F

Part number: A-1041-7041

Price: \$24

TK5 tool kit

Includes: S7 stylus tool (2)
S8 spanner
C spanner
Double-ended spanner
Hex key 1.5mm A/F

Part number: A-1042-7030

Price: \$62

TK6 tool kit

Includes: Hex key 2.0 mm A/F
Hex key 2.5 mm A/F
Hex key 3.0 mm A/F

Part number: A-1042-7031

Price: \$7

TK7 tool kit

Includes: Joint key
S7 stylus tools (2)
Hex key 1.5 mm A/F

Part number: A-1039-0041

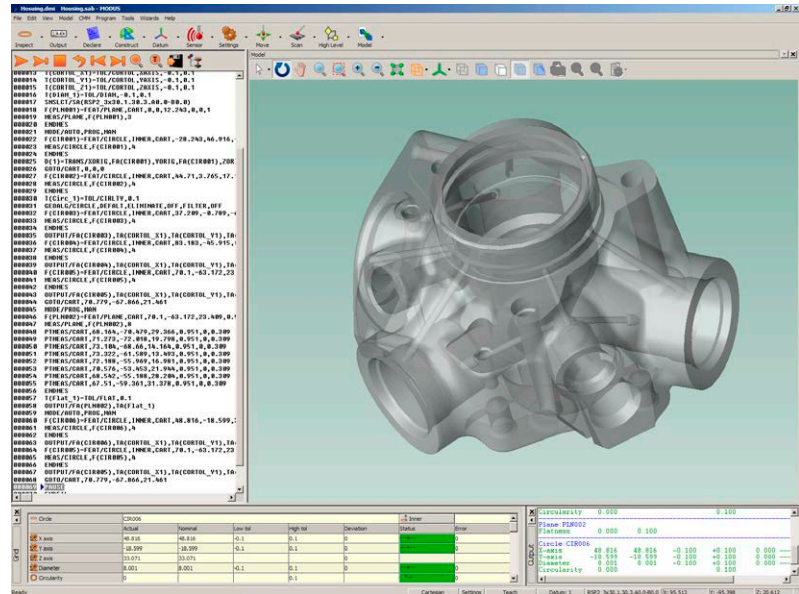
Price: \$28

CMM metrology software

MODUST™

Renishaw's new MODUST™ software provides a powerful platform for 3-axis and 5-axis measurement. A configurable user interface allows native DMIS programs to be developed online or offline, drawing geometry, embedded dimensions and tolerance data from CAD, with full simulation and collision detection. The software includes certified algorithms for feature measurement, feature construction and part alignment.

- Full support for I++ DME compliant metrology controllers, including Renishaw's UCC range of universal CMM controllers
- Full compatibility with REVO® and PH20
- CAD-driven online / offline programming
- Full motion simulation and collision detection, including 5-axis moves
- Native DMIS support
- Certified mathematical algorithms
- Powerful text and graphical reporting
- Flexible output of results data including certified Q-DAS



MODUST™

MODUST™ – 3-axis and 5-axis touch-trigger

Part number: A-5639-0001

Price: \$8,800

MODUST™ – 3-axis scanning

Part number: A-5639-0003

Price: \$12,800

MODUST™ – 5-axis scanning

Part number: A-5639-0005

Price: \$20,800

MODUST™ Offline*

MODUST™ – Offline 3-axis and 5-axis touch-trigger

Part number: A-5639-0101

Price: \$4,400

MODUST™ – Offline 3-axis scanning

Part number: A-5639-0103

Price: \$6,400

MODUST™ – Offline 5-axis scanning

Part number: A-5639-0105

Price: \$10,400

Offline – Graphical reporting

Part number: A-5639-0007

Price: \$1,600

Options

Renishaw offers multiple application-specific analysis packages including Modus Gear, Modus Spline and Modus Airfoil. These are chargeable modules added to a base package of Modus 3-axis or 5-axis. Please contact Renishaw for details.

* The online version of MODUST™ can also be run offline without the need to purchase MODUST™ Offline. Only purchase MODUST™ Offline if you require a dedicated offline seat of MODUST™.

CAD integration options

In addition to the native IGES and STEP support, MODUS™ offers a wide range of CAD options including VDA-FS, STEP, CATIA® (v5 and v4), Unigraphics®, Parasolid®, Pro/E® and SolidWorks®. For a complete list and pricing of CAD import / export options please contact Renishaw sales.

Software maintenance agreements

Every new purchase of MODUS™ comes with one year's free software updates, maintenance and support. After the first year, one-year maintenance agreements can be purchased for MODUS™ and its software options. Please contact Renishaw sales for details.

MODUS™ training at Renishaw Inc

Charge per student.

4 days

Part number: A-5639-1701 **Price:** \$3,000

3 days

Part number: A-5639-1700 **Price:** \$2,250

2 days

Part number: A-5639-1702 **Price:** \$1,500

1 day

Part number: A-5639-1703 **Price:** \$750

Onsite MODUS™ training

Up to four people, all inclusive of expenses.

4 days

Part number: RI-5639-1701 **Price:** \$9,625

3 days

Part number: RI-5639-1700 **Price:** \$7,700

2 days

Part number: RI-5639-1702 **Price:** \$5,775

1 day

Part number: RI-5639-1703 **Price:** \$3,850

MODUS™ training block

Part number: A-5639-2500 **Price:** \$680

Renishaw services

Renishaw has set up a series of part numbers which should be referenced when ordering Renishaw services. These part numbers will appear on your invoice.

Part number	Description	Price
RI-6002-0001	CMM hourly labor	\$150/hour
RI-6002-0002	CMM hourly travel	\$75/hour
RI-6002-0003	CMM expenses	as incurred
RI-6002-0004	CMM in-house training	\$750/day